An ethnographic and technological study of breakbeats in Hardcore, Jungle, and Drum & Bass

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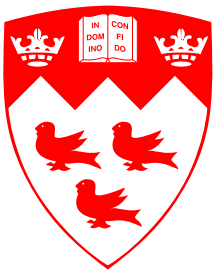

Submitted August 2013

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of Doctor of Philosophy.

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Abstract

During the late 1980s and early 1990s, the United Kingdom's DJ-oriented electronic music community embraced new technologies and developed innovative techniques to master these technologies, resulting in the development of new genres. Three such genres, Hardcore, Jungle, and Drum & Bass (HJDB), emerged at the critical intersection between computer technology and the consumer market, which allowed computer music to be made through the use of home-based studios. The essential instrument in HJDB was the digital sampler, a device that offered musicians the ability to achieve realistic instrumentation through a "cut-and-paste" method of production. The thread that ties these three genres together was their unique usage of fast-paced sampled drums, derived primarily from breakbeats—samples of short percussion solos typically from 1960s to 1980s Funk and Jazz recordings.

This dissertation explores a number of important issues that have not been addressed in prior writing on HJDB, and consists of three main objectives. The first is to provide a written history of the genres from the perspective of those that have made the music. This history catalogues the origins of the United Kingdom's DJ-oriented electronic music genres, the incorporation of breakbeats into this music that created the Hardcore genre, and developments that then resulted in the creation of the Jungle genre and subsequently the Drum & Bass genre. The second objective is to provide an explanation of the main technologies used in the creation of this music (e.g., the digital sampler) and the techniques developed by musicians to harness this technology. The third objective is to provide methods for the computational analysis of HJDB music, through automated determination of the breakbeats being used, detection of downbeat locations, and an estimation of the degree of rhythmic modification. Each of these objectives has been informed by over twenty interviews with musicians and label owners from throughout the history of HJDB. Computational methods based on HJDB-specific knowledge are shown to significantly outperform generalized music analysis techniques, highlighting the importance of style-specific approaches for computational musicology.

Résumé

Durant la fin des années 80 et le début des années 90 au Royaume Uni, le monde de la musique électronique destinée aux DJ a adopté de nouvelles technologies et développé des techniques innovantes pour les maîtriser, aboutissant ainsi au développement de nouveaux genres. Trois de ces genres, Hardcore, Jungle, et Drum & Bass (HJDB), ont émergé au croisement critique entre la technologie numérique et le marché grand public, permettant la production de musique numérique dans les "home studios". L'instrument clé en HJDB était l'échantillonneur numérique, un appareil offrant aux musiciens la possibilité de réaliser une instrumentation réaliste grâce à une méthode de production "couper-coller". Le point commun entre ces trois genres était l'utilisation d'extraits de batterie au rythme rapide, principalement dérivés des "breakbeats"—courts extraits de solos de percussion typiques des enregistrements Funk et Jazz de 1960 à 1980.

Ce travail explore un grand nombre de problématiques n'ayant pas été traitées dans la littérature HJDB et consiste en trois objectifs principaux. Le premier est de présenter l'histoire de ces genres musicaux du point de vue de leurs créateurs. Il s'agit de passer en revue les origines des différents genres de musique électronique destinée aux DJ—au Royaume-Uni, l'incorporation des "breakbeats" dans cette musique résultant dans la naissance du genre Hardcore, et les développements ayant mené au Jungle et par la suite au Drum & Bass. Le second objectif est de présenter les principales technologies utilisées dans la création de cette musique (par example, l'échantillonneur numérique) ainsi que les techniques développées par les musiciens pour maitriser ces technologies. Enfin, le troisième objectif est de fournir des méthodes pour l'analyse numérique de la musique HJDB, par la détection automatique des "breakbeats" utilisés, celle de la localisation des "downbeats", et une estimation du degrés de modification rythmique. Chacun de ces objectifs a été étayé par des entrevues faites avec plus que vingt musiciens et propriétaires de labels ayant participé à l'histoire du HJDB. Il a été démontré que les méthodes d'analyse informatique inspirées de la connaissance spécifique du HJDB surpassent

significativement les techniques générales d'analyse musicale, mettant ainsi en évidence l'importance d'une approche spécifique du genre en musicologie numérique.

Acknowledgements

First and foremost, I would like to thank my advisor, Prof. Ichiro Fujinaga, for his supervision throughout the course of my doctoral studies at McGill University. Prof. Fujinaga has tirelessly provided his encouragement and guidance, which has helped me to define my research goals and to shape the scope and focus of this dissertation. His suggestions and careful critique during all stages of this dissertation were indispensible to the creation of this document. In this regard, I would also like to thank Prof. Nicole Biamonte for her detailed reading and guidance towards a more cohesive, structurally-sound work. I very much appreciate the thoughtful reading and suggestions for improvements and future work provided by the other members of my dissertation committee—Professors Nick Collins, George Massenburg, William Straw, and Eleanor Stubley.

I am grateful to Matthew Davies, who, in the preparation of this document, has advised me on a variety of signal processing issues and has provided suggestions for improvement of the written portion. I would also like to thank Prof. Juan Bello at New York University, for guiding me towards the field of music information retrieval, which resulted in both my work with Matthew Davies and doctoral studies at McGill University under the instruction of Prof. Fujinaga. I would like to extend my gratitude to fellow music technologist, Joseph Thibodeau for his review of this document and his useful discussion throughout the various stages of this project. I would also like to acknowledge the efforts of Joseph Thibodeau and Typhaine Mie-Lejeune for their aid in the French translation of the abstract.

This dissertation would not have been possible without the time and effort of the interview participants, who patiently discussed their personal experiences in the Hardcore, Jungle, and Drum & Bass genres at length. In this regard, I would like to acknowledge the contributions of Alicia Bauer, Tony Bowes, Jason Chatzilias, James Clements, Carl Collins, David Davies, Charlie Fieber, Will Hansen, Martin Heinze, Jelal Kane, Colin Lindo, Robert Macciochi, Dave Minner, Conor O'Dwyer, Shane O'Shea, Peter Parsons, Neil Rumney, David Stewart, Kirk Thompson, Andrew

Wilson, and Andrew Wright. Likewise, I am grateful to Nicholas Sykes, who has kindly shared his knowledge and expertise related to the genres. I would also like to thank Colin Steven (Knowledge Magazine) and Alexander Foy (Organic Music) for their roles as intermediaries in acquiring participants for the interviews. I would also like to acknowledge Karsten Obarski for providing additional information that has helped to clarify the narrative. Much gratitude is also due to Roland Canada (Adrian Marsi), Roland Japan, Akai Professional, and Perfect Circuit Audio for the use of copyrighted images in this dissertation, and to Ben Kulchstein, who kindly parted ways with his 1990s Knowledge Magazine collection used in this research.

The computational analysis methods developed for this dissertation were tested using ground truth information collected from Hardcore, Jungle, and Drum & Bass DJs and producers. Many thanks are due to Conor O'Dwyer, Jason Chatzilias, Ryan Stevens, Kian Joyner, Daniel Lajoie, Scott London, and several others who devoted their time to the development of this data.

Travel funding for part of this project was kindly provided by the Social Sciences and Humanities Research Council of Canada (SSHRC), the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT), and McGill's Graduate and Postdoctoral Studies Graduate Travel Funding initiative.

I would also like to thank the past and present members of the Distributed Digital Music Archives and Libraries (DDMAL) lab—Andrew Hankinson, Johanna Devaney, Ashley Burgoyne, Gabriel Vigliensoni, Cory McKay, Rebecca Fiebrink, Beinan Li, Jordan Smith, Greg Burlet, Alastair Porter, Hannah Robertson, Ryan Groves, and Jessica Thompson—for their friendship, discussion, and encouragement throughout my time at McGill. I would also like to thank Darryl Cameron for his friendship and technical support, and Hélène Drouin for her assistance in keeping me on track for the numerous targets in the thesis timeline.

I am ever indebted to my parents, Monica and Donald Hockman, whose consistent love, encouragement, and support have allowed me to complete this document, and to my sister, Nia von Hockman-Chase, whose musicianship served as an inspiration from an early age. Finally, I would like to thank my partner, Melissa Czajkowski, for her gracious patience, love, support, and understanding, without which this dissertation surely would not have been completed.

Chapter 1: Introduction

Hardcore, Jungle, and Drum & Bass (HJDB) are three related genres of DJ-oriented electronic music created in the United Kingdom during the early to mid-1990s. HJDB's creation and development were motivated by affordable sampling technology, the popularity of rave culture, and an influx of imported popular music genres (e.g., Detroit Techno, Hip Hop). Taken together, the HJDB genres are unique in their use of fast-paced sampled drums, derived primarily from breakbeats (also known as breaks): samples of short percussion solos in 1960s to 1980s Funk and Jazz recordings. The main objective of this dissertation is to examine the development of the HJDB genres, through the perspective of the musicians who have created this music. Specifically, this research is intended to determine which instruments and techniques have been used in the creation of HJDB music, and to examine how breakbeats have been appropriated by HJDB musicians. Towards this goal, interviews with established HJDB musicians and record label owners have been conducted and methods for the computational analysis of breakbeats have been created.

1.1 Background and motivation

The HJDB genres emerged at a critical intersection between computer technology and the consumer market, which allowed computer music to be made through the use of home-based studios (Taylor 2001). The essential instrument in HJDB is the digital sampler, a new device that offered musicians the ability to achieve realistic instrumentation through a "cut-and-paste" method of production. Breakbeats first appeared in Hardcore—chronologically the first of the three genres—around the beginning of the 1990s. Many Hardcore musicians used sampled breakbeats to add "urgency" to their music by layering them over the pre-existing four-on-the-floor bass drum (bass drums on quarter note beats) found in House and Techno. By 1992–3, many musicians began to abandon the four-on-the-floor bass drum, focusing instead on the segmentation and rearrangement of sped-up breakbeats in a genre called Jungle. A rhythmically less complex form of Jungle, Drum & Bass—that

tended to focus more on production aesthetics—appeared in 1994, and by 1996 was the dominant form of the genres. Since the inception of the HJDB genres, over 150,000 tracks (i.e., musical works) have been released by as many as 25,000 artists on almost 7,000 labels, spanning numerous subgenres (Rolldabeats 2013).

Historical accounts of the HJDB genres have been written from several perspectives. There are various popular press documents that tell the narrative of HJDB's evolution from the early 1990s to the present day. Profiles of musicians have been showcased in multiple magazines (e.g., Knowledge Magazine, Atmosphere Magazine, Generator Magazine), and music journalists, such as James (1997), Belle-Fortune (2004), and Reynolds (2012) have written books on the subject. While these historical accounts present many of the genres' major movements and associated musicians, they are written from a music consumer's perspective and as such tend not to be objective in their scope and are not required to cite sources for their information.

Alternatively, cultural historians have written academic literature that situates HJDB in the context of other genres that predate them, such as Hip Hop (Hesmondhalgh and Melville 2002; Noys 1995), Techno (Noys 1995), and Dub (Veal 2007). These sources tend to address the influences that drive the sonic elements (e.g., Reggae-inspired bass lines), but specific techniques and instruments are for the most part not discussed. From a technological perspective, Beadle (1993) and Hesmondhalgh (2006) have addressed the advent, expansion, and repercussions of the digital sampler. Whelan (2009) considers the appropriation and virtuosic use of the *Amen* breakbeat. Originally sampled from The Winstons' *Amen, Brother* (1969), the *Amen* has since gone on to become one of the genre's most sampled breakbeats (*The Economist* 2011; Reynolds 2012). While these accounts explain the ways in which samplers have changed conceptions of musical borrowing, they are not intended to address how HJDB musicians have selected, sampled, and used breakbeats.

Much of the above literature is related to cultural implications of the genre. At present, analysis of HJDB music itself has received considerably less attention. Notable exceptions to this characterization examine electronic music using formal music analysis and socio-cultural observation (Butler 2006; Ferrigno 2008). Focusing primarily on the American House and Techno communities, Butler (2006) first

outlines the ancestry of these genres from Disco and Funk origins, then provides an analysis of the rhythms and instruments used in example tracks. Ferrigno (2008) studies the means of production and (DJ) performance in the Drum & Bass community of the northeast United States, as a participant-observer that becomes a DJ and learns to create Drum & Bass music through social engagements and interviews with DJs.

While breakbeats are the foundation of these musical genres (Butler 2006), discussions on the aesthetics of breakbeat selection and manipulation, and the technology and techniques used by HJDB musicians in the manipulation of breakbeats are almost entirely absent from the literature; as such these topics remain obscure except to those that have made the music. What criteria do HJDB musicians use in the selection of breakbeats? What manipulations do HJDB musicians perform and how are these achieved? Are these techniques related to particular samplers themselves? Do HJDB musicians attempt to preserve certain characteristics (e.g., emphasis on downbeats) in their appropriation of breakbeats? Answers to these and related questions are of great importance as they define the relationship between the HJDB genres and the music from which the breakbeats were sampled.

Computational analysis has the potential to assist in the provision of answers to the above questions. Automated breakbeat analysis could greatly simplify large-scale studies seeking to identify trends related to the HJDB timeline. For example, rhythm detection and determination of breakbeats used in an HJDB track would allow insight into the development of techniques used by individual artists or within subgenres. Such analysis could also be used to assess the prevalence of various breakbeats throughout HJDB's history or to identify the development of rhythmic characteristics related to the genres. In addition, components of the system could be used towards improved results of automatic DJ software and digital audio effects that utilize downbeat estimation as a stage in processing. The breakbeat classification system could also provide DJ software with additional organizational fields—such as the pre-existing artist, title, album, track duration—based on breakbeat name (e.g., *Amen*, *Apache*, *Funky Mule*) as well as fields based on attributes associated with breakbeat usage in HJDB (e.g., sparsity).

The automated analysis component of this dissertation is part of a wider area of computational research in DJ-oriented electronic music, much of which has been pioneered by Nick Collins (2001; 2002; 2004; 2006), who developed real-time breakbeat segmentation and resequencing tools intended to replicate the idiomatic breakbeat manipulations of the genre. While not developed for real-time use, the methods proposed herein could potentially be incorporated into a real-time system capable of recognizing and recreating the manipulations of breakbeats in HJDB music.

1.2 Project objectives

This dissertation has three main objectives:

- To write a history of the HJDB genres, detailing the major movements and subgenres (along with related artists and labels) associated with the timeline. While HJDB has been the topic of popular media books and magazines, a historical account of the genres from the perspective of those that have created the music does not yet exist.
- To provide an explanation of how HJDB music has been made. Specifically, this discussion covers the creation and development of the digital sampler, and the topic of breakbeats and their appropriation in HJDB music.
- To develop computational methods for analysis of breakbeat usage within HJDB music. These methods are intended to provide an estimation of which breakbeats are being used and a likely description of how they are being manipulated within the music.

1.3 Methodology

The first objective of this dissertation, a written history of HJDB, is the result of analysis of multiple sources of information including: 1) popular culture resources, 2) academic writing on the topic, and 3) interviews conducted with established HJDB professionals specifically for this dissertation. In this context, popular culture resources include materials such as books written by music journalists and magazine interviews with HJDB musicians. Interviews have been conducted with established HJDB musicians and record label owners from throughout HJDB's timeline (interview prerequisites and procedures are discussed in Chapter 2).

The second objective of this dissertation—a description of the technology and techniques employed in HJDB music and an examination of breakbeat usage within the genres—also employed interview responses with the same participants. Participants were asked questions pertaining to instruments used, breakbeat selection and usage, and other questions regarding music construction. In addition, information sources including instrument operation manuals and product reviews from reputable periodicals were used to obtain data related to device functionality and cost.

The third objective, the computational analysis of breakbeat usage in HJDB tracks, is intended to identify which breakbeats are being used, and to provide a description of how they are being manipulated. These techniques include an estimation of the original breakbeat used in a HJDB track and a description of how the breakbeat pattern has been modified. There are a number of different breakbeat modifications that HJDB musicians have employed; it is not the goal of this dissertation to automatically determine all types of modifications. Instead, the automated modification description in this dissertation focuses on resequencing—the rearrangement of the order and timing of percussion events in breakbeats.

The original breakbeat is determined through three steps: First, audio segments likely to contain salient drums are selected from the audio signal using a combination of techniques from onset detection research (e.g., Bello et al. 2005) and source-separation literature (e.g., FitzGerald 2010). Second, timbral-based features are extracted from the segments. Third, these features are entered into a machine learning classification scheme to associate the audio segments with one of several potential breakbeats. To determine how a breakbeat has been modified, a two-step process of downbeat detection and percussion detection is undertaken. The chosen downbeat detection method significantly extends a method by Jehan (2005), which is trained using breakbeats and extended with low-frequency onset detection and a beat-tracking stage. This method has been shown to be superior to four state-of-the-art methods in an evaluation using over 200 HJDB tracks (Hockman et al. 2012). Once downbeats are found, percussion detection (e.g., FitzGerald & Paulus 2006) is used to identify the presence of likely drum types. Example analyses are provided to demonstrate the usefulness of these tools in the analysis of HJDB music.

1.4 Contributions

The main contributions of this dissertation are a written history of the HJDB genres from the perspective of those that have created the music, and an explanation of how the music has been created with an emphasis on how technology was used. Detailed interviews with established HJDB musicians and label owners have provided accounts of the foundation and development of the HJDB genres, as well as an explanation of which instruments were used and to what capacity in HJDB music. Interviews have also provided insight into the way in which breakbeats have been incorporated in HJDB music, and how techniques for manipulation of breakbeats have changed over the years. In addition, computational methods for analysis of HJDB music have been presented that will provide researchers with tools to examine breakbeat usage in this music. This will allow an exploration of the relationships between the musical corpus and specific breakbeats amid a large-scale study of the genres.

The downbeat detection method discussed in Section 5.2 has been presented at the *13th International Society for Music Information Retrieval Conference* (Hockman et al. 2012), a peer-reviewed conference. The co-authors of this paper, Matthew Davies and Ichiro Fujinaga, have provided guidance in the development of the method, and Matthew Davies has worked with the author of this dissertation in the development of MATLAB code for this and other aspects. Throughout the remainder of this dissertation, any work not generated by this author is cited as such.

1.5 Chapter overview

The remainder of this dissertation is organized into four main chapters, which include: the background and development of the HJDB genres (Chapter 2); an overview of the technologies and techniques used for manipulation of breakbeats in the creation of HJDB (Chapter 3); a literature review of technologies useful in the analysis of rhythm (Chapter 4); and a description of methods for computational analysis of breakbeats in HJDB (Chapter 5). Conclusions are then presented in Chapter 6.

Chapter 2 consists of five sections: Section 2.1 briefly introduces the interview procedure and participants. Section 2.2 introduces the HJDB genres. Section 2.3

describes the dance music origins in the UK that led up to HJDB and Section 2.4 then discusses the origins and appropriation of breakbeats, and the HJDB genres starting with Hardcore and ending with Drum & Bass. A chapter summary is then provided in Section 2.5.

Chapter 3 consists of three sections: Section 3.1 catalogues the main devices used in the creation of HJDB. Section 3.2 explains the breakbeat sourcing and selection tendencies of HJDB musicians and the techniques used for segmentation, sampling, and manipulation of breakbeats in HJDB music. Section 3.3 then provides a chapter summary.

Chapter 4 consists of six sections: Section 4.1 presents an overview of the research in rhythm and meter prior to audio-based methods. Section 4.2 covers onset detection, used in the identification of musical events in an audio signal. Section 4.3 discusses beat tracking, which attempts to replicate synchronization with a heard piece of music. Section 4.4 considers downbeat detection, which attempts to identify the first beat in every measure. Percussion detection is then considered in Section 4.5, followed by a chapter summary in Section 4.6.

Chapter 5 consists of four sections: Section 5.1 explains the breakbeat classification method and Section 5.2 then details the downbeat detection method. Section 5.3 presents a sample breakbeat modification analysis that provides a description of how a breakbeat has been used. A chapter summary is then provided in Section 5.4.

Chapter 6 presents the conclusions of the dissertation in three sections: Section 6.1 provides a summary of the dissertation; Section 6.2 reiterates the contributions of this thesis; and Section 6.3 outlines possible directions for future research in this area.

Chapter 2: Hardcore, Jungle, and Drum & Bass (HJDB)

This chapter will provide a historical account of the Hardcore, Jungle, and Drum & Bass (HJDB) genres, through a combination of information sources including popular media books and magazines, and interviews conducted with established musicians and record label owners who have experienced HJDB's development first hand. Section 2.1 presents the interview participant requisites, interview procedure, and participants themselves. Section 2.2 provides a brief overview of the genres and subgenres associated with HJDB and Section 2.3 provides a historical account of the UK's DJ-oriented dance music origins. Section 2.4 covers breakbeat oriented genres: beginning with an explanation of breakbeats and Hip Hop musicians' incorporation of breakbeats in the late 1970s and early 1980s (Section 2.4.1); and then a discussion of the HJDB genres between the early to mid-1990s is presented (Sections 2.4.2–4). A chapter summary is provided in Section 2.5.

2.1 Interviews

2.1.1 Participant prerequisites and interview procedure

One of the main sources of information for this dissertation is a collection of interviews with participants from throughout the HJDB timeline. These interviews were conducted over the course of approximately one year, and interview participants were either established musicians or owners of established record labels. In this context, established musicians were those that have released more than five Hardcore, Jungle, and/or Drum & Bass tracks between 1990 and 2013 on the vinyl record format. Established record labels were similarly those that have released at least five vinyl records. The significance of the vinyl format in this context is that it is widely regarded as the most prestigious format in HJDB, and vinyl was the format of choice for Jungle producers (Reynolds 2012, 252).

A list of 150 potential interview participants was collected by the author of this dissertation based on their presence (e.g., interviews, showcase features) in popular Jungle and Drum & Bass magazines (e.g., Atmosphere Magazine and Knowledge

Magazine). Contact information for these participants was then attempted though a variety of sources, including musicians' websites, DJ and artist booking agencies, a social network, and the pre-existing contacts of the author. 45 potential participants were contacted by the author through email and 10 potential participants were approached through messaging service on a social media platform. Additional participants not readily accessible to the author were approached by experienced intermediaries at Knowledge Magazine (Colin Steven) and Organic Music (Alexander Foy). In order to preserve the privacy of potential participants possibly not interested in taking part in this research, potential participants were encouraged to contact the author if they were interested in further information regarding the project. If the potential participants agreed to the terms of the consent form (Appendix A), the interview could begin.

All but one interview took place through email (the other used teleconferencing software, and has been transcribed). Interviews began with questions about the participants' backgrounds and entry into the HJDB genres. Successive questions then probed the participants' initial responses further or were drawn from a list of pre-written questions about musical influence, associations with other musicians, and major movements in the HJDB timeline. Participants were also asked to reflect on instruments used, breakbeat selection and usage, and other questions regarding general music construction. An initial list of questions used is available in Appendix B. After two initial pilot interviews, the decision was made to personalize questions asked to participants, as more detailed information was extracted from interviews through detailed questioning and additional investigation. The content of each interview is available in Appendix C. The methodology used in analysing the qualitative data from interviews relied strictly on intuitive analysis. Excerpts of the interview texts have been extracted and used throughout much of this dissertation with the participants' permission. As these answers were typed in emails on a variety of electronic devices, the author of this dissertation has sparingly corrected obvious typographic errors (i.e., punctuation, capitalization, spelling) as outlined by the 16th edition of the Chicago Manual of Style, Section 13.7 (item 5).

2.1.2 Interview participants

In total, 21 participants (20 male) provided their consent to be interviewed and subsequently answered the interview questions posed to them. The names, musical aliases, year of first release (all musicians are still creating music at the time of writing), and short biographies of the participants (written by the author based on information from interviews and discographies) are provided below in alphabetical order:

Name: Bauer, Alicia

Aliases: Alley Cat

First release: 1999

Biography: Northern California native Alicia Bauer became interested in Breakbeat Hardcore in the early 1990s, after attending her first raves in San Francisco. Soon afterwards, Bauer was buying Hardcore and Jungle records in local record shops and learned to become a DJ. Bauer then decided to move to the United Kingdom, and began making Drum & Bass. She had her first release, *Payload (Konflict Remix)* and *Iodine*, with Tha Countamen (Mark Bauer) in 1999 on Skunkrock Productions. Bauer has since had several releases on a variety of labels including the seminal Reinforced Records and Offshore Recordings. She founded her label Kokeshi in 2009, and has released music from multiple genres (e.g., Drum & Bass, Dubstep) by Lung, Bulb, and others.

Name: Bowes, Tony

Alias: Justice, Icons, and Glider State

First release: 1991

Biography: Tony Bowes began making Hardcore music in 1990, when he and fellow Icons/Glider State member Blame (Conrad Shafie) recorded *Death Row* at a community center in their hometown of Luton. His early recordings with Blame, as well as those with Mercy (Andrew Wright) were released on Chill Records and White House, and can be seen as some of the earliest examples of the burgeoning genre of Jungle. Bowes has been a crucial member of the HJDB community since early on and his music is known in the HJDB community for its unique and challenging qualities. Bowes' music has been released on an assortment of established labels, including Basement Records, Moving Shadow Recordings, Creative Wax Records, Partisan, R&S, Offshore Recordings, Hardleaders, Hydrogen Dukebox Records, and his own Modern Urban Jazz Recordings (also known as MJAZZ), which he founded in 1995.

Name: Chatzilias, Jason

Alias: 0=0

First release: 2003

Biography: Jason Chatzilias was born in Toronto, Canada, and has experienced the HJDB scene as imported to Canada. While his first releases came post-2000 (*Reflux/Running* (2003) on Mashed Up Records), he has been making music and been an active member of Toronto's Jungle and Drum & Bass community since 1994, when he attended his first raves. His music has been released on labels such as Planet Mu, Subtle Audio Recordings, and Alphacut Records. In 2004, he began his own Synaptic Plastic imprint. Chatzilias has also created his own proprietary system for manipulating breakbeats and other characteristic elements of Jungle and Drum & Bass using controllers in a live context.

Name: Clements, James

Aliases: ASC, Intex Systems

First release: 1999

Biography: James Clements started listening to Hardcore the early 1990s, and soon afterwards began making Hardcore and Jungle using tracking software on his personal computer. His first tracks, made in 1997–9, were released starting in 2000 on established labels such as Good Looking Records and Nu Directions. Clements then founded the Covert Operations label on which he had released over 30 vinyl records and 8 CD albums. He has since released numerous singles and albums on a variety of labels, including Exit Records, Non-Plus Records, and Samurai Music. In 2010, Clements began his new record label, Auxiliary, which was intended to continue his musical output in the Autonomic subgenre (of which he was a key member). Clements and Auxiliary artists—Sam KDC, Method One, and Synth Sense—have released music in multiple styles that have progressed onwards from their Autonomic origins.

Name: Collins, Carl

Alias: N/A

First release: 1990

Biography: Carl Collins has followed the evolution of popular music since the early 1980s, when as a teenager, he was a contributor to *Blues & Soul Magazine*. He has followed the underground British dance music scene from its infancy into its modern era. Along the way, he has worked behind the scenes for popular acts such as Soul II Soul. In 1988, he remixed *Let The Warriors Dance* by Addis Posse. Collins then became label manager for the Warriors Dance record label, where he worked with musicians including No Smoke and Bang The Party. Later, Collins became the manager of Hardleaders, a subsidiary label of Kickin Records, which released music from major Jungle and Drum & Bass artists including Dillinja, Lemon D, Decoder, and Justice. Collins was also the manager of Black Market Records in Toronto, Canada, a satellite of the Soho, London shop of the same name.

Name: Davies, David

Aliases: DJ Trax, Mixrace, (with Dev Panya)

First release: 1991

Biography: By age 13, David Davies was a professional scratch DJ. Davies first release (as Rawtrax with DJ Raw) appeared on Bizzy B's Brain Records in 1991. Davies, who had also recorded for Bug Kann and The Plastic Jam, began writing Hardcore with his friend Dev Pandya (Paradox) under the Mixrace alias. Their first joint release, containing the tracks *The Future Is Before Your Eyes* and *2 Bad For Ya* (1992), was released in 1992 on Moving Shadow Records. Davies and Pandya's early releases were recorded at Rob Playford's (owner of Moving Shadow) Stevenage studio, but by 1994, they had gathered enough equipment to create music on their own. Davies and Pandya then released tracks and albums on their own labels, such as Stronghold, Nautilus, and Offset. Pandya and Davies are known for the development of the Drumfunk subgenre of Drum & Bass, which focuses on the sourcing and manipulation of rare breakbeats.

Name: Fieber, Charlie

Alias: Fracture

First release: 2002

Biography: Charlie Fieber grew up in East London listening to Blues and Rock music in his father's record collection, and his first instrument was the guitar. In around 1991, he began listening to Hardcore music on pirate radio stations. During the mid-1990s he began producing as part of the duo Fracture and Neptune (with his friend Nelson Bayomy). In 1999, Fieber started a three-year residency on London's Rude FM. Fieber and Bayomy had their first release on Danny Breaks' Droppin' Science record label in 2002, and have had numerous releases on major labels such as Hospital, Subtitles, and Bassbin records, as well as their own Astrophonica record label. Fieber is also well known for his solo output, including his recent incorporation of rhythmic and timbral characteristics of Chicago's Juke music into the Drum & Bass genre. Fieber's recent music has appeared on labels such as Exit Records, Metalheadz, and his own Astrophonica label.

Name: Hansen, Will

Alias: Escher

First release: 2006

Biography: Will Hansen began listening to Hardcore and Jungle circa 1993, and learned to be a DJ soon afterwards. Inspired by Reinforced Records and Metalheadz producers such as Doc Scott, Goldie, and Dillinja, Hansen began producing Drum & Bass during college, and had his first release, *Boomka Boomka* (2006), on the SC:Digital label. Hansen has since had releases on Future Thinkin' Records and has begun a musical partnership with Phillip Smith (Blocks), with whom he produces under the Blocks and Escher alias. The duo has released music on Digital Soundboy and their co-owned record label Narratives Music.

Name: Heinze, Martin

Alias: Martsman

First release: 2005

Biography: Martin Heinze is a German Drum & Bass musician that had his first release on Offshore Recordings in 2005. While his entry into Jungle and Drum & Bass was through the Drumfunk subgenre, Heinze is now known for his unique approach to experimental Drum & Bass, involving off-kilter rhythms and emphasized synthesizer bass and lead lines. His style of music bridges influences from Breaks, Breakcore, and Dubstep. Heinze has released music on several labels including Hospital Records and its related Med School Records, Counter Intelligence, and Warm Communications.

Name: Kane, Jelal

Aliases: Bay B Kane, The Rood Project

First release: 1989

Biography: Between 1989 and 1997, Bay B Kane released over 200 tracks on vinyl and CD format. In 1986, he began his production career as a Hip Hop musician signed to T.U.F. Records. In collaboration with Mister E (Matthew Edwards) under the Nu-Matic alias, the duo created some of the first music that fused Techno and sampled breakbeats, and were signed to XL Recordings alongside Prodigy, SL2, and Liquid. Kane then began a solo career and started his own label, Ruff Guidance Records. Kane became one of the most prolific and seminal producers of the Jungle genre, releasing a large number of classics such as *Quarter to Doom* (1992), *Bagpipes In Effect* (1993), *Hello Darkness* (1993), and *Thunder* (1994). He has appeared on a large number of record labels, including Kikman Records, then later on White House Records, which was responsible for releasing his music on a worldwide scale. Kane has released music under numerous aliases, including Bay B Kane, Kid Thunder, Double Tee, Rinca, Code K, Intelligent Junglist, The Rood Project, and Icon.

Name: Lindo, Colin

Aliases: Alpha Omega, Nubian Mindz, Da Elite

First release: 1994

Biography: Colin Lindo wrote his first Jungle/Drum & Bass tracks in 1994–5, and had his first releases on DJ Stretch's AKO records under the Da Elite alias. These were soon followed by releases on the seminal Reinforced Records from 1996 to 2001, and a variety of established record labels, such as Outbreak Records, Trouble On Vinyl, and Offshore Recordings. He has released two Drum & Bass albums: *Journey To The 9th Level* was released in 1999 on Reinforced Records, and *Word Of Mouth* was released on Thermal Recordings in 2006. Lindo also creates music in the Techno genre under the Nubian Mindz alias, and has released three albums and numerous singles on labels such as 2000 Black, Archive Records, Delsin, and Disco404.

Name: Macciochi, Robert

Alias Macc

First release: 2004

Biography: Originally a drummer, Robert Macciochi became involved in Jungle and Drum & Bass during college, where he learned to be a DJ. After college, he became involved in creating Jungle and Drum & Bass. Unlike many other producers, Macciochi often uses his drumset to record percussion for his productions. His first tracks were released on Outsider, and had subsequent releases on a variety of labels often associated with the Drumfunk subgenre, such as Subtle Audio Recordings and Counter Intelligence, as well as other labels such as Offshore Recordings and 13 Music. Macciochi has since become a mastering engineer who has mastered well over 30,000 tracks from various genres.

Name: Minner, Dave

Alias: AK1200

First release: 1994

Biography: Dave Minner is an American DJ/producer that has been involved in HJDB music since the early 1990s. As an owner of a record store in Orlando, Florida, Minner formed early working relationships with Dan Donnelly of Suburban Base Records and Rob Playford of Moving Shadow. He soon was traveling to the UK and playing on pirate radio stations, and recording with Rob Playford. In the mid-1990s, Minner became responsible for finding new musicians for Moving Shadow, and subsequently went on to record an album for Run Records, and singles and remixes for multiple established labels. He has released records on several labels including Moving Shadow, Breakbeat Science Recordings, DSC14 Records, and a solo album *Shoot To Kill* on Run Records in 2002. Minner has also released recordings of his DJ sets on Moonshine, Sub Bass Records, and Not On Label. Along with DJs Dara and Dieselboy, Minner has showcased Jungle and Drum & Bass across the United States with the Planet of the Drums tour.

Name: O'Dwyer, Conor

Alias: DJ Code

First release: N/A

Biography: Conor O'Dwyer was immediately drawn to the percussion in Hardcore and Jungle, which he had heard on early 1990s mixtapes (DJ mixes on cassette) of DJs such as LTJ Bukem, Randall, Dr. S. Gachet, and Monk. O'Dwyer soon became a DJ himself, and in 2006 started his own label, Subtle Audio Recordings, which showcases Drum & Bass with a large amount of breakbeat manipulation and ambience. In 2012, he started a second label, Bustle Beats, which caters towards heavier, more percussive tracks associated with Jungle of the mid-1990s.

Name: O'Shea, Shane

Aliases: Naphta

First release: 2000

Biography: Dubliner Shane O'Shea became interested in dance music in 1991, and in Hardcore in 1993. Intrigued by the music's urgency, he began buying Hardcore by late 1993 and became a DJ soon afterwards. In 1996, O'Shea met Rohan Reilly, with whom he began a series of events in Dublin, and subsequently began Bassbin Records. Since 2000, O'Shea has released several singles on various labels, and two politically-influenced LP albums called *Democracy Now* (2009) and *Democracy Now, Part 2* (2012).

Name: Parsons, Peter

Aliases: Voyager, Rev-P

First release: 1991

Biography: Peter Parsons is one of HJDB music's most influential members, who has worked in the background as an engineer for HJDB musicians. In an era before many DJs had access to their own studios, Parsons engineered music for some of the most recognizable names in HJDB. Parsons had his start as a drummer in a Punk band and soon became interested in musical arranging. He was hired at Monroe Studios, and quickly became fluent in the studio gear, which included an Akai S950 sampler. Many of the HJDB genres' most well-known members are among his clientele. Parsons has taken part in approximately 250 HJDB tracks, as producer and engineer for major figures in HJDB, such as DJ Seduction (John Kalkan), DJ Rap (Charissa Saverio), DJ Crystl (Daniel Chapman), and DJ Fokus (Paul Stokes) on seminal record labels such as Dee Jay, Lucky Spin, and Impact. His work with DJ Crystl resulted in early Jungle classics such as *Meditation* (1993), *Warpdrive* (1993), *The Dark Crystl* (1993), *Inna Year 3000* (1993), and *Let It Roll* (1994). Parsons' engineering for DJ Rap resulted in several singles and the *Intelligence* LP (1995). Parsons has also released solo records as Voyager, Rev-P, and Static Substance on influential labels such as Lucky Spin, R&S, Good Looking Records, and Creative Source. In addition to his work in HJDB, Parsons has also released music in the Breaks genre as London Breakz with DJ Tamsin (Tamsin Elliot) and in the UK Garage genre as Hi-Times with Ollie Red-Eye (Ollie Bridge).

Name: Rumney, Neil

Aliases: N.R.G.

First release: 1991

Biography: In 1989, Neil Rumney began playing on Pressure FM, a pirate radio station based in Luton, UK. While his early influences were Hip Hop and Chicago House, during his time on the station, Rumney was drawn to Hardcore's speed and energy. He made his first tracks in the style of Bleep Breakbeat, a hybrid genre with characteristics of Acid House and sped-up breakbeats. His early releases on the Chill record label, such as *The Terminator* (1991) and *I Need Your Lovin'* (1992) were early Hardcore hits (*I Need Your Lovin*' was licensed to over 50 labels). Rumney went on to release Hardcore on other established labels such as R&S and his own Ruff on Wax. Along with DJ Paul Landon in 1993, Rumney formed Smokin Beats, a record label specializing in the House genre.

Name: Stewart, David

Aliases: Subject 13, Mr. Lefteye

First release: 1990

Biography: David Stewart started his musical career as a scratch DJ and became interested in Hardcore through an interest in breakbeats and turntablism. In 1990, Stewart made his first track, *Eternity*, which sold approximately 18,000 copies. Stewart then completed a degree in audio engineering at the Islington Music Workshop. He has since written music that has appeared on many established labels such as Basement Records, Mix'n'Blen Records, Creative Source Records, and Earth Records. Stewart has also released two full-length albums: *The Black Steele Project* (1997) on the Selector record label, and *Disclosed Knowledge* (1998) on Sony Music Entertainment Japan Associated Records. Stewart is also the owner of several record labels, including Vibez and 13 Music, and began hosting an FM Radio show on London's Kane FM in 2013.

Name: Thompson, Kirk

Aliases: DJ Krust

First release: 1989

Biography: Originally a scratch DJ in the late 1980s, Kirk Thompson formed Fresh Four with his brother and two friends. The group had major-label success with *Wishing On A Star* (1989), which brought them studio access, where Thompson used his first sampler. Thompson, together with his friends from Bristol, Ryan Williams (Roni Size), Daniel Kausman (DJ Die), and Paul Southey (SUV), transferred his interest in breakbeats from turntables to samplers. Thompson has released numerous genre-defining records within the Jungle and Drum & Bass genres, such as *Jazz Note* (1994), *Future Talk* (1995), *Angles* (1996). *Soul in Motion* (1997) and *Warhead* (1997), two of Thompson's seminal tracks, are exemplary of his expertise in subtle layering of sounds. Thompson and Williams started their own labels, Full Cycle and Dope Dragon, and the group Reprezent. Reprezent won the Mercury Prize for their album *New Forms* (1996). He has also appeared on numerous releases on V Recordings, and his solo album, *Coded Language* (1999) was released by Talkin' Loud. His second album, *Hidden Knowledge* (2006), was released on Full Cycle Records. Thompson has collaborated with several musicians outside the Jungle and Drum & Bass genres, such as Rahzel, Vikter Duplaix, Saul Williams, Jocelyn Brown, and Beverly Knight. He has recently returned to music production and started a new record label, Rebel Instinct.

Name: Wilson, Andrew

Aliases: Villem

First release: 2009

Biography: Having grown up in the countryside outside of Ipswich, Andrew Wilson first heard Hardcore and Jungle on mixtapes, and later at raves. Wilson started to collect records and soon became a DJ. Wilson became interested in writing music and studio production during university, and started making Drum & Bass. Villem's music incorporates a variety of influences including Funk and Jazz. He also collaborates with Mako (Stephen Redmore) as the duo Mute. His first tracks were signed to Symmetry Recordings, and has since had released tracks on Med School, Samurai Red Seal, and Ingredients Records.

Name: Wright, Andrew

Aliases: The Moog, Rotor, Mercy

First release: 1992

Biography: In the late 1980s and early 1990s, Andrew Wright became involved with Acid House and the burgeoning Hardcore music genre through the demoscene—a community of artist-programmers that developed graphics and music on computers with limited processing power. His interest in software trackers (hybrid sampler-sequencers) led him to discover others that were making Hardcore. Wright went on to release several vinyl singles that have sold in the tens of thousands, under a variety of aliases, including The Moog, Rotor, Mercy, Terra Incognita, and Obviously High. Wright went on to release several records in the Hardcore and early Jungle genres, such as *Kaleidoscope* (1991) and *Jungle Muffin* (1992). He also collaborated with Tony Bowes (Justice) to create Justice & Mercy's *The Concrete Jungle EP* (1992), which included the seminal early Jungle track, *Soothe My Soul*. He has appeared on a variety of record labels, such as Chill Records, Up-Roar, and his own Delirious Records.

2.2 Introduction to HJDB

HJDB are UK-based music genres that are situated in an international continuum of DJ-oriented electronic music. The genres were popularized in the 1990s as an outgrowth of Rave music and culture (discussed further in Section 2.3), and were made possible through the development of the home-based studio (discussed in Section 3.1). While the genres cover a wide variety of styles and timbral attributes, common characteristics among most music in the genres are fast-paced percussion and low-frequency bass lines, both of which have dominant roles in the musical scope. This music, much like most DJ-oriented electronic music is written in a 4/4 time signature. The percussion in HJDB music is mostly comprised of sped-up breakbeats—sampled recordings of solo percussionists generally from Funk or Jazz music of the 1960s to the 1980s—which are incorporated into the music through the use of the digital sampler. Breakbeats are generally recorded from vinyl records, segmented and manipulated in samplers, and then resequenced (i.e., rearranged) through the use of sequencing or tracking software (see Chapter 3 for technical descriptions of this process). Breakbeats comprise the main timbral and rhythmic characteristics of HJDB music. It is this characteristic that sets the HJDB genres apart from other DJ-oriented electronic music such as House and Techno (NB: these genres may also incorporate breakbeats, but neither House nor Techno has used breakbeats at as fast of a pace, or manipulated them to the degree of HJDB music).

Vinyl sales figures for HJDB releases varied considerably based on a number of factors, including the distribution company managing a release, the DJs that played the tracks, and the quality of the release (Kane 2013). If a release was highly successful, it would sell tens of thousands of records (Clements 2013; Kane 2013; Wright 2013). Lindo (Alpha Omega) recalls, "the average release would see 1500 upwards and the bigger, known tunes would sell 4,000 upwards with the 'hit' tunes hitting the 10,000 mark and more" (Lindo 2013). The number of vinyl sales required for a release to be deemed successful has diminished substantially with the decline of vinyl records as a medium (Clements 2013). However, vinyl has still maintained a presence in the HJDB community, as the revered format on which to release music—that is, a vinyl release is perceived as more prestigious. Bowes (Justice) explains: "It was the [Electro and Hip Hop] music that led me into records, the

whole magical experience and [to] appreciate vinyl as not only a conduit for the music but as an actual artifact itself. I think that is part of the reason that vinyl is still revered today within the drum and bass and related bass music scenes, because many of the artists/producers involved are from a similar background and have carried […] forward the notion of vinyl in an almost nostalgic way as an antithesis to today's MP3 dominated market" (Bowes 2013).

While the genres have been merged under the HJDB acronym in this dissertation and have some degree of overlap, Hardcore, Jungle, and Drum & Bass occupy distinct positions within the history of popular music, and contain influences from different genres. **Figure 2.1** presents the HJDB genres (in color) along with other DJ-oriented electronic music genres that are related to HJDB in a timeline spanning from the 1970s to the present (2013). Arrows represent paths of direct influence that have been proposed in a variety of literature sources (James 1997; Belle-Fortune 2004; Reynolds 2012; N. Collins et al. 2013) and information collected from interviews (e.g., Bowes 2013; Chatzilias 2013; Lindo 2013; Thompson 2013).

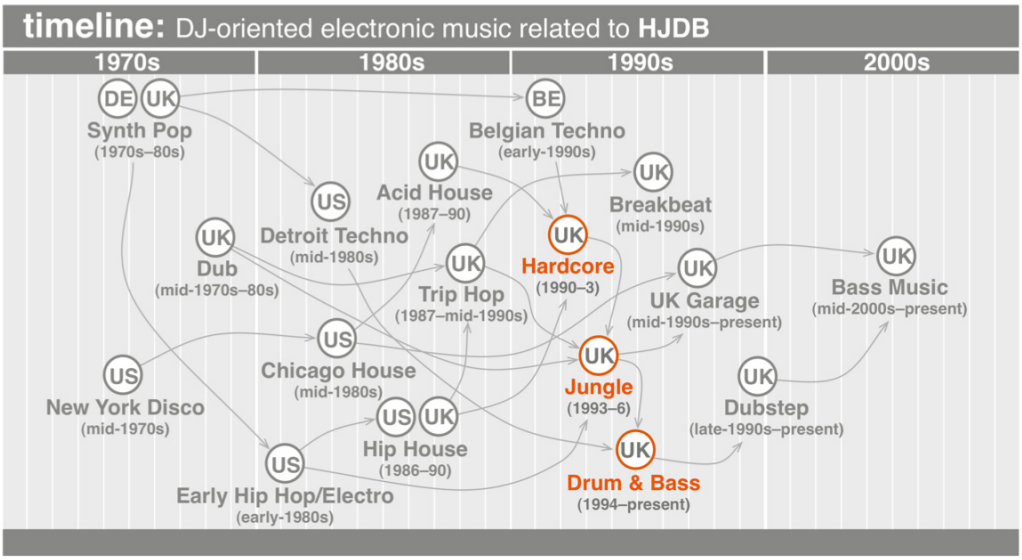

Figure 2.1: The HJDB genres (in color) within the context of several other DJ-oriented genres from the 1970s to the present day (2013). Abbreviations in the circles above genre names denote the country of the genre's musical center, and arrows denote direct musical influences as described in various literature sources and interviews.

Closer inspection of the HJDB's genres themselves reveals several subgenres that are associated with the three main genres (i.e., Hardcore, Jungle, and Drum & Bass). **Figure 2.2** demonstrates several of these subgenres and larger genre names, which have been used as umbrella terms to describe these subgenres between 1990 and the mid-1990s—the formative years of the HJDB timeline. The discussion of HJDB genres in Section 2.4 focuses on these years; specifically, the narrative follows the evolution of the genres starting with Hardcore and ending with Techstep. The collection of subgenres presented in **Figure 2.2** is by no means comprehensive; it is merely a selection used to demonstrate a number of the larger subgenres associated with the HJDB genres.

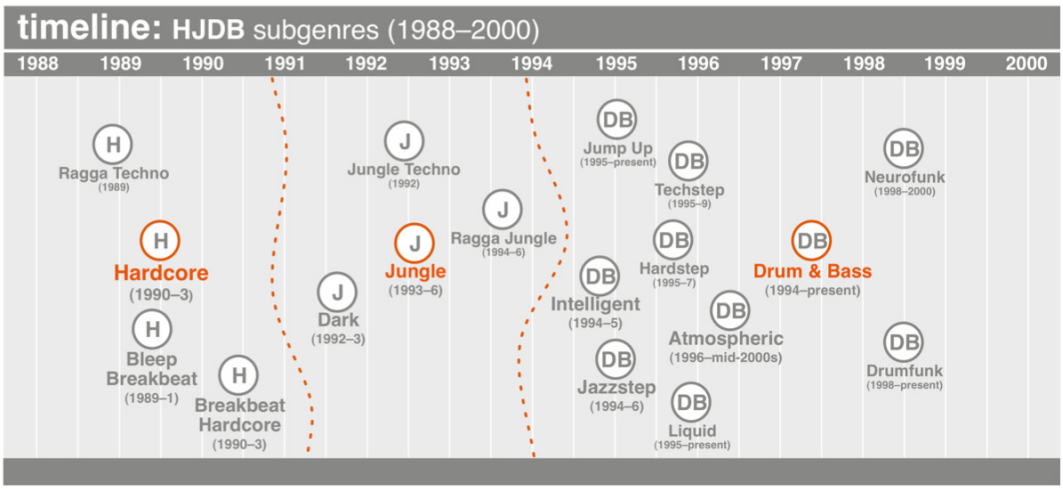

Figure 2.2: The HJDB subgenres until 2000 (shown in grey), associated with larger genre names (in orange: Hardcore (H), Jungle (J), and Drum & Bass (DB)), and the years of relevance for each. Dashed vertical lines represent divisions between the three main genres.

The first of these genres to appear, Hardcore, had developed through the incorporation of breakbeats in Rave music in 1989–90, which was made possible by the contributions of a number of individuals and groups. Early pioneers in Hip House (e.g., Rebel MC), Ragga Techno (e.g., Shut Up and Dance), and Bleep Breakbeat (e.g., DJ Hype and The Scientist) incorporated sped-up breakbeats into

productions at House and Techno tempi (discussed further in Section 2.4.2). DJs, such as Fabio and Grooverider, also incorporated sped-up records from other genres that used breakbeats—such as instrumental Hip Hop—into sets that were otherwise comprised predominantly of Acid House and Techno. Musicians, having heard the effect of breakbeats in the DJs' performances, soon began to incorporate breakbeats along with four-on-the-floor bass drum patterns (i.e., a bass drum on every quarter note) typical in House and Techno in their own productions, which soon lead to the creation of a new genre with the breakbeat as the essential rhythmic and timbral component.

It should be noted that the name Hardcore (not to be confused with the Punk-Rock genre from the late 1970s) has been used to encompass a variety of styles of DJ-oriented electronic music, such as Hip House and Ragga Techno, as well as Pop Rave, Breakbeat Hardcore, and Belgian and German Techno (Reynolds 2012, 96–133). Reynolds (2012, 108–13) credits the harder styles of Belgian and German Techno with the developments of several Breakbeat Hardcore productions, including those of 4hero's Manix, such as *Never Been To Belgium* (1990). In the context of this work, which focuses on the incorporation of breakbeats, the term Hardcore is used to represent those styles of Hardcore that incorporate breakbeats: Hip House, Ragga Techno, Bleep Breakbeat and Breakbeat Hardcore.

Between 1990 and 1992, Breakbeat Hardcore gained popularity not only in the underground (i.e., alternative to the UK Top 40) dance-music scene, but in popular culture as well, with acts such as Baby D, Prodigy, and KLF achieving positions on the national pop charts (Reynolds 2012, 194–5; Clements 2013). In order to adapt vocal samples to the phrase length of faster Hardcore tracks, musicians would often pitch-shift vocal samples upwards using a sampler. This process would often result in cartoon-like voices, and some groups, such as Prodigy and Smart E's, soon began to incorporate samples from popular children's television programs.

Beginning in 1992, Hardcore split into two breakbeat-oriented genres: Happy Hardcore (also known as 4-Beat and Happy Tunes) took on a lighter playful sound characterized by these pitched-up vocals, Rave-style piano sounds, and the continued usage of the four-on-the-floor bass drum pattern; so-called Darkside (or Dark) music went in the opposite direction, embodying an ominous, intentionally frightening

sound often achieved by sampling horror films. Percussion patterns in Darkside were not as linked to the four-on-the-floor bass drum pattern as in earlier Hardcore music. Eventually, around 1993, musicians began to incorporate Reggae-style basslines and an increased manipulation of breakbeat segments, in a genre called Jungle.

Aided by radio play on underground pirate radio stations, Jungle reached mainstream culture in the summer of 1994 in its first popularized form, Ragga Jungle. The most identifiable feature of this music was the Reggae-style MC toasting—that is, providing lyrics rhythmically as a frontman on top of the music. Other common features included samples of dialog from popular Jamaican gangster films, and effects such as gunshots and Reggae horns. After a fairly public controversy (discussed in detail in Section 2.4.3.3), Ragga Jungle fell out of favour and other forms of Jungle came to the fore.

Also popular in 1993–4 was the Jump Up subgenre of Jungle. Jump Up typically featured heavy melodic bass lines, breakbeats with a large amount of manipulation, and often included vocal samples from Hip Hop. The related subgenre of Hardstep emerged around 1994. Musicians of this subgenre often incorporated sections containing manipulated breakbeats and bass alone; then juxtaposed these with longer breakdowns (i.e., sections of the track that showcased the non-rhythmic ambient characteristics such as sustained chords).

As the popularity of Ragga Jungle waned, Ambient Jungle became the next popular subgenre (C. Collins 2013). Ambient Jungle had its start during the era of Darkside, when musicians such as LTJ Bukem fused elements of Detroit Techno (e.g., subtractive synthesizer leads and sustained sounds) with sped-up breakbeats. Also termed Intelligent or Atmospheric, Ambient Jungle was a less aggressive, often Jazz- or Funk-infused form of Jungle, which often incorporated instrumentation from these genres (including flutes and Rhodes piano) in a style idiomatic of Fusion genres. The related genre of Jazz Step moved even further in this direction, often incorporating elements typically heard in Jazz recordings, such as drum fills and upright bass. This was the first form of music in this continuum to become known as Drum & Bass, which was differentiated from earlier Jungle by its simpler rhythms, and increased focus on production techniques.

The Techstep subgenre began in 1995–6, and was a darker-themed subgenre that merged the aesthetics of Darkside with less complex drum patterns, distorted bass lines, and samples from technophobic science fiction films (e.g., *Blade Runner* (1982)).

Since the mid-1990s, several subgenres have emerged; many of these can be seen as a refinement of styles leading to new subgenres (e.g., Ambient Jungle's less aggressive and melodic characteristics being refined to create Atmospheric Drum & Bass), the result of an intersection of pre-existing genres/subgenres in the timelines presented in **Figure 2.1** and **Figure 2.2** (e.g., Neurofunk as a progression of the Techstep genre to include aspects of Techno with synthesizer-heavy Funk influences), and others through the incorporation of musical styles outside the scope of DJ-inspired dance music altogether (e.g., Samba or Bossa Nova with Drum & Bass to create Brazilian Drum & Bass). While Happy Hardcore is one of the only large subgenres of Hardcore to remain popular, several strands of Jungle and Drum & Bass have experienced a resurgence (Volume 2013).

2.3 UK dance music origins

In the United Kingdom during the early 1980s, the popularity of Disco was on the decline, and many dance clubs were relegated to the backs of pubs. Strict door policies often required suits and ties, and club-goers regularly engaged in formation dancing—as made popular on US television shows like *Soul Train* (C. Collins 2013). Many of these clubs also had segregationist door policies, which created the impetus for the growth of an independent house party scene—or Blues parties—which were held in private residences and often had music powered by large sound systems in the Jamaican cultural tradition. Lindo (Alpha Omega) recalls,

> […] the soundsystem culture was something that originated in Jamaica and was basically exported over to the UK once Windrush [a ship that traveled between Jamaica and UK] took effect in the late 40's and 50's. I'm from Jamaican parents so I was always surrounded by the culture. As a youngster I remember my step-dad running a soundsystem with his brothers and pretty much playing parties every weekend, if not elsewhere then at my house. […]
>
> It was when I got older, in my early teens that I started to understand a bit more about the history of this culture and its relevance in the UK. For many Black people it served a myriad of needs. Community, friendship, music, dance as well as economic needs were catered for

> with these parties. You know, much of the door policies in the UK were quite restrictive (racist) so it was impossible for us to get into many of the established clubs at the time […] So a whole community of people were forced to build something away from that, something where you could dance away the troubles of the week and still retain a connection to your heritage without worrying if you could get in to a club because you were the wrong colour (or had the wrong shoes on!). (Lindo 2013)

A new interest in experimentation created new styles of dancing and musical tastes. At the UK nightclub Crackers, DJ George Power was able to create a following of young club-goers of multiple ethnicities and sexual orientations. The youth that attended Crackers enjoyed a free spirit afforded by the counter-culture movement of their parents during the 1960s (C. Collins 2013). Some of the UK's leading DJs were in attendance at Crackers, including, Carl Cox, Norman Jay, Paul Trouble Anderson, and Terry Farley (Brewster and Broughton 2010, 373). HJDB DJ and pioneer Fabio (Fitzroy Heslop) recounts, "I tell you what was so great: it was going into a place and it was mixed. Blues parties were 99 percent black. But this was 50/50. That was the first time I'd ever seen that. It was the first time I saw colour didn't really matter" (Brewster and Broughton 2010, 440–1).

Musical tastes also changed substantially during this era, as imports from the US served to guide popular interest (C. Collins 2013). "The early to mid-eighties consumed music with a ferocious appetite. Commercial Pop artists turned to the remix, the art of combining the latest hip underground sounds of club culture with commercial pop releases" (C. Collins 2013). Major record labels began to fund subsidiary dance-music labels that released records with strict beats per minute (BPM) values printed on the labels (C. Collins 2013), to assist DJs in the selection and mixing process.

Many Punk musicians seeking new musical avenues found themselves using synthesizers in the creation of new forms of dance music in the early 1980s (Nehring 2007). Synth Pop developed in the post-Punk era of the late 1970s and early 1980s, and became widely popular in the UK national charts (e.g,. Gary Numan's *Cars* (1979)). Many of Synth Pop's main characteristics—such as repeating synth bass lines and effects, and tools such as drum machines and synthesizers—formed much of the sonic landscape for later developments in dance music from Europe and the United

States (e.g., Detroit Techno) (N. Collins et al. 2013, 90–119). Several Synth Pop bands, such as Depeche Mode, Human League, and Yazoo, were listed as early influences for some of the interviewed musicians in this project (Bauer 2013; Lindo 2013; Thompson 2013). Joy Division's adoption of the synthesizer famously resulted in the creation of New Order, whose success ultimately resulted in the creation of Manchester's well-known dance music club, Hacienda, in 1982, and paved the way for experimentation with dance music by Alternative Rock groups such as the Happy Mondays. The early 1980s also brought Electro and early Hip Hop together with a pre-existing interest in European Jazz, Funk, and Disco (C. Collins 2013).

Hip Hop imported from the US helped to encourage an interest in the Rare Groove scene and an interest in creating new music from breakbeats found on these records. While Hip Hop was exceedingly influential in the development of preferences for many British youth in the 1980s, an independent British Hip Hop scene (i.e., artists, record labels, and fan base) never flourished. Hesmondhalgh and Melville (2002) and C. Collins (2013) propose that this was due to an inability of the British youth to connect with the lyrical content of Hip Hop from the US, while nonetheless being captivated by its sonic characteristics. In Hip Hop's place, US House and Techno from New York (New York House), Chicago (Chicago House), and Detroit (Detroit Techno) were of great interest among British youth (Reynolds 2012, 35–40).

Pirate radio played a large role in the dissemination of new music styles in the public consciousness. The origins of pirate radio stem from Radio Caroline, a pirate radio station that broadcasted an amplitude modulation (AM) signal from the North Sea in 1964 (Jones 1988). Pirate radio stations in 1980s and 1990s were land-based, and operated using frequency modulation (FM) transmission.

> Music was in abundance due to the burgeoning British Pirate radio scene no longer based in international waters. The radio waves […] were being transform[ed] by urban-based transmitters high over London and inner cities broadcasting music not dictated by playlists but DJ's sense of taste and dance floor worthiness or lyrical content depicting emotions all could relate to in some way or form. (C. Collins 2013)

These stations were made possible through the use of a transmitter, with a high-power amplifier and antenna connected to buildings or tower blocks to provide

wide reception of the signal on the FM band. The station's music was broadcast by feeding the audio signal to the transmitter remotely from the studio through encrypted microwave receiver (Belle-Fortune 2004, 60–85; Reynolds 2012, 225–36). To prevent authorities from identifying a singular studio source, technicians would send the studio signal to the receiver through microwave feeds from multiple home satellite antennas, which would blur the actual location of the signal source. In addition, stations would regularly change studio locations. Studios would most often be set up in bedroom apartments, and could be relocated quickly and easily as needed (Reynolds 2012, 225–36). Several of the musicians interviewed played on pirate radio stations in the 1980s or 1990s (Davies 2013; Fieber 2013; Minner 2013; O'Shea 2013; Rumney 2013). Pirate stations were not only integral to the broadcast of new underground music, but also in the dissemination of information about events. During the mid-1980s, an era before social media and other online forms of advertising, party-goers learned of events through a variety of sources including pirate radio, as well as fanzines, newsletters, and flyers (James 1997, 10; C. Collins 2013).

By the mid-1980s, dance-music parties were being held in unconventional locations. Instead of the backs of pubs, dance parties were held in privatised clubs (requiring membership) and alternative spaces such as warehouse parties and music festivals (C. Collins 2013).[1] The Ibiza island resort became the intersection of US House and Techno genres with the British audience. UK DJ Paul Oakenfold famously visited the popular Balearic island retreat and was enthralled by all-night parties in nightclubs such as Amnesia (Butler 2006, 43–4; Reynolds 2012, 35–40). Oakenfold returned the following year with his friends Danny Rampling, Nicky Holloway, and Johnny Walker—all of whom were influential in the UK's dance music community. At the core of these parties was Balearic Beat, a blend of House music styles from around the world (including US House genres), and ecstasy—a new drug that played a large role in the party experience (Reynolds 2012, 36–7). Ecstasy and its effects have been discussed not only in context of experiences at dance parties (Besson 1995; Brewster and Broughton 2000, 362–9; Bowes 2013;

[1] The "All-Nighter" and "All-Dayer" parties had been a popular form of UK party since the 1970s.

O'Shea 2013; Wright 2013), but also in relation to its role in the music-creation process (Besson 1995; Goldie and Gorman 2002, 124; Colebrooke 2013).

Oakenfold and his friends returned home determined to replicate the Ibiza party scene in London, and established club nights that specialized in Balearic music (Brewster and Broughton 2010, 362–9; Reynolds 2012, 37–40). Acid House became a popular form of music played in these clubs. Acid House had its beginnings in Chicago, with Phuture's *Acid Tracks* (1985). The most distinctive characteristic of Acid House is the squelch-like sound of the Roland TB-303 Bass Synthesis module. Wright (The Moog) believes of all the individual genre names in electronic music, "Acid house is probably the most deserving. It's the punk-rock of the electronic music world. The TB-303 being used so heavily, along with the TR-909 and TR-808s and spoken-word vocals really were a new phenomenon, musically and culturally" (Wright 2013).

Original genre-defining tracks by musicians such as DJ Pierre, Sleezy D, and Bam Bam found new life in London clubs such as Rampling's Shoom and Holloway's Trip. By the late 1980s, the term Acid House began to be used more broadly to define the style and club nights associated with underground dance parties, and the music played at these club nights, of which Acid House was one genre (Brewster and Broughton 2000, 367). The popularity of dance music was not restricted to the underground scene. Several US House musicians enjoyed mainstream success; Chicago's Farley 'Jackmaster' Funk reached the number ten position in the UK Top 40 with *Love Can't Turn Around* in 1986,[2] and Steve 'Silk' Hurley reached the number one position the following year with *Jack Your Body*.[3]

The late 1980s saw the Acid House scene flourish in the UK, and outgrowth of the associated dance parties from clubs and warehouses into raves—large, often all-night electronic music parties held in warehouses and countryside fields, at which attendance sometimes exceeded the tens of thousands (Brewster and Broughton 2000, 370–2; Hill 2002). Many of HJDB's major musicians from the early to mid-1990s were in attendance at raves such as Biology and Sunrise in 1989 (Davies 2013). Holding these parties in remote locations outside the city not only served to avoid

[2] http://www.officialcharts.com/archive-chart/_/1/1986-09-27/

[3] http://www.officialcharts.com/archive-chart/_/1/1987-01-24/

legal troubles in dense urban environments but also to captivate a new audience. Wright (The Moog) remembers when he first heard Rave music:

> My crossover into house happened in the summer of 1989. By chance, an illegal acid-house party took place in the field next to my house in Dunstable, England. I sat on my bedroom window ledge all night listening to this new sound. To me it was the logical progression on from everything I'd heard before. Todd Terry's "Dreams of Santa Anna" and Corporation of One['s] "The Real Life" stuck in my head for months afterwards. (Wright 2013)

Oftentimes, obtaining a license for these all-night events was prohibitively expensive, and rave promoters would withhold the location until the day of the event, when party-goers—or ravers—would drive to specified locations such as car parking areas, where they would meet others that would take them to the specified locations of the event (James 1997, 10–11; Belle-Fortune 2004, 10–12). In response to these attempts to evade policing, the Pay Party Unit (PPU) was set up in 1989 to prevent unlicensed parties. Hill (2002) states that this was part of a joint effort by legislators, law enforcement, and the conservative press to enforce a degree of control emblematic of Thatcher's social policies. In order to circumvent the PPU, rave promoters developed even more elaborate methods of evading the police. Rob Playford (of the Moving Shadow record label) recalls,

> Pirate stations would blast out the clues to the locations of the raves, convoys of ravers would congregate at service stations passing on the word. The only information on the flyer would be a mobile telephone number with the location of the party not being given out until enough people had phoned in. Eventually there was even a rave line to call, which allowed numerous lines into a single answering machine. Technology which allowed messages to be changed quickly in order to thwart police attempts to stop the party.
>
> […] We knew it couldn't last but we kept on thinking of more ingenious ways of putting the police off our scent. To start off with they [the police] were pretty crap but towards the end of '89 the started to get their act together and it started to get really difficult. (James 1997, 7)

By the end of 1989, the PPU had begun twenty investigations, and developed a database of nearly 6,000 names, over 700 vehicles, had listened in on over 4,000 phone calls and made over 250 arrests (Collin 1997, 101–2). As a further preventative measure the Entertainments Act (1990) was enacted to increase the fines for

organizing illegal parties from £2,000 to £20,000 and a minimum six-month jail sentence (Hill 2002).

By 1990, illegal rave activity had been mostly subdued, and the popularity of Acid House began to wane, yet the incorporation of the personal computer and sampler allowed a new generation of musicians to experiment with making Rave music at home (Reynolds 2012, 96). New samplers with longer sample times allowed breakbeats to be integrated into Rave music (Rumney 2013). Coupled with the effects of ecstasy, the music at raves began to get faster and more aggressive. Bowes (Justice) remembers that "people wanted to take an E [ecstasy] and dance and the breakbeat is perfect for that. The breakbeat started for many to become the backbone [of the music] and they started to get faster and rougher" (Bowes 2013).

2.4 Breakbeat-oriented genres

> Breakbeats are initially analog…but get manipulated digitally. […] Someone hit those drums in [a] room, and sound hit a mic and also bounced off a room and hit the mic. That mic hit a preamp…that preamp hit a tape…hitting a compressor and eq…hitting a needle which then carved into acetate to be stamped into records. These captured moments are then trapped there for a long time before they get utilized. That's a lot of energy to have happen before someone like me can start tearing these things apart. […]
>
> […] Part of the expression becomes the deviations of those breaks as platforms through your own programming and engineering. They are so characteristic. And it's those characteristics that dictate their uses and usefulness. So many harmonics to play with that can respond to different FX and techniques. I've always been a fan of confrontational and challenging music and those properties of breakbeats really lend themselves to that.
>
> - 0=0 (Chatzilias 2013)

> Having got into the music, and Hip Hop for that matter, in its early form, breakbeats have always been an interest of mine. They formed the character of many early tracks, which then went on to be the blueprint for years to come.
>
> - Fracture (Fieber 2013)

One of the most identifiable features of HJDB music is the incorporation of fast-paced drums, derived primarily from samples of percussion solos typically from 1960s to 1980s Funk and Jazz recordings. These samples are known as breakbeats,

and were originally introduced into the genres in Hardcore in the early 1990s. Breakbeats had previously been incorporated in other genres predating HJDB, such as in Hip Hop from the US, and have subsequently been used by musicians in several genres since, such as Rock and Bass Music. Unlike these other genres, however, in which other musical elements are typically in the foreground (for example, the vocals or guitar in Rock music), the breakbeat and its manipulations are central to HJDB music (Butler 2006, 80). This section will discuss the origins of breakbeats, their initial adoption by Hip Hop artists, and the subsequent appropriation by British musicians in the HJDB genres.

Some of the most prominent breakbeats that were first adopted in Hip Hop are from recordings of music created by James Brown and his band during the 1960s and 1970s (Rose 1994, 70). Breakbeats from James Brown's music are also among the most frequently sampled in HJDB as well; the breakbeat from *Funky Drummer* (1970) was one of the most popular breakbeats used in Hardcore (Parsons 2013). Additionally, multiple breakbeats (e.g., *Cold Sweat* (1967), *Funky Drummer*, *Soul Pride* (1969)) by James Brown were identified as favourites or popular by many of those interviewed in the course of this study.

The main instruments in breakbeats are often those of a typical drum kit containing a collection of membranophones and idiophones: bass drum (also known as a kick drum), snare drum, floor toms, high hats, and cymbals. Many breakbeats also contain additional percussion such as bongos and tambourines (e.g., Michael Viner's Incredible Bongo Band's *Apache* (1973)), or brief rhythmic vocal shouts by bandleaders, such as James Brown. Breakbeats from other bands often feature similar shouts, as in Bobby Byrd in *I Know You Got Soul* (1971) and Mickey Murray in *Marvellous* (1988).

The percussion patterns in the music from which these breakbeats are derived tend to be in a 4/4 time signature and avoid the use of complicated drum fills (Stewart 2000). They are often characterized by heavy syncopation in the individual drum parts, which when taken together create a unified whole that reinforces the meter (Butler 2006, 87–9). The percussion in these recordings contains rhythmic characteristics of New Orleans street processional drumming, originally appropriated for the drum kit in the 1950s by New Orleans drummers such as Earl Palmer

(Stewart 2000). Palmer has been cited as the first Funk drummer due to his early incorporation of the New Orleans beat—or street beat—into 1950s' Rhythm and Blues (Vincent 1996, 69; Davis 2005). In Professor Longhair's *Tipitina* (1953), Palmer incorporated a syncopated street beat that subdivided straight eighth-note patterns (popular in Rhythm and Blues of the time) into sixteenths (Stewart 2000; Davis 2005).

James Brown's drummers, Clayton Fillyau and Clyde Stubblefield, were influential in bringing syncopated rhythms (referred to loosely as "Fatback" grooves) to Brown's band in the 1960s. The patterns they played were characterized by sixteenth-note grooves with very little swing in two or four measure patterns. They were also played with accents on beats normally considered weak—beats two and four, or eighth notes surrounding these beats, and with an implicit focus on the downbeat, or the first beat of every measure. Downbeats were of crucial importance to James Brown: "The 'One' is derived from the Earth itself, the soil, the pine trees of my youth. […] Stepping up proud only happens on the aggressive 'One,' not the passive Two, and never on the low downbeat" (Smith 2012, iv).[4] Several members of Brown's band had initially found it difficult to play with emphasis on downbeats. In his memoir, Brown recalls his interactions with bassist Bootsy Collins:

> When I met [Bootsy Collins] he was playing a lot of bass—the ifs, the ands, and the buts. I got him to see the importance of the one in funk—the downbeat at the beginning of every bar. I got him to key in on the dynamic parts of the one instead of playing all around it. Then he could do all his other stuff in the right places—after the one. (Brown and Tucker 1986, 218)

The emphasized downbeat was traditionally used in West African music as a synchronization point for all that participated in the musical experience (Vincent 1996, 37). The downbeat served a similar purpose for members of Brown's band, who used it as a structural reference point in their improvisations (Vincent 2008, 55). The inclusion of this characteristic in Brown's music was in opposition to much of popular American music before it, which was chiefly based on melodies, with an emphasis on beats two and four and with a lack of emphasis on the one (Vincent 2008, 55). Brown created an anticipation of the one in his music through the use of

[4] the low downbeat potentially refers to beat three, as expressed by James Brown in Vincent (2008, 55).

devices such as the subtle interplay between different instruments (i.e., swing), emphasis on off-beat sixteenth notes to weaken traditionally strong beats, and cross-rhythms (Danielsen 2006). In the analysis of *Sex Machine* (1970), Danielsen (2006, 79) explains that the guitar is "so late that the off stroke virtually coincides with the beat on the snare drum that it is intended to anticipate". This interaction between the guitar and drums creates the impression that the snare on beat four is earlier than it actually is. To a similar effect in *Sex Machine*, Bootsy Collins' bass notes are played either before or after traditionally strong beats, thus reducing the prominence of these beats (Danielsen 2006, 79–80). Cross-rhythms (e.g., four against three) are also used to both reinforce and neutralize the main pulse, continually shifting a listener's focus between different interpretations of events, creating an interplay between these events and forming spaces that are as crucial as the events that define them. Other than in James Brown's band, these characteristics were used by a variety of Funk bands in the 1960s and 1970s, including Sly and the Family Stone, Parliament, and The Meters. Reflecting on his interaction with the other members of The Meters, bassist George Porter Jr. recalls, "There was holes in the music, there was always space….I always believed that it's not what you say, but what you don't say" (Vincent 2008, 67).

Another characteristic of Funk music (as it relates to breakbeats) is the use of repetition as a compositional tool. *Funky Drummer's* breakbeat is sixteen measures long and spans approximately twenty seconds. Prior to the start of the breakbeat solo, James Brown declares, "You don't have to do no soloing brother, just keep what you got, don't turn it loose, 'cause it's a mother." Clyde Stubblefield (the drummer in *Funky Drummer*) continues to play the same pattern he had played prior to the band's exit and that he continues to play after the band's return. In her analysis of *Funky Drummer*, Danielsen (2011) explains that Stubblefield's repetition is used to enforce a groove, yet addition or removal of elements on each repetition serve to generate new versions of the pattern. Butterfield (2006) proposes that we experience these versions differently, and instead of generalizing a heard pattern and becoming accustomed to it, we instead expect a "potential for repetition" that may or may not be realized—an effect that enforces the "expressive power of the pattern".

The timbre of the drums in these recordings is created through an interplay between the drummer's performance, the drum kit, the recording equipment, and the storage medium (Chatzilias 2013). Microphones, preamplifiers, compressors, and equalizers all impart their own characteristic sound to the recording process. Microphone placement and parameter settings of each of these components, along with the room in which the recording was made and the tape used to make the recording, help to further individuate each recorded breakbeat.

2.4.1 Hip Hop

> When I was about 12 or 13 [approximately 1982] my brother got me into hip hop by listening to a groundbreaking British DJ on Capital radio called Mike Allen. His weekly frontline chart had the latest imports from the US, and we both got hooked on the sound, and tried to find out how they were making the beats. When I was 16 I got some cheap decks which I adapted with a home made kill switch and started to teach myself how to scratch records, and keep loops going on two turntables…I'd play some house parties playing old breaks, hip hop and then got into making pause mixes of tunes and breaks by bouncing them down on a four track cassette recorder. The sound quality was pretty bad, but the mixes used to be played on a local radio station's hip hop and soul show and at local club nights and all dayers.
>
> - N.R.G. (Rumney 2013)

The person often accredited with the development of Hip Hop is Clive Campbell (known as Kool Herc), a Jamaican immigrant living in the South Bronx, New York. Campbell is also the first DJ to select and mix breakbeat sections in Funk recordings. During the 1970s, the popular music in New York was Disco, but Campbell had observed the Bronx crowd's excitement when he played Funk music, and further, that they were even more exuberant during the sections when the drummer would play alone (Fernando 1999, 14–15). Through the use of two turntables and a two-channel mixer, Campbell was able to switch between breakbeats by cutting (i.e., using the mixer's crossfader and channel sliders to quickly select output from either channel) between two records with percussion solos.

Campbell also developed a mixing technique he termed "Merry Go Round", in which he could extend the length of any breakbeat through the use of two versions

of the same record (Chang 2005, 79). This technique was achieved by playing the breakbeat from one record on the first turntable, with the crossfader positioned on the first channel. While this breakbeat was playing, the DJ would cue (i.e., prepare another record for playback at a desired starting time position and hold it in place) a second breakbeat on the second turntable. As the first breakbeat ended, the DJ would simultaneously release the cued record on the second turntable, and use the crossfader on the mixer to switch between the two inputs, playing the second record. The first breakbeat could then be cued again, and the process could be repeated as long as the DJ chose.

This was a different approach to the pre-existing method of mixing dance records, in which records were blended together through overlapping them and slowly using the crossfader to fade one in while fading the other out (Fernando 1999, 18). After Campbell, other DJs such as Afrika Bambaataa and Grand Master Flash began to layer the breakbeats by beat matching (i.e., aligning the heard beats of two or more recordings. This technique was made possible by the variable pitch control (although termed pitch control, its main purpose was to adjust the tempo) on specialist turntables and a cue monitor on the mixer) and cutting in at the appropriate times.

By the end of the decade, breakbeats were in demand and second-hand record stores such as New York's Downstairs Records became hubs of activity for professional and aspiring DJs alike who were looking for rare source records (Chang 2005, 171). This served to revitalize interest in record sales of singles containing breakbeats. A regular customer of Downstairs Records, Lenny Roberts (known as Breakbeat Lenny) would later compile a large number of these breakbeats on the *Ultimate Breaks and Beats* series for DJs (Charnas 2010, 25–6; Katz 2012, 159–60). Between 1986 and 1991, Roberts created 25 volumes of *Ultimate Breaks and Beats* (Katz 2012, 159), and many of these breakbeats were the same versions that were used in early Jungle tracks (Chatzilias 2013; Thompson 2013). At present, this and other major collections of breakbeats have been collected and catalogued by the Cornell Hip Hop Collection.[5]

[5] Cornell University Library hip hop collection, #8052. Division of Rare and Manuscript Collections, Cornell University Library.

Using breakbeats, DJs would create mixtapes—cassette tapes with recordings of their sets made with turntables and a mixer. Dual-deck tape machines were also used to create mixes (Driscoll 2009). These particular mixtapes, often called pause tapes, or pause button mixes, were made by recording a breakbeat from a source tape to a destination tape in the deck with a record head. At the moment when the breakbeat reached the end of the last measure, the recording deck would be paused and the source deck would be stopped and its tape would be rewound to the beginning of the breakbeat. Then, simultaneously, the source breakbeat would be played again and the pause button would be released on the destination tape deck.

> Since the older cats in my hood couldn't afford two turntables and a mixer, they used the pause button on their boom boxes to loop the break beats over and over, creating their own little mixes and routines. They would all gather around and battle to see who had the dopest pause tape. (Dot 2005, xvi)

The creation of pause tapes is historically important as the techniques applied in their creation involve analogous techniques applied in the creation of early Hip Hop with drum machine samplers. While the Roland TR-808 and other drum machines were prominent in Hip Hop productions of the early 1980s, samplers only became popular with the introduction of the E-mu SP-12 in 1985 and subsequently the E-mu SP-1200 in 1987 (Driscoll 2009). Interestingly, there were very few samplers that were adopted by the Hip Hop community; other than the SP-12 and SP-1200, Akai's MPC-series has been very well received (Driscoll 2009; Caramanica 2011). A common feature of these devices is drum pads, with which a musician may trigger events and sequences, unlike conventional samplers that are either equipped with a keyboard or with no triggering device at all.

By 1982, Hip Hop had been exported to the United Kingdom. Hesmondhalgh and Melville (2002) propose that Hip Hop was able to permeate British society through Rare Groove—a connoisseur's genre that brought together various styles such as Jazz, Soul, R&B, and Funk, that are often known to contain elements desirable for sampling (e.g., breakbeats).

While UK audiences had already shown an interest in these genres prior to the import of US Hip Hop, the popularity of Hip Hop had served as an impetus for British musicians to source sample material in a similar way (Bowes 2013; C. Collins

2013; Davies 2013, Lindo 2013; Stewart 2013). Hip Hop and Electro were the first music genres in which many Hardcore and Jungle musicians were deeply interested. Bowes (Justice) states, "the majority of guys growing up like myself would have been listening to music such as hip hop, rare groove and the like" (Bowes 2013). He continues:

> It was through hip hop […] that I began to become aware of production, equipment and the techniques used. […] As hip hop progressed it was the sampling that really came to the fore and it was this process and taking something "old" and flipping it into something new that really caught the imagination and added a whole new dimension to the tracks I was hearing. It was the beats and breaks that I was hearing and the snippets from James Brown and Bobby Byrd tunes that sent me off on a voyage of discovery to go and hunt out these breaks and find out where they came from and who had done them originally. (Bowes 2013)

Bowes' description of his "voyage of discovery to hunt out these breaks" is reminiscent of the method by which many Hip Hop artists amassed their own unique collections of breaks, with which they created their music. While it is possible today to acquire almost any breakbeat online (Wilson 2013), this amounted to a much more difficult task in the 1980s, which required listening to and collecting a large number of vinyl records.

Other UK HJDB musicians interviewed also had been involved with Hip Hop prior to HJDB. Prior to his excursions in Hardcore and Jungle, Kane (Bay B Kane) was in a Hip Hop group, and had played alongside Public Enemy in 1986, before professionally releasing Hip Hop singles in 1987 (Kane 2013). Before experimenting with samplers, Thompson (DJ Krust) began his career as a scratch DJ with a large collection of records containing breakbeats (Thompson 2013). Davies (DJ Trax) was a Hip Hop connoisseur by age 11, learning scratching techniques he had heard performed by Whizz Kid, Marley Marl, and Grandmaster Flash, and by age 13 he was making pause tapes and putting on Hip Hop shows (Davies 2013). Stewart (Subject 13) also had made pause tapes and was a scratch DJ, and attributes much of his development as an artist to his experiences as a turntablist—that is, a performer that incorporates turntable techniques like beat matching, scratching, and beat juggling to create new music from vinyl records (Stewart 2013).

Many UK musicians also created pause tapes before they began making Hardcore and Jungle. (Davies 2013; Rumney 2013; Stewart 2013). Hardcore musician Rumney (N.R.G.) remembers:

> Lots of hip [hop] tunes had good fills and breaks in them to make [the] job easier. Like 16 bars of a Run DMC track, then in the last half bar, you'd drop in a James Brown sample for just half a bar then kick in with a Mantronix track for instance. As you can guess the sound quality wasn't great but there was no digital audio to have compared [it] to anyhow. Like a very crude and noisy Pro Tools! Amazing looking back at the huge time and effort and hours that went into a 5-min. mix that can now be done so much more accurately with perfect quality digital sound.
>
> I eventually got a 4-track tape deck which split a normal cassette tape into four mono tracks that could be played simultaneously. This meant I could record turntable mixes with basslines and scratch over the top and even add some vocal accapellas [*sic*] from vinyl. (Rumney 2013)

While Hip Hop had a profound influence on popular music genres and approaches to music making, the UK's own Hip Hop scene never flourished. Hesmondhalgh and Melville (2002) relate this to the different social, political, and cultural conditions under which Hip Hop was established in the US, as UK society has for the most part been integrated for much longer than US society. While the UK has certainly had its own issues with race and inequality, these issues have been in the forefront of people's lives in the US within the last century—a struggle that has been infused in much of the music (Hesmondhalgh and Melville 2002).

2.4.2 Hardcore

> I think Hardcore (rave) became a convenient umbrella term to contain many different sub genres. In the early raves I went to you would hear a multitude of tracks—Belgian Techno, US House, Carl Craig, some breakbeat tracks, embryonic D and B, Hip Hop it was all there. And for me the whole scene became a melting pot for all these different influences which would all feed into other tracks.
>
> - Justice (Bowes 2013)

> My first taste of the Hardcore had begun at the time I was working with Warriors Dance, artists like Shut Up & Dance and Acen were developing and changing the scene. The Akai S900 sampler, along with the [Roland TR-]909 drum [machine], had created a crunchy

> sound [that was] the hallmark for beats at the time [and is] now a vintage piece of equipment […] still highly regarded in today's dance music production. By the early 90s, the roots of hardcore were developing.
>
> - Carl Collins (C. Collins 2013)

> When House music and Techno fused together and the "scene" exploded with lots of new fans, new kids came and sought out the craft of production. These new kids had more of an urban background, and wanted something more edgy so rave music happened, and Hardcore was an extension of that, made by kids who liked hip hop and wanted the raw feel of Hip Hop and scratching, etc. blended with their tunes. Once that happened, momentum carried it through. Ultimately it was a social thing, this was the first chance many of these kids had to find a name for themselves, and they used all of their influences to portray in music what they felt in their heads from all the music around them.
>
> - AK1200 (Minner 2013)

Due in large part to the popularity of Hip Hop, an interest in sourcing and sampling breakbeats had permeated UK society in the mid- to late 1980s. Instead of creating Hip Hop, however, many musicians combined breakbeats with other popular-music genres (e.g., Reggae, Acid House) specific to the UK's interests, creating hybrid genres such as Ragga Techno, Hip House, and Bleep Breakbeat—three early subgenres of music that became known as Hardcore. Wright (The Moog) recalls, "By late 1991, in the UK rave scene at least, almost everyone seemed to be using breakbeats. I'm not totally sure why it caught on more in the UK, compared to the Belgian scene, etc., but I suspect it was because of the crossover appeal for people who were into late 80s hip-hop. Chopping up the beats just added variety" (Wright 2013). Between 1990 and 1992, the subgenre of Breakbeat Hardcore emerged and gained popularity in both the underground dance music scene, and in the mainstream pop charts (Reynolds 2012, 194–5; Clements 2013). This section presents three subgenres of early Hardcore—Ragga Techno, Hip House, and Bleep Breakbeat—and the subsequent Breakbeat Hardcore subgenre.

2.4.2.1 *Ragga Techno*

One of the first of these hybrid genres to appear was Ragga Techno, a genre that merged elements of Techno, Hip Hop, and Reggae. Philip Johnson and Carl Hymans—PJ and Smiley of Shut Up and Dance (SUAD)—built and operated their

own sound system (Brewster and Broughton 2010, 449–50). In an effort to make their shows more distinct and energetic, SUAD and their DJ, Kevin Ford (later known as DJ Hype), began to blend Reggae with Hip Hop (Brewster and Broughton 2010, 449–50). In a 2011 interview, Smiley recalls:

> Reggae dances had this kind of slow thing to it. And we wanted it more energetic, so DJ Hype was cutting up reggae and hip-hop and my brother would be MCing over hip hop…no one really understood what we were doing; we just wanted to sound different. (Bennett 2011)

SUAD started producing tracks in 1987 and created their self-titled record label in 1989 (Brewster and Broughton 2010, 451). Because they were interested in providing fast music for breakdancing, SUAD created songs with Hip Hop instrumentals and MC lyrics at House and Techno tempi (around 120–130 BPM). To do this they began to experiment with sped-up breakbeats. Smiley recalls: "We took the breakbeats out of Hip Hop culture and put it into our music, but we sped it up to a House tempo" (from *Pump Up The Volume*, a BBC Four House music documentary).

SUAD's experimentation was a source of inspiration that drew many of HJDB's key figures into the genres, such as DJ Rap (Atmosphere 1996a), Foul Play (Atmosphere 1995b), and Alpha Omega (Lindo 2013). Lindo (Alpha Omega) remembers the impact SUAD had on his conception of the genres, "when I heard Shut Up and Dance back in 1990 I instantly understood everything, the hip hop breaks sped up, the heavy reggae basslines, soulful vocals from Nicolette, Techno sounding pads and FX [sound effects] and that London ruff neck [*sic*] attitude that held everything together. For a UK teenager back then it was musical Shangri-La and something I still hold very close to my heart" (Lindo 2013).

SUAD achieved notoriety with their 1989 release, *10 Pounds To Get In*, which fit perfectly with UK rave's penchant for faster and louder music at the time, and was their first track that featured breakbeats. The track serves as a commentary on the group's attitude towards party promoters that were taking advantage of the increase in popularity of rave culture, and charging high prices for entry (Verma 2000). After a brief introduction by a male vocalist and samples from Suzanne Vega's *Tom's Diner* (1987), a breakbeat comes to the fore in the form of a two-measure loop. The group followed *10 Pounds To Get In* with other successful tracks, such as *20 Pounds To Get In*

(1989), and *Raving I'm Raving* (1992), which achieved the number two position on the national singles chart in May of 1992.[6]

2.4.2.2 *Hip House*

Hip House blended fast-paced Hip Hop vocals with House music. Examples of the genre were present in both the UK and US as early as 1986. Beatmaster's *Rok Da House* (1986) featured two British MCs rhyming over a repetitive synthesizer bass and a four-on-the-floor bass drum pattern at approximately 120 BPM. In the US, artists such as Fast Eddie, Rob Base and 2 In A Room paralleled the UK Hip House scene. While the US lyricists were heavily influenced by east coast Hip Hop of the mid- to late 1980s, UK Hip House musicians were influenced by the predominant Caribbean community in London. One such artist, Michael West, became known for his unique style of blending Reggae with Electro in his DJ sets (Dugs 2012b). West recorded his first release, *Street Tuff* (1989) with Hip House duo Double Trouble (Leigh Guest and Michael Menson), then went on to begin a solo career as Rebel MC in 1990. While the Hardcore music of 1990 was largely focused on piano riffs, high-pitched vocals, and four-on-the-floor drum patterns, West was creating music that featured breakbeats at a House music tempo with samples from Reggae, Rocksteady, and Dancehall artists.

2.4.2.3 *Bleep Breakbeat*

The Bleep Breakbeat genre was also introduced in the late 1980s and early 1990s. "Bleep Breakbeat tracks featured lead sounds and melodies from a [synthesized] sawtooth bleep sound looped on a sampler and played with breaks running underneath," recalls Rumney (N.R.G.) about the genre (Rumney 2013). Bleep Breakbeat tracks were made by musicians such as DJ Seduction, LFO, Unique 3, and The Scientist (in collaboration with DJ Hype (also mentioned in Section 2.4.2.1)), and were released on labels such as Fast Forward Records and Kickin Records. Collins recalls working for Kickin Records, and the widespread success of The Scientist's *The Bee* (1990) and *The Exorcist* (1990).

> I found myself in 1994, working with UK label Kickin Records set up by the late Peter Harris. We had actually met in the early eighties when

[6] http://www.officialcharts.com/archive-chart/_/1/1992-05-30/

> I was a sales rep for the music magazine Blues & Soul. Kickin Records will always be synonymous with The Scientist - *The Bee* and the track from same artist, *The Exorcist*; early hardcore hits of national chart proportions. (C. Collins 2013)

Before making Hardcore, Rumney (N.R.G.) made his first track, *The Terminator* (1991), in the Bleep Breakbeat genre. He recollects the process:

> Mine came about with me messing around with different keyboard patterns overdubbed on the Alesis sequencer […] after coming up with 3 or 4 I liked, and playing some looped breaks underneath.
>
> […] The Boss drum machine was a DR-220A which was click sync[ed] from memory which meant it could link to my non-MIDI Roland SH101 [see **Figure 2.3**] and would trigger the SH101's sequences from the DR-220A's click track. (Rumney 2013)

Figure 2.3: Roland SH-101, used by Neil Rumney (N.R.G.) to create synthesizer patterns in Bleep Breakbeat tracks (from the private collection of Tony Bowes).

2.4.2.4 *Breakbeat Hardcore*

Acid House and early Hardcore DJs were also engaged in experimentation with breakbeats during their sets. Originally making their mark as DJs in the Acid House scene, south London's Fabio (Fitzroy Heslop) and Grooverider (Raymond Bingham) were offered a residency at an after-hours venue, Mendoza's, where they played various styles of House and Techno (Brewster and Broughton 2010, 442–3). It was during their residency at Rage in London's Heaven nightclub that they began to incorporate sped-up breakbeats into their Techno sets. Fabio recounts, "It wasn't so

much hardcore, it was techno. But we'd get these B-side mixes from Masters at Work, and they used to have straight-up breaks on and we used to speed them up and mix them into the techno stuff. We realized anytime we did that we were getting people euphoric, like this is something new" (Brewster and Boughton 2010, 444). The duo would play Dub, Trip Hop, and Hip Hop instrumentals (e.g., *Most Wanted's Calm Down* (1989)) at 45 RPM instead of the intended 33 RPM, and blend these tracks with House and Techno music (BBC 2012). Rumney (N.R.G.) remembers the eclectic blend of music played at Rage:

> I went to Rage in the early 90s and Fabio and Grooverider were residents. The night always had a great crowd and the atmosphere was amazing. So many people from my town made the journey into London every week without missing. You'd hear a UK-made Prodigy or Acen record alongside a US-made Frankie Bones tune, Belgian techno from Joey Beltram or even US house tracks like Crystal Waters' Gypsy Woman. That tune still gives me goosebumps with memories of Rage as they often played it as the last tune when the lights were up. They also had live PAs [performance artists] some weeks and seeing the Prodigy play there was inspiration to me too. They were promoting their *What Evil Lurks* EP. (Rumney 2013)

Many of HJDB's influential producers, such as Goldie (Goldie and Gorman 2002, 112–3), Dillinja and Lemon D (BBC 2012), Mickey Finn (Goldie and Gorman 2002, 112), DJ Crystl (Besson 1995), N.R.G. (Rumney 2013), and DJ Trax (Davies 2012) were in attendance during these nights and listened to Fabio and Grooverider's mixes. Several of these producers began to intentionally attempt to incorporate breakbeats directly in their own music (BBC 2012). It was around this time that the term Breakbeat Hardcore began to be used to describe the specific brand of Hardcore.

Other nightclubs also hosted early Hardcore shows, such as Camden Place, Orange at the Rocket, Labyrinth, and The Grid (Wright 2013). Bowes (Justice) recalls attending The Grid nightclub in 1990 and hearing a variety of styles including European House, Detroit Techno, Hip Hop, and Balearic music (Bowes 2013). Wright (The Moog), Bowes (Justice), and Davies (DJ Trax) recall attending Milwaukee's, a club in Rushden, UK from 1991 to 1993 (Bowes 2013; Davies 2013; Wright 2013). Wright remembers:

> Milwaukees was a club in an old converted truck stop in the middle of nowhere, that became a rave legend. It was my first experience of a real rave drug-den. As you walked into the place, you'd be hit by the smell of Vicks Vaporub, as it was customary at the time for Ecstasy users to smear themselves in the stuff. The music was full-on hardcore, with DJs such as Fabio, Grooverider, Carl Cox, Clarkee, Ratty, and almost all of the big names from back then. I think the promoters were Helter Skelter, ESP and Equinox. The capacity can't have been much more than 500 people, so it had an amazing intimate atmosphere, with a low ceiling, fog machines, thumping sound system, and decent lights. The central dance floor was surrounded by chill out booths, strewn with "gurning" ravers who could no longer co-ordinate themselves. Everybody has their special nostalgic venue, and that is ours. When you were there, you just knew that nowhere else in the future would ever come close to matching that whole experience. Good times. (Wright 2013)

Stewart (Subject 13) recalls the first time he heard music that he associated with Hardcore in 1990, the same year he released his first single, *Eternity*. "I guess I heard the first emergence of possibilities in late 1989, but 1990 is when it was officially born and given its name hardcore" (Stewart 2013). Stewart remembers 4hero's *Mr. Kirk's Nightmare* (1990) as being an influential track in this new genre.

In 1990, Mark Clair, Dennis McFarlane, Gus Lawrence, and Ian Bardouille released *Mr. Kirk's Nightmare* on their Reinforced Records label. *Mr. Kirk's Nightmare* begins with a spoken introduction by a police officer explaining to a father that his son has died of an implied ecstasy overdose—a sentiment which was in opposition to much of the commercial rave culture at the time. Early Reinforced Records featured Hardcore that blended influences from House, Hip Hop, and R&B. Initial releases came from the label owners under various pseudonyms, such as solo releases by Clair under the Marc Mac and Manix aliases, and McFarlane under the Dego, Tek9, and Dollis Hill aliases, as well as collaborative efforts under the 4hero and Tom and Jerry aliases (and later as Cold Mission and Jacob's Optical Stairway). In subsequent years, Reinforced Records released music by other artists as well, including Nebula II, Doc Scott, and Goldie (recording as Metalheads and Rufige Kru). The early 1990s releases by Reinforced Records generated some of the earliest examples of Jungle and Drum & Bass' most notable characteristics: modification of breakbeats through a variety of techniques involving on-board sampler

transformations (e.g., pitch modifications, looping, reversal of sample), as well as out-board signal processing effects from hardware units.

The early 1990s also saw other producers creating music with sped-up breakbeats. 2 Bad Mice was the collaborative effort of Simon Colebrook and Sean O'Keefe (also known as Deep Blue), who made their first music after persuading Rob Playford to use his studio (Colebrooke 2013). Colebrooke, who had an affinity for Hip Hop and breakbeats, fused these with O'Keefe's interests in House music. The result was the track *2 Bad Mice*, released on Playford's Moving Shadow label, under the 2 Bad Mice production name. Then, alternating between the 2 Bad Mice and Kaotic Chemistry production names, the trio released seminal Breakbeat Hardcore releases such as the seminal *Hold It Down* EP that contained the eponymous track, *Hold It Down*, along with *Waremouse*, and *Bombscare*. The *Hold It Down* EP is often cited as one of the defining moments in the direction of early Jungle (Duffield 2005).

Most of the aforementioned developments were centralized in or around London; however, popular Hardcore communities had also emerged in Bristol and Manchester. The Bristol electronic music community of the late 1980s was comprised of an eclectic assortment of genres including Reggae, Punk, Pop, Rap, and Electro (Thompson 2013). The Bristol electronic music community, well-known for Trip-Hop, was comprised of several musicians that were also experimenting with breakbeats, as can be heard in Massive Attack's (formerly Wild Bunch) *Any Love* (1988) and Smith & Mighty's *Anyone Who Had A Heart* (1988). Smith & Mighty also produced *Wishing Upon A Star* (1989) by Fresh 4 (consisting of DJ Krust, his brother Flynn, Suv, and Judge), which used a looped *Funky Drummer* breakbeat for percussion. *Wishing Upon A Star* launched the career of the members of Fresh 4, providing them with the opportunity to work with studio gear. Thompson (DJ Krust) remembers,

> After the whole Fresh Four thing we got signed to 10 Records to do an album. They threw us in a studio and said go and make an album, and none of us knew how to use any of the equipment. We're 19 year old kids in this studio, massive speakers, big desk and all that, and we're like, "what the fuck are we supposed to do here?" No one had a clue! My brother made *Wishing On A Star* with Smith & Mighty. They were our producers; we didn't know how to use any of the equipment. But

> for me, I got the bug. I just looked in this space, and saw all the equipment, and I was like fucking hell man! And my mind just started to wander, I started to tinker with everything, I didn't really know what I was doing for a while, but what happened was that my brother had a sampler, and I lived in his back room for like three years, slept on the floor everything, […] and I just mastered it. (Thompson 2013)

Thompson (DJ Krust) remembers that when he and his friends first began sampling (using a Casio FZ-1 sampler), they started with breakbeats.

> When we were DJing, we were cutting up two copies [of the same records], so we had collections with breaks ready to go, so when we started to sample, we knew where the breaks were. We were straight in. (Thompson 2013)

Manchester's Gerald Simpson (A Guy Called Gerald) had achieved international success through his collaborative efforts with 808 State (with Andy Barker, Graham Massey, Darren Partington, and Martin Price). He had also enjoyed success through his solo work such as *Voodoo Ray* (1988), which achieved the number 12 position on the national singles chart.[7] The song title was originally intended to be *Voodoo Rage*, named after a sample of the two words. However, due to limited sampling time in Simpson's sampler, he was unable to capture the full sample (Dugs 2012a). Simpson recalls the first time he had heard the sped-up breakbeat sound in the Midlands:

> I think it was Grooverider who was playing before me. Anyway he was playing these really fast breakbeats and the kids were just going mad. I hadn't seen anything so manic before, I was totally mesmerised. Suddenly I thought, 'shit these beats are all at least 160 BPM and all my stuff is much slower'. I'd basically planned to play a House set, stuff which had been going down really well everywhere else but I just knew it would be a disaster here. Anyway I had these breaks already looped in the sampler so I just sped them up to the right speed and increased the tempo on the backing tracks. And I played the other stuff live. It was totally spontaneous, I just didn't know what was going to happen next. But it went down really well. (James 1997, 12)

Simpson continued to produce Hardcore music with breakbeats at these faster tempi. He released the *28 Gun Bad Boy* EP (1992) (and LP of the same name in 1993), which featured characteristics of the Jungle sound—pitched-up and

[7] http://www.officialcharts.com/archive-chart/_/1/1989-04-08/

resequenced breakbeats, high-speed vocals, synthesizer riffs—two years before these characteristics became more commonplace (Dugs 2012a). *28 Gun Badboy* caught the attention of Fabio, Grooverider, and Goldie, who persuaded Simpson to come to London to become more connected with the Jungle community (Goldie and Gorman 2002, 136). Goldie and Simpson later collaborated as The 2 G'$ in *Energy* (1995).

Breakbeat Hardcore gained popularity not only among in the alternative underground, but in the popular culture as well. Tracks such as 2 Bad Mice's *Bombscare* (1991), KLF's *3 AM Eternal* (1991), The Prodigy' *Charly* (1991) and *Jericho* (1992), Acen's *Trip II The Moon* (1992), The Shamen's *Ebeneezer Goode* (1992), and Baby D's *Let Me Be Your Fantasy* (1992) enjoyed Top 40 success (Reynolds 2012, 194–5; Clements 2013). This success generated the exposure to reach a new generation of listeners and musicians. Clements (ASC) remembers,

> Acts like Smart E's, Bizarre Inc, Urban Hype, SL2 and of course, The Prodigy, were all being played on TV and the radio, and it was an unbelievable time for that music. So as a young teenager during this time, I wanted more of it. A group of us at school were all into it and started listening to local pirate radio stations and making tapes of the DJs. We'd then dub tapes from each other and swap our collections. Back then, me and my friend Chris took it a step further and decided we were gonna start buying vinyl and learn how to DJ, which led to us both becoming minor celebrities in our school when we landed a show on one of the pirate radio stations we listened to. (Clements 2013)

2.4.3 Jungle

> Jungle was born out of the urban underground dance music scene in the UK and specifically from London and even more specifically from the East and North side of London. Originally a fusion of Techno elements and Breakbeats and bound together by very low frequency sub-bass…often with a sprinkling of Dub/Reggae samples too.
>
> - Bay B Kane (Kane 2013)

> You had this Rave music which essentially was a lot of stabs, bass sounds, strings, high-pitched vocals and breaks thrown in, thrown together, and it was interesting, there was something definitely going on there. Jungle Techno simplified the process, it used one kick drum, one break, bass sound, one vocal, maybe a string, and it was about the

> arrangement. Jungle took out the flat [four-on-the-floor] beat totally, […] took out the Techno-y [*sic*] bassline, and put a sub bass in its place, and then replaced the vocal with more of a Ragga vocal, or a Hip Hop vocal.
>
> - DJ Krust (Thompson 2013)

Between 1991 and 1992, several hybrid subgenres appeared, which blurred the distinction between House, Techno, and Hardcore. One of the larger of these subgenres was Jungle Techno, which was characterized by faster syncopated percussion (often utilizing breakbeats), with bass timbres and arrangements typical of Techno. The XL Records label had been a source for some of the earliest examples of this subgenre. **Figure 2.4** presents the musicians associated with the XL Records in April of 1992, including artists such as Prodigy, SL2, Liquid, and Nu-Matic.

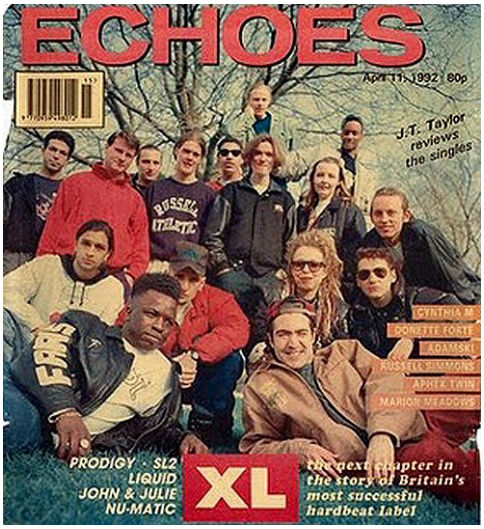

Figure 2.4: Echoes Magazine cover from April 1992, with a feature on XL Records and artists Prodigy, SL2, Liquid, John & Julie, and Nu-Matic (Bay B Kane and Mr. E).

Kane (Bay B Kane), recording with Mr. E (Matthew Edwards) as Nu-Matic released the *Hard Times EP* on XL Records in 1992. The *Hard Times EP* was described as Jungle Techno by the press in the same year, which was one the first times Kane had heard the term used outside the community of producers that made the music (Kane 2013). Kane states that while the Hardcore name is vague, and encompasses too many disparate genres (e.g., Belgian Techno, Hip House, Breakbeat

Hardcore), Jungle and its lineage is much more definable. On the origin of Jungle, he remembers, "Jungle […] started its life for those that may not know as JungleTechno [*sic*]. […] we and others involved in the scene were using the term [JungleTechno] since long before […] over the course of the following year or two as the music evolved and settled into its own unique style, the Techno reference was inevitably dropped and became known as Jungle" (Kane 2013).

By 1992, many musicians who were making music in these hybrid genres increased the speed of their tracks substantially from those of House and Techno (Wright 2013). Davies (DJ Trax) remembers,

> […] gradually our hip hop tracks started to get faster and more hype! When Dev and I went in to record with Plastic Jam, we pushed the BPM up to 140 (very fast for those days). That was kind of the birth of us making hardcore/rave as it was known then.
>
> The demo tape we sent off to Rob Playford had the Plastic Jam track plus 3 or 4 other hip hop tracks and a couple of instrumentals. The Future Is Before Your Eyes was on the tape and was originally 180 BPM with Too Bad for Ya at 188 BPM! Rob wanted to sign them and we had a debate about the speeds. Hardcore was around 130 at the time so the speeds (although the future was before your eyes ;)) were a bit too mad! We agreed that TFIBYE [The Future Is Before Your Eyes] would be 160 and 2 Bad for Ya [would be] 180. (Davies 2013)

With the dramatic increase in tempo came the need to adjust the speed of the samples used in the music such that they were in sync. One often used solution for this problem was achieved through the use of a sampler; samples could be triggered using a higher MIDI note than the root note (see Section 3.1.1 for a more detailed explanation). This technique has an additional effect of raising the perceived pitch of the sample, which could impart an artificial feel to the sample. Triggering the sample at even higher notes would cause what some have termed "chipmunk" vocals (named as such from the voices of the popular children's singing cartoon, Alvin and the Chipmunks, created in the late 1950s). Several Breakbeat Hardcore musicians began to incorporate samples from television programs and advertisements for children. Possibly the most notorious of these tracks were Prodigy's *Charly* (1991), which intersperses samples from a children's advisory program and a cat's meow from a cartoon, and Smart E's *Sesame's Treet* (1992), which sampled a group of

schoolchildren singing the theme song from the popular children's TV show, *Sesame Street*.

These tracks had immense crossover appeal to a mainstream audience that was largely unaware of the musical timeline of electronic music. In response to *Charly*'s success, the popular press magazine *Mixmag* published a cover feature entitled, "The Prodigy: Did 'Charly' kill rave?" in which Dom Phillips writes:

> Liam is heir to the homemade computer enthusiast tradition that goes back to Derrick May and to A Guy Called Gerald and even to the bedroom days of punk rock. But when 'Charly' turned from wacky hardcore anthem into chart-busting gold dust, Howlett's silly little novelty tune joined another, far less honourable heritage.
>
> One that goes back to Jonathan King and Keith Harris and Orville and a million nightmare novelty records that countless grinning Top of The Pops goons have introduced over the years. The great awful British novelty song. That song, the one everyone hates and still gets up for…And if someone like Shut Up and Dance take the place of Sham 69, then The Prodigy are Jilted John. Nobody told them—that joke isn't funny any more. (Phillips 1992)

It was at this point that the Hardcore scene divided: Tracks such as *Charly* and *Sesame's Treet* became predecessors of the Happy Hardcore genre (also known as 4 Beat and Happy Tunes), typified by a lighter and excessively jovial mood. Tracks by musicians such as Hixxy, DJ Force and The Evolution, Higher Level (DJ Krome and Mr. Time's Happy Hardcore alias), and Vibes and Wishdokta exemplify this genre. The other style, which was described as Jungle Techno, and ultimately Jungle, embodied the darker and more bass-heavy sound and infused Hip Hop influences (Lindo 2013; Parsons 2013).

Jungle music was typically faster than most Hardcore. While the tempos were not that different—the change amounted to an increase from the mid-150 BPMs to the mid to high-160 BPMs (Parsons 2013)—this difference afforded substantial timbral modifications that allow differentiation between the genres. Parsons (Voyager) had worked as an engineer for several Darkside musicians such as DJ Crystl and DJ Fokus at Monroe Studios during Hardcore's transition into Jungle. Parsons recalls, "It gave Jungle a rawer edge and injected it with a kind of kinetic energy, and seemed to make the syncopation of the sounds and beats work so much better. It also worked because the half-time rhythm became more apparent as well,

which gave it a rhythmic advantage over the slower hardcore/rave tracks. It also meant you could sway around to Jungle, and did not have to dance like a maniac to the faster rhythmic patterns all night" (Parsons 2013).

> The faster pace of Jungle also allowed new sonic characteristics to come to the fore. With the increase in tempo came the increase in melodic pitch, which also affected the [equalization settings] of a lot of sounds. If you have a sampled loop or beat playing at a higher pitch, you have a higher frequency range, so a lot of the breaks started to sound a bit more tinny and thin which left more space for bass. The lower mid-range frequencies that had been taken [up] by slower breaks and added kick drums wasn't there anymore, so you had a hole in the lower mid range and bass frequencies that was filled by monster [Roland TR-]808 bass lines. (Parsons 2013)

Parsons explains his techniques for creating such large bass sounds in his early Jungle tracks:

> It was a mixture of low- and high-level monitoring on mixdowns and making sure that I could hear bass on the [Yamaha] NS10s and also on the big custom Tannoys that I had in the main studio (which would probably explain my Tinnitus). When I was using the NS10s I'd also check the VU levels to see the increase and decrease in dB when the bass was muted to make sure it was loud enough, and also check the monitors from the side to see how much the cone was vibrating. I'd add compression on the [Roland TR-]808 and not add too [much] below 50Hz otherwise it would just swamp the whole track and would upset the balance of the rest of the mix, plus you'd lose the higher notes of the bass melody because you couldn't have the level high enough to hear them. I'd stressed a few of the 808s through the desk inputs and distorted them into the Akai [sampler] as well to get some nasty sounds, also time stretching the 808 on the Akai gave some pretty sick results, as did over-driving the sample into the compressor and squashing the hell out of it and then resampling it. (Parsons 2013)

The increased speed of Jungle also allowed for synchronization with genres existing at the half-tempo rate; thus samples from Ragga or Rhythm and Blues (R&B) were often incorporated with less deviation from the original pitch (and speed). Examples of this integration can be heard in Dem 2 Ruff's *Nice Tune* (1994), which featured a sample of Toni Braxton's *Breath Again*, and M-Beat's *Sweet Love* (1994), which featured samples of Anita Baker (although the vocals were sung by Nazlyn on the full release).

2.4.3.1 *Darkside*

Darkside was the first of the Jungle subgenres to gain widespread popularity after the separation from Hardcore. Darkside musicians were interested in distancing themselves from the commercial aspects of Hardcore. "Most of the DJs thought that the scene was getting too commercial. They wanted to deepen the music […] the idea was that the true raver would stick with it and the commercial people—the fakers—would fade out of it," expressed musician and Formation Records label owner Leroy Small (DJ SS) in 1994 (Headon 1994).

Darkside musicians created a stark version of Hardcore that removed the lighter elements associated with prior commercial success (e.g., high-pitched vocals, Rave-style pianos) in favour of "darker-themed" samples, often taken from horror films. In *Valley Of The Shadows* (1993) by Origin Unknown (Andrew Clarke and Anthony Miles), the rave-style piano is replaced by a modulated FM synthesized bell sound that accompanies dismal vocals that explain, "I was trapped in a long dark tunnel".

Another source of samples in Darkside was Belgian Hardcore. One of the most well-known and often cited Darkside tracks is Nasty Habits' *Here Come the Drumz* (1992). In *Here Come the Drumz,* Nasty Habits (Scott McIlroy, also known as Doc Scott) superimposes a manipulated sample of the lead synthesizer sound in Second Phase's *Mentasm* (1991)—the sound itself is often referred to simply as a Mentasm. The Mentasm sample was originally created on a Roland Alpha Juno synthesizer (Reynolds 2012, 109), and has been incorporated in many Jungle and Drum & Bass tracks. Musicians affiliated with the Reinforced Records label (e.g., Manix, Tek-9, Goldie) and later Goldie and Doc Scott's Metalheadz label, became well-known for their manipulation of the Mentasm sound throughout the early to mid-1990s.

Fabio and Grooverider's Rage club night at Heaven had closed in 1992. Darkside soon found a home at AWOL club and was championed by DJs Randall, Micky Finn, Darren Jay, Kenny Ken, and Dr S. Gachet (James 1997, 23–5). AWOL was frequented by many of those that also attended Rage (Bowes 2013; Davies 2013), but the club night soon became notorious for its tougher vibe and "Gangsta

Rave" atmosphere (James 1997, 25). Music critic Simon Reynolds attended the AWOL club nights and recalls the drastic change in the audience:

> It's old news that the effervescent friendliness of 1992-era hardcore is long gone, but basic civility seems to be in short supply. On the dancefloor, I watch a girl expertly roll a giant spliff while her boyfriend ignores her, then hand it to him silently. With incredible rapidity, he smokes most of it, hands it back without a word or glance, and strides off. […] I spot a gang of super-sharp stylists, eyes masked behind sunglasses standing erect and statuesque […] their faces are frozen, their arms folded across the chest, 1986 B-boy style". (Reynolds 2012, 354–5)

Rumours of the use of harder drugs such as crack cocaine began to circulate, and by 1994 there were several reports of increased drug use and violence at Jungle events such as AWOL, including stories of crack use, guns, and murder (Headon 1994). It was even conjectured that Jungle musicians were using crack to create the music. 4hero's Dego refuted this claim, "the first Dark records that were made were not made by crack heads and neither are they now. […] You don't need to be on nothing to get the Dark sound. The Dark sound is a result of the technology creating it" (James 1997, 26).

2.4.3.2 *Jump Up and Hardstep*

In 1993 to 1994, the Jump Up subgenre of Jungle appeared. Jump Up Jungle is characterized by heavily manipulated breakbeats, a distorted melodic bassline (as in Dead Dred's *Dred Bass* (1994)), and Hip Hop samples (e.g., DJ Zinc's *Super Sharp Shooter* (1996) featuring samples from Wu-Tang Clan's Method Man). The percussion in Jump Up typically centers around manipulations of well-known breakbeats such as the *Amen*, generally performed through on-board effects of samplers (e.g., timestretching,[8] reversal of individual drum hits). The breakbeats in several Jump Up tracks have been manipulated to create harmonies or melodies from the drums. This effect can be heard on tracks such as DJ Hype's *Shot in the Dark (Gunshot Mix)* (1993), DJ Red Alert and Mike Slammer's *In Effect (Dark Dub Mix)* (1993), and Madbones' *Soundboy* (1994). Jump Up is exemplified by labels such as Ganja Records, Frontline Records, True Playaz, Back 2 Basics, Trouble on Vinyl, and Joker Records. Well-

[8] See Section 3.1.1 for an explanation of timestretching.

known artists of this subgenre include DJ Hype (Kevin Ford), DJ Zinc (Ben Pettit), and Pascal (Pascal Redpath), Marvellous Cain, and Dead Dred.

Dead Dred is an alias for the production duo comprised of Asend (Lee Smith) and Ultravibe (Warren Smith), with additional production provided by label owner JB (Jason Ball). 1994's *Dred Bass*, while featuring some of the staple sounds associated with Jungle at the time—a time-stretched vocal sample, an intricately manipulated *Amen* breakbeat with pitched individual drum hits, and a gunshot sample—also featured a distorted and reversed synthesized bass sound (Hamilton 2000). The group was voted one of the best Jungle/Drum and Bass producers of 1994 by *NME* magazine and sold over 50,000 copies (Hamilton 2000). The bass timbre popularized in *Dred Bass* was replicated in several later productions, including Urban Takeover's *Arsonist* (1995), and DJ Zinc's *Super Sharp Shooter* (1996).

The related subgenre of Hardstep was popularized in 1994, and was typified by long sections of sparse bass and breakbeats. Conor O'Dwyer (DJ Code) explains that the breakbeats in Hardstep had an "emphasis on heavier and more repetitive drum patterns (in comparison to earlier jungle). […T]he basslines tended to have a harder edge and less organic sound to them than what [came] before. Individual drum hits seemed to carry more weight and punch than earlier productions" (O'Dwyer 2013). These sections were often juxtaposed with longer breakdowns, or sections of the track that showcased the non-rhythmic ambient characteristics such as sustained chords. Ambience in tracks of the Hardstep subgenre was often created through constantly held, typically synthesized sounds. Musicians and labels associated with Hardstep have a large amount of overlap with those from other subgenres such as Jump Up. Two of the most well-known figures associated with Hardstep were DJ SS and Grooverider (O'Dwyer 2013). DJ SS's tracks, such as *Rollidge* (1994) and *Black* (1995), and Grooverider's remix of DJ SS's *United* (1994) and the *Grooverider's Hardstep Selection* (1994–5) compilation on Kickin Records typify the above characterization of the genre.

2.4.3.3 *Ragga Jungle*

After the demise of commercialized Hardcore in 1992, popular media coverage of the HJDB genres was negligible until the summer of 1994. During the interim, the

underground popularity of Jungle had been maintained through the efforts of several pirate radio stations that championed the genre. Dave Stone, owner of Sound of the Underground Records (SOUR) remembers,

> Without the pirates, I don't think there'd be a scene. The rest of the scene reviled Hardcore [and Jungle]. They looked at it as speeded up chipmunk kind of bullshit. There was nowhere interested in representing it. But a whole section of people were really into this music. So the pirates formed as a natural need for people to hear this music. (Belle-Fortune 2004, 60)

While the popular media had ignored the developments of Jungle since it split from Hardcore, radio stations such as Kool FM, Rude FM and Easy FM were broadcasting Hardcore, Darkside, and Jungle (Belle-Fortune 2004, 60–7; Reynolds 2012, 224–236). It was only when the larger media outlets such as the BBC realized that they were missing their target audience that they began to pay attention to the music the pirate stations were playing (Belle-Fortune 2004, 78–81). In the summer of 1994, Jungle became mainstream, and the first popular subgenre of Jungle was Ragga Jungle. Ragga Jungle, as its namesake implies, was characterized by its marked use of Ragga and Dancehall samples as well as pronounced influences from early productions by musicians such as Rebel MC (e.g., X Project's *Walkin' In The Air* (1993)) and SUAD (e.g., The Ragga Twins' *Spliffhead* (1990)).

An important distinction between Ragga Jungle and Jungle is the emphasis on the vocals of an MC, which are either present in the context of a full song or samples of vocal phrases. Ragga itself is a genre of Jamaican-influenced music originating in the UK during the 1970s. Ragga's heritage is rooted in soundsystem culture and has a large amount of overlap with Dancehall, and is focused on the lyrical expertise and style of a MC as a frontman (James 1997, 32–4). Popular Ragga musicians include Buju Banton, Bounty Killer, Mad Cobra, Ninjaman, and Yellowman.

The percussion in Ragga Jungle tracks is typically comprised of breakbeats (often the Winstons' *Amen* breakbeat) that are incorporated with a great deal of intricately resequenced patterns and manipulations. The bass is usually centered in the lower frequencies, moulded in the style of the Reggae bass line. Additionally samples are often sourced from Ragga music (often vocal phrases from Ragga MCs), film samples, and Ragga horns and alarms, often processed through spring reverbs

and delays. The sound was exemplified by labels including Kemet Records, Congo Natty Records, Ibiza Records, and SOUR, and artists such as Congo Natty, Dem 2 Ruff, Shy FX, DJ Krome and Mr. Time, and M-Beat.

Original Nuttah by Shy FX (Andre Williams) was released on SOUR in 1994. The track features many of the aforementioned Ragga Jungle components: a deep Reggae bassline, sampled Ragga horns, frantic *Amen* breakbeat, and an MC—UK Apachi (Abdul Lafta), who provides a full lyrical performance. *Original Nuttah* entered the UK Top 40 singles chart at number 39 in October 1994 and sold over 50,000 records in 1994 alone (Atmosphere 1996c). The single had been the earliest appearance of Jungle on daytime radio and television, and launched Shy FX's career (Henaghan 2003b). In addition, *Original Nuttah* was one of the first Jungle tracks with a music video that was played on British MTV. Collins recalls the success and impact of *Original Nuttah:*

> Shy FX and UK Apache dominated dance floors […] this jungle anthem could do no wrong. UK Apache and Shy FX on SOUR had chart success with the release of *Original Nuttah* in 94, being placed at 34 in the national charts. Shy FX developed into one of the scene's finest producers and alongside creative partner T-Power went onto achieve chart success with *Shake Your Body* in 2003. (C. Collins 2013)

Many of the characteristics that made Ragga Jungle distinct, however, were not exclusive to the subgenre. Rob Playford explains, "There were all these people taking really obvious elements and sticking something even more obvious over it to try to make a pop record. The sound they were trying to cop was something very close to our hearts, very deep underground and it just pissed everybody off" (James 1997, 37). For example, the intricately manipulated breakbeat with pitched drums was also a characteristic shared by the Jump Up subgenre. Also, the Jamaican influence in Ragga Jungle was not exclusive to the subgenre. Attributes at the forefront of Ragga Jungle, such as the Reggae-inspired bass lines and Ragga vocal samples, had been present in Hardcore since the early 1990s (Bowes 2013; Parsons 2013; Wright 2013).

Many Jungle musicians outside of the Ragga Jungle subgenre did not agree with the shift in focus from the studio musician (in the HJDB genres often termed a producer) who creates the track to the Ragga aesthetic of the MC as a frontman. As Rob Playford explains, "Any form of House Music, which is where we come from,

was an engineers', producers' music in the first place, there were never acts or artists involved in it. It's these backroom people that are doing all the tracks. Which is not very different from the commercial scene nowadays, where they need people to front it" (Bunz et al. 1997).

Ragga Jungle's demise began with a fairly public controversy surrounding an interview with General Levy, the frontman in M-Beat's *Incredible* (1994). *Incredible* had reached number 39 on the UK Top 40 singles chart in June of 1994,[9] and the remix had reached number 8 in September.[10] In a statement for *The Face*, a popular press magazine, General Levy overstated his influence in the Jungle community (Reynolds 2012, 253–4). Sarah Sandy, owner of the Groove Connection artist management agency, remembers, "when that thing blew up, it blew up for the wrong reasons. General Levy came in and gave Jungle to the wrong people. It wasn't the people who initiated or instigated it. It was people who didn't have a clue what Jungle was…. Obviously some of the DJs were playing *Incredible*. And before you knew it, it blew up as the face of Jungle" (Belle-Fortune 2004, 19). A public apology from Levy was printed in a subsequent issue of *The Face*, which has been attributed to the actions of The Committee—a hidden group of influential members of the Jungle community who are believed to have been frustrated with how Jungle was being represented in mainstream culture (James 1997, 61–9). Kane (Bay B Kane) is not convinced of The Committee's intentions and associates them with Intelligent subgenre (discussed in Section 2.4.4).

> […] I was aware of the so-called committee, and yes it was made out to be something that it really wasn't. The committee I felt were a bunch of self appointed so-called leaders of the so-called Intelligent movement who were nothing more than ignorant opportunists looking after their own interests and had no interest in helping the scene or anyone in it unless they agreed with the so-called Intelligent point of view…which let's face it was far from intelligent in its thinking! I fiercely opposed all this divide rubbish and often argued the point that restricting any artist to stay within the boundaries of a virtual musical concentration camp was not the way forward and in fact it was a thousand steps backwards at the very least. (Kane 2013)

[9] http://www.officialcharts.com/archive-chart/_/1/1994-06-25/

[10] http://www.officialcharts.com/archive-chart/_/1/1994-09-24/

The effect of this public controversy on the careers of M-Beat and General Levy, and the credibility of Renk Records (the label which released *Incredible*) was substantial. Collins remembers, "the General apologised, [and] the label tried to blame it all on a misquote. The label Renk Records was the most successful at this time with jungle crossover chart success. The rot had set in, the scene was upset and its guard was up. […] The backlash against M-Beat was not the catalyst for the demise of Jungle, but a mere footnote in the power of street music and its many different influences and how they come to shape things" (C. Collins 2013). Collins continues, "Jungle was still being produced but the impact in terms of the national charts was diminishing, UK Garage was picking up the slack left after the jungle and ragga era. The jungle scene was still strong in terms of events. Specialist big parties devoted to Jungle still occurred, Jungle Mania being the biggest event" (C. Collins 2013).

2.4.4 Drum & Bass

> Drum & Bass…was born directly from the seed of Jungle, make no mistake there! Originally starting with the emerging "Intelligent" sub genre from within Jungle. It was a more drifty, dreamy, atmospheric type of sound. Less busy and more sparsely instrumental often with a vocal hook preferably female! The name tag is simply down to the fact that the dominant elements were always the drums and bass, hence the term Drum & Bass.
>
> - Bay B Kane (Kane 2013)

> [Drum & Bass] was the natural progression, the refinement of all the early influences, some taken forward, some left where they were, as we learned the craft of making music the ear became attuned to what we wanted to hear and make.
>
> - Justice (Bowes 2013)

The term Drum & Bass (also written as Drum and Bass, Drum 'n' Bass, dnb, D&B) had been used through the 1970s and 1980s in a form of Reggae called "Dubwise", and appeared in track titles such as I-Roy's *Drum and Bass Ecstasy* (1970), King Tubby's *Drum and Bass Song Dub* (1979), and U Brown's *Drum and Bass* (1984). The

term was also used in the Jungle community as a description of the music's important elements. T-Power recalls,

> People used to call a lot of the Breakbeat stuff Drum 'n' Bass. It was because that's what the music had become like, the melody just wasn't as important as the core elements of the rhythm anymore. There were always elements within the Drum 'n' Bass which were 'Junglist'. They were referred to as 'Junglism', but it wasn't Jungle. It was simply Junglism or Drum 'n' Bass. And no one came out of the other—they were all sort of happening within the same movement. Everyone was feeding off each other and it was as they became genres in their own right that things started to split. (James 1997, 4)

2.4.4.1 *Atmospheric*

The Atmospheric subgenre (also called Intelligent Jungle/Drum & Bass and Ambient Jungle/Drum & Bass) was one of the first subgenres to appear after the demise of Ragga Jungle. The origins of Drum & Bass can be traced back to developments in Hardcore and Jungle. Early Ambient Jungle (a term introduced by Reynolds (2012, 336)) contained elements of the sound that was to become Atmospheric. Ambient Jungle is the name for subgenres of Jungle that contained elements often associated with Ambient music—such as slowly-evolving, less-aggressive synthesizer sounds. While several labels released Ambient Jungle (e.g., Dee Jay Recordings, La Bello Blanco), the subgenre can be exemplified by the mid-1990s releases of two labels: Moving Shadow and Good Looking Records.

Rob Playford, the founder of the Moving Shadow record label, started his musical career as a Soul and Disco DJ and first attended raves in 1987 (Belle-Fortune 2004, 34). Soon afterwards, Playford began to work as a rave promoter with then label owner of Ibiza Records, Paul Chambers (Belle-Fortune 2004, 34). In 1990, he began producing Hardcore music, and started his Moving Shadow label in mid-1990, with the release of his own *Orbital Project EP* (1990). Artists signed early to Moving Shadow included Cosmo & Dibs (Steve Thrower and Rob Playford), Earth Leakage Trip (Tony Lobue and Neil Sanford), Mashed (Mike Ash and Rob Playford), DVus (Joey Vasquez and Rob Playford), Blame (Conrad Shafie), Hyper-On Experience (Alex Banks and Danny Demierre), 2 Bad Mice (Simon Colebrooke and Sean O'Keefe), and DJ Trax (David Davies) and Paradox/Alaska (Dev Pandya), who would record together as Mixrace (Dellow 2003; Davies 2013).

Playford relocated his studio, which was now being used by several artists on the label, to central London (Colebrooke 2012). Original Moving Shadow artists such as 2 Bad Mice, Blame, and Mixrace would use the studio for the majority of the week; the remaining days saw the studio being used by new artists such as Foul Play (John Morrow, Steve Bradshaw, and Steve Gurley). Between 1993 and 1994, Moving Shadow released a variety of singles and artist EPs including the *Time Will Tell EP* by DJ Trax, *Lords of the Null-Lines* by Hyper-On Experience (Alex Banks of E-Z Rollers and Danny Demierre who also recorded for the label as Flytronix), *You Got Me Burnin'*, *Mr. Logic*, and *The Dreamer* by Cloud 9/Nookie (Gavin Cheung), and *Anthemia* by Blame and Justice. It was at this time that Moving Shadow also signed Omni Trio (Rob Haigh). Recalling the widespread popularity of Omni Trio's releases, Playford states,

> We had Omni Trio in place at the exact time that the press really wanted to write about the right stuff. Rob Haigh fitted the bill perfectly for them. He was different from the rest of the stuff which was around and suddenly people got into it and realised that there was a history there. (James 1997, 73)

Originally recording under the Splice alias, Haigh brought his prior experience as an Ambient musician to the Jungle genre (Reynolds 2012, 338–40). Haigh blended slow-building atmospherics (i.e., effects or textures intentionally created to produce a mood) with percussion sections full of "splintered breakbeats" (James 1997, 73). Haigh's first tracks on Moving Shadow— *Feel Good* (1993), *Mystic Stepper (Feel Better)* (1993), and *Mainline* (1993)—were released at a time when Darkside tracks such as Origin Unknown's *Valley of The Shadows* (1993) were the most popular form of Jungle (Henaghan 2003a). Perhaps Haigh's most well-known production is *Renegade Snares* (1993), which was released around the same time as Origin Unknown's Darkside classic, *Valley of the Shadows* (1993) (Henaghan 2003a). Praising *Renegade Snares*, Reynolds writes: "What I really love about Omni Trio—as best exemplified by Haigh's all-time masterpiece 'Renegade Snares'—is the music's sentimentality; the way the tenderness of the voices and tingly, almost twee piano motifs fit the huggy, open-hearted poignancy of the Ecstasy experience" (Reynolds 2012, 339).

The Ambient Jungle subgenre soon became a popular form of Jungle (James 1997, 78–80). Moving Shadow artists such as Omni Trio, Foul Play, JMJ & Richie

(E-Z Rollers), and Cloud 9 were championed at the Speed club night. The label's success allowed Playford to quit his day job in 1994 (Belle-Fortune 2004, 26), and O'Keefe to purchase his own sampler and begin his own solo career (Duffield 2005). O'Keefe's first release under the Deep Blue alias was *The Helicopter Tune* (1993). Within six months of its release, *The Helicopter Tune* sold over 22,000 vinyl copies (Reynolds 1994); its success has been attributed to its unique position between the two prominent styles in 1993—Ragga Jungle and the developing Ambient Jungle scene (Duffield 2005).

The emerging Ambient Jungle sound that typified Moving Shadow artists such as Omni Trio, JMJ & Richie, Cloud 9, Blame, Justice, and Deep Blue was gaining popularity among other producers and labels as well (James 1997, 72); 1994 saw releases by Voyager (Peter Parsons), Sounds of Life/Source Direct (Phillip Aslett and James Baker), Studio Pressure/Photek (Rupert Parkes)—to name a few—on labels such as Dee Jay Recordings, Certificate 18, La Bello Blanco and Lucky Spin Records (James 1997, 72).

Good Looking Records' first release was by label owner Daniel Williamson (LTJ Bukem). *Demon's Theme* and *A Couple of Beats* were released during Hardcore's transition into Darkside in 1991–2. Williamson recalls, "The music was Dark then. Dark full stop. I'd been trying to get away from it, mixing it in with other stuff which was nicer" (James 1997, 72). In *Demon's Theme*, as in his other tracks, Williamson created percussion arrangements that were akin to those created by a live drummer (Reynolds 2012, 349). *Demon's Theme* combines Detroit Techno influences in its synthesizer timbres and melodic riffs with shakuhachi flute and processed vocals.

Williamson is known for his reverence for 1950s to 1970s Jazz and Soul and 1970s Funk, and has cited Chick Corea, Lonnie Liston Smith, and Roy Ayers among his influences (Duffield 2009). His sound palette reflects these influences, most often consisting of a Fender Rhodes keyboard, early analog keyboard synthesizers (e.g., ARP Odyssey, Moog Minimoog), flutes, hand percussion, mallet instruments, upright bass. In 1993, Good Looking Records released LTJ Bukem's *Music*, Apollo Two's *Atlantis (LTJ Bukem Remix)*, *Travelling (Part Two)* by D.O.P.E. (Ben James and Ray Stanley), *Bang The Drums* by LTJ Bukem and Tayla (Russell Taylor), and *Tear Into It* by Parallel World (E-Z Rollers). 1994 saw the release of *19.5* by Bukem and Peshay

(Paul Pesce), and Good Looking expanded its roster to include other Ambient Jungle artists, such as The Invisible Man (Graham Mew), and Photek (Rupert Parkes). In 1994, Williamson created his second label, Looking Good Records, as an auxiliary output for the growing number of artists on his Good Looking roster.

Founded in 1994 by DJs Kemistry and Storm (Valerie Olukemi Olusanya and Jane Conneely) (Stewart 2013), the Speed club night at Mars Bar was popularized under the mantle of LTJ Bukem and Fabio through the aid of Sarah Sandy from Groove Connection and Leo Roche (Belle-Fortune 2004, 99). The night offered an alternative to the popular Ragga Jungle form of Jungle that was prevalent in 1994. Lindo (Alpha Omega) remembers "[Fabio and LTJ Bukem] didn't really take to the ragga/jump up side of things and started their own club promoting their take on Jungle and that really helped shape another strand of Jungle that's just as important as anything before or after that time" (Lindo 2013).

Speed's success was not overnight. As Williamson (LTJ Bukem) remembers, "Only 20 people showed up but we kept doing it for a few months. Then one night we just had a queue around the block and it was like that for a few years" (Mayers 2012). As the popularity of Ragga Jungle waned, Speed, and ultimately Good Looking Records became popular in the media spotlight (Belle-Fortune 2004, 99–100), and famous musicians from other genres began attending the night. Stewart (Subject 13) remembers,

> I guess as its popularity gained it started to attract the likes of artists like David Bowie, Bjork and many others […] It was such a cool hub as you had the likes of Photek, 4hero, Blame, Dillinja, J Majik, Peshay, Intense, but to name a few. I could go on and on but truth […] all those amazing artists who made great music attended at some point. […] it was Speed's intimate almost jazz club feeling atmosphere which inspired most…it was cramped in there…pretty dark and just seriously bass heavy…it was a world of learning and hearing off the chain stuff…for me this is what is missing today, we need club nights where people know things ain't gonna be quite what you expect…the unpredictable in music is what makes way for new things and I feel we need to get back to that…Speed played a massive role [for] me and I'm grateful to have been part of it. (Stewart 2013)

During the era in which Speed became popular, there was an interest in rebranding the genre (Reynolds 2012, 347–8). It has been conjectured that this impetus came from the media and larger corporations, which were interested in

selling the music to a wider audience (Belle-Fortune 2004, 99). The subgenre term "Intelligent" came into being during this era, and was used as a subgenre name for Ambient Jungle. Many within the Jungle community believed that labelling one subgenre Intelligent implied that other subgenres of Jungle were unintelligent.[11] Kane recalls the rise of the Intelligent subgenre and the associated divide it caused:

> In late 1994 there was a noticeable shift in Jungle from the ragga-based [Jungle] towards what had started to be labelled as "Intelligent". This shift was led by the label Good Looking Records (GLR) owned by the legendary DJ/producer LTJ Bukem. This shift within the scene as time went by grew and became a massive divide not only within the music but also for those who followed the movement and attended the raves. Although it was somewhat inevitable I remember feeling that no good would come of such a massive divide within the scene. It was partly due to [the] crack culture epidemic which was sweeping the nation in late 94 through 95 and the crack dealers targeted mostly the ragga jungle raves. This eventually drove away many who were into the music but not into the crack scene and all that went along with it meaning the robberies and violence that went hand in hand with the crack epidemic. So those who were no longer attending the ragga jungle raves started to favour the intelligent sound and because of this more and more raves were happening where the theme would be the intelligent/atmospheric sounds of jungle which I should also point out quickly detached itself further by taking on the new assumed identity of Drum & Bass and was no longer associating itself with Jungle…when in fact it always was and will be a direct offspring of Jungle. This to me was the most regrettable of all the changes that I had witnessed within the scene as when any force is divided it inevitably becomes weaker. At one point in early 96 it became so ridiculous that we as producers were expected to choose which side of the fence we sat, as it were, so much so that certain producers and labels would not entertain working with producers who dabbled in ragga jungle & vice versa; labels known for D&B wouldn't mix with Jungle producers & the same went for DJs. This situation really damaged the scene as a whole and as a direct result record sales slumped and what was once an incredibly radical and powerful movement became fragmented and weak beyond recognition. (Kane 2013)

Figure 2.5 displays a short description found on the record sleeve of *Intelligent Drum & Bass, Volume Two* LP (1995) from the Strictly Underground Corporation, which reads: "As with volume one this Album is the real deal for the purest in Drum

[11] A similar controversy previously surrounded Warp Records' *Artificial Intelligence* (1992) compilation.

& Bass and has NO JUNGLE ON IT. The term intelligent Drum & Bass was coined by DJ's who wanted to specify the quality and musical side of the Drum & Bass Scene. This is the music that can't be thrown together in 5 minutes, it takes time & talent to make and is for those that know, a million miles from jungle".

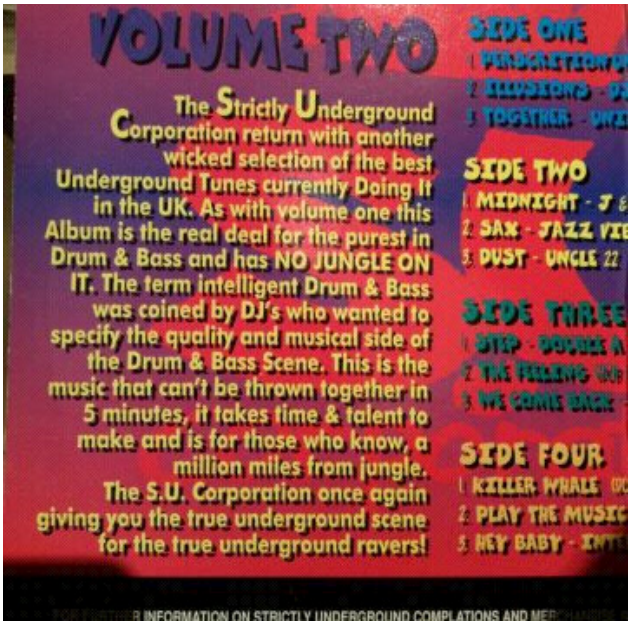

Figure 2.5: Record cover for the Strictly Underground Corporation's *Intelligent Drum & Bass Volume Two* LP (1995), with an album description that demonstrates the divide that was created between the Jungle and Drum & Bass communities (from the private collection of Daniel Lajoie).

Jungle's veterans not associated with "Intelligent" music were outraged by this type of criticism. Pascal Redpath (Pascal) stated,

> The thing I don't like is when people start labelling the music as either Jungle, Hardstep, intelligent, especially when they say intelligent, cause certain people will do a track that has a string intro that goes on for about two years which then goes into a well known break with a bass that consists of two notes. It will continue like this for about another two years and people will call it intelligent. What is intelligent about that? (Atmosphere 1995c)

In response to the growing controversy surrounding the term and his role as a major musician within the so-called Intelligent Drum & Bass community, Williamson (LTJ Bukem) sought to distance himself from the term.

> The sooner people stop using that word the better, if what I play is 'intelligent', then what is it that Hype plays? At the end of the day, I may play a different style of music but I'm not going to dis those guys that have been there with me since day one by saying mine is 'Intelligent', I'll tell you why the media has labelled the music 'Intelligent', right, for x amount of years the media has been dissing this music and the whole jungle scene. Now it appears that over the last year or so the media has found something or perhaps a few influential people have started to like this music and say, "hang on a minute this is good music." So now the press have picked up on it and thought "oh shit! We better write about it but we haven't got a name for it…so hang on…I'll tell you what we'll call it Intelligent" and if it makes it then it's cool to be into. It's like a journalistic embarrassment not realising about this music up until the last 12 months. Calling it intelligent kind of gets you out of it for missing it for so long. The term intelligent is very wrong. (Manion 1996)

The Ambient variety of Jungle was rebranded as Atmospheric Drum & Bass, a term that became popular around 1996 (e.g., *Millennium Records' Atmospheric Drum & Bass* series). Ambient/Atmospheric Drum & Bass artists became the focus of attention for major labels such as London Records, Sony (Higher Ground sublabel), and Virgin Records. Good Looking Records signed a licensing deal with Pete Tong's FFRR Records (Reynolds 2012, 347), a subsidiary of London Records, a partnership that eventually resulted in the creation of the popular Logical Progression series in 1996.

Collins explains, "the major labels tend to monitor independent labels as they always need finance to acquire and develop talent. The majors […] focused on investing in talented Drum & Bass producers over the next 2 years [from 1994]" (C. Collins 2013). He continues,

> Artists were being offered lucrative deals, large advances, this was unheard of in Jungle. The press at the time took on the mantle of Drum & Bass after flirting with the terms atmospheric Drum & Bass and intelligent Drum and Bass, for a while in the later part of 94, the intelligent jungle scene was created. (C. Collins 2013)

Several other Drum & Bass musicians soon began to sign record deals with major labels. DJ Rap, Grooverider, and Subject 13 signed with Sony. Photek and Source Direct signed with Virgin Records. Perhaps Drum & Bass' most prominent figure, Goldie (Clifford Price), signed with FFRR for the release of his *Timeless* LP (1995).

The *Timeless* EP was written by Price and produced by Moving Shadow's Rob Playford. Price had sought Playford's expertise as he respected his work under the 2 Bad Mice production outfit (Goldie and Gorman 2002, 145–6). The album's main track, *Timeless*, is an uncharacteristic 21-minute piece (a typical track lasts five to seven minutes) consisting of three parts: *Inner City Life*, *Pressure*, and *Jah*. The album features a variety of guest appearances and collaborations with Dillinja (Karl Francis) and vocalists Diane Charlemagne and Lorna Harris. *Timeless* challenged the perceived limited musicality of Jungle/Drum & Bass, and demonstrated its viability as a medium outside the scope of club-oriented music—an effort that was not always met with acclaim (Reynolds 2012, 344–5).

Goldie, along with Doc Scott (Scott McIlroy) and DJs Kemistry and Storm, created the Metalheadz label. The name Metalheadz derived from the term metal heads, which Grooverider used to describe both dubplates—acetate pressings of tracks that DJs would make before the actual release of a track—and a name he used to describe DJs who were constantly looking for these dubplates (Goldie and Gorman 2002, 128). Many of the first releases on the Metalheadz record label were by Hardcore and Jungle veterans, including Wax Doctor (Paul Saunders), Alex Reece, Dillinja, Lemon D, Goldie, and Doc Scott. These artists were joined on the label by several musicians from Good Looking Records, such as Peshay, Photek, and Source Direct, and newcomers, such as Hidden Agenda (Jason Gooding and Mark Gooding) and J Majik (Jamie Spratling). Later releases included musicians Adam F (Adam Fenton), Digital (Steve Carr), Ed Rush (Ben Settle), Optical (Matthew Quinn), Sci-Clone (Jason Cambridge (A-Sides) and Nathan Haines), and Codename John (Raymond Bingham).

Releases by the Metalheadz record label in the mid- to late 1990s are well known for their emphasis on production quality and their darker-themed atmospheric sound, which often combined a bleak ambience reminiscent of the

Darkside subgenre with new approaches to breakbeat manipulations (James 1997, 98–100). Reynolds (2012, 344) describes many of these musicians as engineer-programmers, and James (1997, 99) praises them as some of the "most skilled studio operators in the world." Hansen (Escher) explains the characteristics of the Metalheadz style that interest him: "its the rudeness of the tunes, the b-boy flavour to […] break-switching, nods to hardcore. That badboy sort of attitude, not overly aggressive (normally) but rude. Lots of contrast, stuff [...that] tells stories. That resonated with me so strongly, along with Photek, Prototype Recordings, 31 Records" (Hansen 2013). Unlike earlier Jungle genres such as Jump Up and Ragga Jungle—often known for their abundant intricately manipulated breakbeats—many of the releases on Metalheadz and similar labels (e.g., 31 Records, Photek, Prototype Recordings, Hardleaders) were known for their perceived effortlessness. Hansen discusses this attribute and the influence it had on his own productions:

> […] *Prototyped* [by Doc Scott] really made me think about tracks, I couldn't understand how it was so good but nothing was even going on. Rather than things coming in on the drop, everything disappears. Incredible. Also Photek['s] *Still Life* remix [originally by Goldie and Dego] […] Also [Dillinja's] *Threshold* and *Silver Blade*, the bleakness of *Threshold*, sort of tune you can lose yourself in, eyes closed, screw face, it gives me so much strength listening to that, it's mad. A lot of the really bleak and reflective stuff is like that for me. (Hansen 2013)

Lindo (Alpha Omega) and Thompson (DJ Krust) also discussed their appreciation of music released by Dillinja and Lemon D (Lindo 2013; Thompson 2013). Thompson reflects:

> No one was doing what they were doing. The beats the basses, the mixes, the arrangements, the loudness, [and] the rhythms. Then Dillinja started playing the drums on his own tracks. It was like, you couldn't beat him then. Its like, he's gone to that level now. He's gone that deep that he's learned to play the drums now. Right. Just makes you work even harder. Pushing it and pushing it and pushing it. Its pure creativity. If you had went to his studio, you'd be amazed. Inside, he's hardly got anything there. He's a typical example of using every thing he's got in his room to make a beat. […] His exceptional level of detail to mixing and analyzing what needs to be done mixing—just relentless. Not stopping until you've got a perfect sound. For us, listening to what they were doing was really inspiring. (Thompson 2013)

The Metalheadz record label hosted the Metalheadz Sunday Sessions at The Blue Note in Hoxton Square, which despite its unusual 7 PM to 12 AM time slot on a Sunday, became a popular club night attended by public figures such as Billy Zane, Catherine Zeta-Jones, Kate Moss, and musicians David Bowie and Kylie Minogue (Goldie and Gorman 2002, 162). Similar to the Speed night, Blue Note Sessions were structured around the cultivation of a connoisseurs' approach to Drum & Bass; a large portion of the crowd was comprised of musicians that came to hear and be influenced by the newest Drum & Bass music. A strict policy placed restrictions on the role of MCs such that the Ragga MC as frontman was not allowed. MCs such as Cleveland Watkiss and Justyce instead provided sparse accompaniment to the music. Goldie explains, "I was not about people taking the mic and chatting all over your tune. 'Headz [Blue Note Sessions] moved everything up a few notches in terms of intensity, everything, and MCs had to take the back seat…Rage never used MCs, it was just about the music and that's what we went for at the Blue Note" (Goldie and Gorman 2002, 163).

2.4.4.2 *Bristol Drum & Bass*

Concurrent with the development of London's Jungle and Drum & Bass communities, other communities had also developed in other cities in the UK. One of the largest and most well known was the Bristol scene, led by the members of the Full Cycle record label: Roni Size (Ryan Williams), DJ Krust (Kirk Thompson), DJ Die (Daniel Kausman), and SUV (Paul Southey) (Thompson 2013).

Full Cycle Records sought to differentiate themselves from others creating Jungle and Drum & Bass with the production quality of Hip Hop and the relaxed character of Funk. Thompson (DJ Krust) recalls, "we wanted it to sound as fat as Hip Hop […] that big sub-bass of Hip Hop, but also we wanted it to have that […] Bristol Funk sound, that laid back party vibe" (Thompson 2013). "So you had Fabio and Grooverider and Bukem playing this next type of music that would sit alongside the Ragga Jungle thing, and we loved both of it. Full Cycle was like a combination of both those things" (Thompson 2013). The Full Cycle group owned and operated two labels: Full Cycle Records and Dope Dragon. On the difference between the output on the two labels, Thompson explains: "The whole Dope Dragon label was built

around using commercial breaks [e.g., *Amen*, *Apache*, *Funky Mule*]. It was easy quick music. The Full Cycle music really was like 'take your time, get the breaks right, it was fucking long, […] we would spend a week on a tune. It would sound amazing but we wanted to make some music fast and quick for the weekend and that's what Dope Dragon was about. Commercial breaks, having fun. Most of those tunes were done once, we didn't go back to them. First time mix, gone" (Thompson 2013). While the Dope Dragon output would be done fairly quickly, Thompson reiterates that this would only be as a result of the large amount of time spent working on music prior to this. "You'd build up energy. It sounds like it would be made in two hours, but we would be in the studio for 3 months before that […] all day every day" (Thompson 2013).

The Full Cycle group also operated as the collective Reprazent (along with MC Dynamite), which was formed in 1996 and combined Drum & Bass with live instrumentation (Shapiro 1999, 185). Thompson explains the varied backgrounds that led to their dynamism as a group:

> We all had a kind of similar background. Die is from sort of a rock, folk, live band background, so he would always bring loads of samples in from that perspective, Roni was like sort of Lover's Rock, R & B, and Hip Hop as well, so his samples were around that thing. My thing was Hip Hop, sort of House, sort of Electro as well, so my samples came from there, SUV was kind of Reggae and Hip Hop, and everything else in between. So between us we kind of had the whole spectrum covered. (Thompson 2013)

Reprazent released the *New Forms* album in 1997. *New Forms* won a Mercury Prize in 1997, ahead of albums by other major UK artists such as The Chemical Brothers, The Prodigy, Radiohead, and The Spice Girls.

The Bristol sound was also exemplified by other labels as well. O'Dwyer (DJ Code) explains that London's V Recordings "wasn't run by the Bristol crew; V pretty much exclusively released music from Roni Size, [DJ] Krust, Die and Suv with only the odd exception from 1993–2000" (O'Dwyer 2013).

2.4.4.3 *Techstep*

In the mid-1990s, several Drum & Bass musicians began to diverge from Atmospheric Drum & Bass' relaxed character, and returned to the "darker-themed"

aesthetics of Darkside. Releases from the Metalheadz record label by musicians such as Rufige Kru, Dillinja, and Lemon D in 1995 and 1996 illustrate this shift. The Techstep subgenre was an outgrowth of the sparse Hardstep style, to which it added minimal, ominous synthesizer sounds, distorted bass lines, and samples typically taken from technophobic science fiction films such as *Alien* (1979) and *Blade Runner* (1982). Techstep has been characterized by Christodoulou (2011) by its "harsh noise, tonal dissonance and a discourse of sonic violence." The label most often associated with the Techstep sound was No U Turn (Reynolds 2012, 357–9). The name of the subgenre was created by DJ Trace (Duncan Ballantine) and Nico (Nicholas Sykes) and was subsequently used as a compilation album title by Emotif Recordings (a subsidiary label of SOUR) (Sykes 2013).

Sykes, a producer and engineer, created the No U Turn record label in the early 1990s. Around 1992, Ed Rush introduced Sykes to Hardcore, at which point Sykes began to create HJDB music with an Akai S1000 sampler (Atmosphere 1996b). No U Turn's first major release came in 1992, with the Darkside track *Bludclot Artattack*, written by Nico and Ed Rush. The first tracks released in the Techstep subgenre by No U Turn were Ed Rush's *Guncheck* (1995) and *Technology* (1996), which were both co-written, produced, and engineered by Sykes. In addition to his self-releases on No U Turn, Sykes has also had numerous releases on a variety of labels including Dee Jay, Lucky Spin, Emotif, SOUR, Prototype, and Trouble on Vinyl. Sykes also began co-writing, producing, and engineering tracks for DJs such as Ed Rush, DJ Trace, and Fierce. On his working relationship with DJs, Sykes recalls:

> There is no doubt in my mind that of all the people doing music in the early 90s, it was the DJs that were most passionate and excited about their music. As a producer/engineer that excitement is what you crave in a studio situation. The combination of producer/engineer and DJ led to some great collaborations. These days [in 2013] it seems people have to be all of these things if they are going to make their mark. (Sykes 2013)

Regarding the characteristics of No U Turn's releases, Christodoulou (2011) states that the "defining feature is the distorted bass sound, achieved by feeding the pre-recorded bass notes into music equipment effects settings like distortion and overdrive." While HJDB musicians and engineers had distorted bass lines to increase the presence of the bass element (e.g., Parsons' description of treatment of the

Roland TR-808 bass sounds in Section 2.4.3), tracks such as *The Sleeper* (1996) by Spider Net (Sykes and Peter Lazaro) and *Mothership* (1996) by Ed Rush (co-written, produced, and engineered by Sykes) feature substantial distortion of the bass applied as an instrumental effect (as opposed to a compressor or limiter technique exclusively). Sykes explains the development of this method: "I wanted to hear what the sub bass was doing […] in the track I'd just been up all night making, whilst driving my car home early in the morning. The tiny speakers in my old car revealed nothing of the powerful bass that I knew was there" (Sykes 2013). Borrowing a technique from Jazz bassist Larry Graham, Sykes used a guitar pedal to add distortion. "A dash of distortion made every note clear. Once I'd done this a few times, Trace, Ed Rush and everyone else didn't want the bass without the distortion" (Sykes 2013). Distortion was not only applied to the bass, but the breakbeats as well to achieve a "dirtier" sound—that is, intentionally reducing the fidelity through increased distortion. Sykes shared this technique with musicians at No U Turn and others such as Bad Company (Dan Stein, Darren White, Jason Maldini, and Michael Wojcicki) (Sykes 2013).

Dominic Angas (Dom, or alternatively Dom and Roland), one of Techstep's most well known musicians (O'Dwyer 2013), had his earliest HJDB releases on Sykes second label, Saigon. Sykes recalls, "Dom […] was given constant support from day one. He was local and keen. Dom used to visit […] the studio where he was given samples, tips, general support and encouragement including the release on No U Turn's sister label Saigon of his first attempts at drum and bass" (Sykes 2013).

Angas attributes the dark atmospheres in Techstep to influences from early 1990s Darkside, and associates the synthetic rhythmic and timbral characteristics with earlier Electro, such as The Jonzun Crew's *Pack Jam* (1982) and *Space Is The Place* (1982) (Atmosphere 1996d).

Ed Rush enlisted Dom as an engineer for several releases, including the *Skylab* EP (1996) released on Metalheadz and *Subway* (1996) on Prototype Recordings. In comparison to engineering by Sykes, Dom's engineering has been described by O'Dwyer (DJ Code) as being "a bit dirtier [meaning an increased amount of distortion], with more switching, editing and filtering of the breaks. […] Dom tended

to use this technique more on drums, a good example being *Mechanics* (1996) released on 31 Records" (O'Dwyer 2013).

2.5 Chapter summary

The majority of this chapter has concentrated on a historical account of the Hardcore, Jungle, and Drum & Bass (HJDB) genres, through a combination of information sources including popular media books and magazines, and interviews performed with established musicians and record label owners. The overarching storyline of the chapter tells the tale of how breakbeats became an integral component in British dance music during the course of the 1990s, having been introduced through a variety of loosely-related genres grouped together as Hardcore, then formalizing characteristics in Jungle, and then the reduction of rhythmic variability and a refinement of influences in Drum & Bass. Throughout the timeline, there have been multiple critical junctions at which new subgenres have either emerged or lost momentum. Examples within this chapter are: the division between Happy Hardcore and Jungle (1992); the split between Jungle and Drum & Bass (1994); the development of the Techstep genre apart from Atmospheric (1995–6).

At its height, Jungle and Drum & Bass were two of the most popular DJ-oriented electronic music genres in the UK, with club nights attended by famous musicians and movie stars. The genre's leading figures had signed contracts with larger companies such as Sony, Virgin, and London Records. Since the late 1990s, Drum & Bass has continued to subdivide, in a fashion not dissimilar to the examples presented in this chapter, creating new subgenres such as Neurofunk, Drumfunk, Liquid Funk, and splintered genres that have more recently morphed into subgenres such as Drumstep.

The sampling and modification techniques of breakbeats involved in the creation of HJDB music have continued to develop since their initial usage within HJDB. While new strands of Bass Music (a more recent popular DJ-oriented genre outside the scope of this dissertation) has incorporated fast manipulated breakbeats in a style idiomatic of Jungle, Drum & Bass subgenres such as Autonomic and 170 often emphasize half-tempo drum rhythms that are more akin to Dubstep (another post-HJDB genre) and Bass Music than Drum & Bass.

The next chapter will delve into the sampling practices of HJDB musicians. In addition, it will present many of the techniques and technologies that have been used to make HJDB music throughout the history of the genres.

Chapter 3: HJDB track creation process

> I think sampling was just our thing. What we grew up doing…even when we had all these synthesizers and all that, we'd sample the sound. Even later when we had Pro Tools and we'd play it all line in, we'd still sample the sound.
>
> - DJ Krust (Thompson 2013)

> When I first came across sampling I already knew about breaks. The first hip hop generation would just stop a record, take it from the break and the DJ would loop it so people could dance to it […] So when I came to make music I felt that the breakbeat element needed incorporating more. All that stuff like the 'Mary Mary' break needed to be used. And I would load and load and load until there was nothing left in the sampler.
>
> - Goldie (Goldie and Gorman 2002, 116)

The previous chapter provided a historical account of both the genres leading up to HJDB and the HJDB genres themselves. The topic of the present chapter turns to the creation of the music itself. The following discussion will present the main tools that have been used in the creation and development of these genres (Section 3.1). Section 3.2 will then provide discussion of breakbeat usage in HJDB through musicians' sourcing, selection aesthetics, segmentation and sampling methods, and arrangement and manipulation techniques. A chapter summary will then be presented in Section 3.3.

3.1 Devices used in the creation of HJDB

The HJDB genres emerged at a critical intersection between computer technology and the consumer market, which allowed computer music to be made through the use of home-based studios (Taylor 2001, 3–4). Much of the HJDB discography was made through the use of home studios comprising of a personal computer, a sampler, a mixer, and sound sources such as synthesizers, drum machines, and a turntable for vinyl records. **Figure 3.1** shows the typical home studio of Andrew Wright (The Moog), located in the musician's bedroom, where he wrote *Kaleidoscope*

(1991) and *Jungle Muffin* (1992) and collaborated with Tony Bowes (Justice) to create the *Koncrete Jungle EP* (1992) and *Mixed Koncrete EP* (1992).

Figure 3.1: Andrew Wright's (The Moog) home studio in Dunstable, England, circa 1992–3. From left to right: a Commodore Amiga A500 with 14" CRT monitor, amplifier, unidentified keyboard on stool (front), Ensoniq EPS 16+ sampling keyboard (back), mixer and sound modules in rack (from the private collection of Andrew Wright).

HJDB musicians have made use of a wide variety of devices and software packages in the creation of their music. An exhaustive discussion of all such devices in this text would be far too expansive; further, several texts exist that provide comprehensive overviews of various recording and synthesizer technologies (e.g., literature on synthesis technologies (Roads 1996) and catalogues of commercial synthesizers (Vail 2000)). This section will focus instead on the technology that has been paramount in the creation and development of HJDB music: the digital sampler (henceforth, simply called the sampler). The rationale behind this selection arises from previous writings on the genres that emphasize the importance of sampling in

their development (Ferrigno 2008; Reynolds 2012, 96–113, 188–202, 238–254), interviews performed in preparation of this work (e.g., Lindo 2013, Rumney 2013, Thompson 2013), as well as the emphasis given in the present work to the topic of breakbeat usage in HJDB, which has been greatly simplified through the use of sampling technology. The sampler is covered in Section 3.1.1, home computers and sampling peripherals are considered in Section 3.1.2, and sequencers and trackers are discussed in Section 3.1.3. An emphasis is be given to the development of tracking software in this section, since these programs may be seen as hybrid sequencer-samplers, and have been used both independently and in conjunction with other studio devices to create HJDB music.

3.1.1 Samplers

> Once the sampler was understood producers realized they could incorporate anything they were into within this new sound. That's what made the music so intense and creative. You were able to showcase your past, your present and mold the future.
>
> - Alpha Omega (Lindo 2013)

The sampler is the crucial piece of technology that facilitated the use of breakbeats in the HJDB genres. A sampler is an electronic music instrument that uses audio recordings as sound sources, which are triggered for playback either by keys or pads on the sampler itself or by an external MIDI[12] device. While analog tape-splicing techniques were well established in several musical genres prior to the early 1990s (e.g., Musique Concrète in the 1940s), it was not until the introduction of digital technologies into the home-based studio environment that individuals were able to use similar techniques on a wide scale (Taylor 2001, 3–4). Equipment such as synthesizers and sequencers, and computer programs and interfaces such as sample editors and MIDI, allowed the home-based musician to assemble entire musical works by themselves. A key component in this new model was the sampler, as it provided the musician with the ability to easily replicate and manipulate any sound, without reverse engineering or synthesis. A musician was now able to simply record a

[12] Musical Instrument Digital Interface

sound into a sampler's memory, and play it back through the use of a MIDI sequence.

A sampler converts continuous analog audio into a discrete digital signal, which is then stored in random-access memory (RAM). A continuous analog audio signal is converted into a discrete time-series of sampled amplitudes through the use of an analog-to-digital converter (ADC) as in **Figure 3.2**. The ADC produces the discrete time-series, $x[n]$, by measuring the continuous amplitudes, $x(t)$, at regular intervals, governed by the sampling frequency (in Hertz (Hz)). Through quantization, these measurements are approximated by a discrete set of representable values with a resolution defined by the bit depth (also termed word length) (Lyons 2001, 2–47, 349–50).

The sampling theorem states that in order to properly encode a continuous analog signal as a digital sequence, the sampling frequency must be at least twice the maximum frequency (termed the Nyquist frequency) represented in the analog signal. Typically a low-pass filter is used prior to sampling to ensure that no frequencies exist above the Nyquist frequency (Lyons 2001, 2–47).

Bit depth is number of binary digits assigned to each measurement, which determines the number of possible values used in quantization; the precision of the approximation is dependent on the bit depth of the system performing the digitization. For example, a 4-bit system will divide the dynamic range into 16 possible positions. An 8-bit system will enhance the resolution by offering 256 possible positions, and a 16-bit system will enhance this further by providing 65536 possible positions. An increase in the possible positions used for characterizing the input voltage reduces quantization errors—discrepancies between the analog signal value and the measured digital value—associated with each sample.

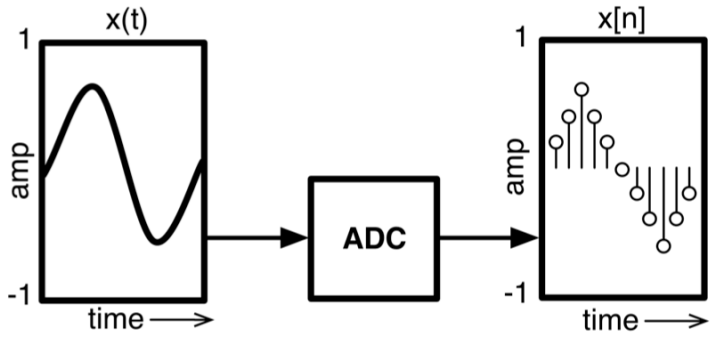

Figure 3.2: A continuous audio signal (left) is converted into an equidistant discrete sequence of amplitudes (right) through the use of an analog-to-digital converter (ADC). Discrete samples are shown here with circles representing fixed discrete amplitudes based on quantized positions.

Samplers are capable of altering the pitch of a given sample. Typically this is achieved by playing sampled audio at different sample rates. If a sample with an initial sampling rate of 22.05 kHz is played back at twice its original rate (44.1 kHz), the frequencies will be doubled, resulting in the sample pitch being raised by an octave. Appropriately chosen divisions and multiples will then create equal-tempered frequencies associated with a modern music keyboard (Manning 2004, 286). After the development of MIDI, sampler playback could be produced in response to MIDI note input, at a given pitch and velocity (amplitude). Samplers, like synthesizers, have fixed numbers of independent timbres (voices) and independent notes that may be sounded at one time (polyphony). Audio may, for example, be sampled from one note and then be made available on all other keys through sample-rate conversions as explained above, the result being a full keyboard using one voice. If the MIDI note is played at an interval far from the original note, however, the result may sound artificial due to the change in rate of note envelopes or modulations such as vibrato. To ameliorate this potential problem, multiple notes are often sampled across a keyboard to minimize the distance between non-sampled notes and sampled notes, which ultimately reduces the deviation from a sample's original sample rate. Most samplers contain groups (sometimes referred to as

programs), in which an arbitrary number of samples may be processed and controlled (e.g., modulated, filtered, pitch-shifted) with the same settings.[13]

Sampler technology has a long history in popular music that predates its usage in HJDB. Before the introduction of computer music systems capable of storing digital content, tape-based technologies existed for playing back samples with keyboards. Perhaps the most popular tape replay keyboard, the Mellotron, was popularized in the late 1960s through famous bands such as The Beatles, The Moody Blues, Yes, Genesis, and Led Zeppelin. Each key was coupled to an individual tape machine with its own eight-second tape. Both the machines and tapes were fairly unreliable, and performers often would travel with an identical replacement (Vail 2000, 65–6).

3.1.1.1 *Hardware samplers*

In 1975, the Fairlight Company, headed by Peter Vogel and Kim Ryrie, was created with the intention of developing the first computer-controlled synthesizer (Vail 2000, 214). Vogel and Ryrie had licensed Tony Furse's Quasar computer music instrument (CMI), which was capable of rudimentary digital synthesis. As the intended model required too much processing for real-time synthesis, Fairlight continued development based on the Quasar's architecture, which resulted in the 1979 Fairlight CMI Series I that focused on a digital sampling method to achieve its realistic sound. Ryrie recalls:

> What we realized was that by having 16K of RAM there, it was possible to actually sample a real sound into memory. So Peter designed an 8-bit A-to-D converter, and lo and behold, this solved our sound quality problem. (Vail 2000, 217)

At a high price, the Fairlight CMI samplers were attainable by very few musicians, such as Stevie Wonder, Peter Gabriel, Jan Hammer, and Thomas Dolby (Manning 2004, 225). The original Series I sold for approximately £12,000, and later versions, the Series II (1982) and Series III (1985), were even more expensive (upwards of £20,000), and in all, only about 300 were manufactured (Vail 2000,

[13] Some synthesizer and sampler manufacturers combine these terms, providing only the specification of polyphony as a number of independent voices.

215).[14] The Fairlight CMI offered 8-bit sampling with a maximum sampling time of 1.2 seconds (using maximum fidelity recorded at 32 kHz), and an eight-note polyphony (Leete 1999). Samples were either loaded from floppy disks or recorded directly through an ADC. The Series I and II provided basic sample editing through an interactive graphics display and light pen system, allowing users to adjust dynamics and spectral content. The Series II contained a pattern-based sequencer that would display note pitch, timing, and duration—a precursor to the MIDI event list (Manning 2004, 226). Series III added MIDI control, and improved the 8-bit ADC to a 16-bit converter, as well as raising polyphony from eight to sixteen notes (Vail 2000, 219).

Early competition for the Fairlight came from E-mu, with the release of the Emulator in 1981. The Emulator was released in 1981 and sold for £4,900 (Vail 2000, 223), approximately 1/4 the price of the Fairlight (Manning 2004, 284). The significant reduction in price in comparison to the Fairlight was due to a technology that improved memory usage. As Dave Rossum, a co-founder of E-mu, remembers: "the Z-80 microcomputers we could buy were fast enough to handle note-on events and functions such as that…and that if we could get our instrument to play many notes out of one memory, we could tremendously reduce the cost of the system and make it affordable" (Vail 2000, 222–3). Between 1981 and 1984, approximately 500 units were sold, which E-mu co-founder Dave Rossum attributes to the development of a sound library that was sold with the unit (Vail 2000, 225).

The Emulator had an 8-bit, 30 kHz ADC; however, the dynamic range reached almost that of a 12-bit system through internal compression (Manning 2004, 284). The unit was available in four- and eight-voice versions, both with an eight-note polyphony and 128 KB of memory (of which 8 KB were used for the operating system). Sample editing features included truncation and looping, which were performed using sliders without the aid of a display (Alpert and Rossum 1982). Samples were stored to 5.25" floppy disks (180 KB maximum).

The Emulator II (EII) MIDI sampler was released in 1984, and initially sold for approximately £10,000 (Wiffen 2000a). The EII was also 8-bit, however it used

[14] Conversions throughout section are performed with mean US dollar to English pound to value for given year.

delta/sigma encoding; instead of using the eight bits to characterize the full dynamic range of the input voltage to the ADC, the eight bits were instead used to encode the difference between successive samples (Wiffen 2000a). The EII had an eight-note polyphony, with eight voices, and was equipped with low-pass filters on each voice (Wiffen 2000b). The EII had 512 KB of memory, a sample rate of 27.78 kHz, and could store 17.6 seconds of audio (Anderton 1987a). The EII allowed users to select the range of individual samples on the keyboard (Wiffen 2000a) and sample time was allocated dynamically as needed until the 17.6 seconds was used up. Editing was aided by the use of a liquid crystal display (LCD), which displayed sample values during truncation, looping, and splicing functions (Anderton 1987a). For storage, the EII used dual 5.25" double-sided, double-density floppy disks with 360 KB capacity (Anderton 1987a; Mueller 2004, 472–4).

By the mid-1980s, samplers were becoming significantly less expensive. Already the Emulator and Emulator II were a fraction of the cost of the Fairlight CMI (Manning 2004, 284). The Ensoniq Mirage, released in 1984, was the first sampler to be priced less than £1,000 (Ensoniq 1987). At 1/4 of the initial cost of the Emulator II, and sharing many of the same features (e.g., MIDI, multi-sampling, and looping), the Mirage was immediately popular, selling over 30,000 units before production ended in 1988 (Manning 2004, 291). The low cost was in part due to the Mirage's usage of the same voice chip as found in the Amiga computer, which Bob Yannes—cofounder of Ensoniq—had developed two years earlier (Vail 2000, 33). The Mirage offered 8-bit sampling at a variety of possible sample rates (between 10.101 and 29.4 kHz) (Mauchly 1985), offering 13 seconds of sample time at 10.101 kHz and 4.4 seconds of sample time at 29.4 kHz. The Mirage had eight voices and an eight-note polyphony. In addition, the Mirage was equipped with a 333-note sequencer, and a variety of signal processing options, such as an analog 4-pole low-pass voltage-controlled filter (VCF) with resonance control, a low-frequency oscillator (LFO) for modulation of sample pitch, and amplitude and filter envelopes (Ensoniq 1985). The Mirage was equipped with 128 KB of memory that could be used entirely for a single sample, or could be divided evenly between the upper and lower registers of the keyboard, in which case each half was capable of hosting up to eight separate samples (with 8 KB each). Sounds were stored on a 3.5" double-

density disk drive, which had a capacity of 720 KB (Ensoniq 1985; Mueller 2004, 472–4). All sampling and editing was performed using a two-digit hexadecimal display (Ensoniq 1985). The Mirage was available in both 61-key (DSK-8 (1984) and DSK-1 (1986) models) and rack-mountable (DMS-8 (1985)) versions.

By the mid-1980s, samplers had seen a dramatic reduction in price, and 12-bit sampling soon became standard. Akai's S612 (shown in **Figure 3.3**) was released in 1985 for under £800 (Akai 1985). The Akai S612 was the first sampler used by Hardcore and Jungle artist Bay B Kane (Kane 2013). The S612 could play six voices and was capable of sampling at a variety of sample rates from 4 to 32 kHz (Akai Electric 1985). The S612 provided at best eight seconds of sampled audio, and only one second at the highest rate (Akai Electric 1985).

Figure 3.3: Akai S612 sampler (courtesy Akai Professional).

The following year, Akai released the S900 (shown in **Figure 3.4**)—a 12 bit sampler with nearly eight times the sampling time of the S612, which sold for approximately £1,600 (Jenkins 1986). The sampling time available to the S900 was 63.3 seconds at 7.5 kHz and 11.75 seconds at 40 kHz (Akai 1986). The S900 had an eight-note polyphony and an eight-voice architecture. Up to 32 samples could be stored in the sampler memory at one time. The S900 also contained a programmable low-pass filter. Users could perform sample-editing functions—such as truncation, looping (with automatic looping, coarse- and fine-tuning loop controls), and resampling—using the LCD (with two rows of characters) and the rotary encoder. Storage was performed with a 3.5" double-density disk drive with a storage capacity of 720 KB (Akai 1986). The Akai S900 was used by HJDB artist Subject 13 to create his first major record, *Eternity*, which was released in 1990, and used subsequently as the main sampler in his releases until 1995 (Stewart 2013).

Figure 3.4: Akai S900 sampler (courtesy Akai Professional).

The S900 was followed by the S950, which was released in 1988. The S950 was similar in look and feel to the S900; however, what set the S950 apart was its timestretching and pitch-shifting functionalities (Akai 1988) that allowed HJDB artists to manipulate the length and sound of breakbeats to a varying degree. This effect, used extensively in the Jump Up genre during the 1993–4 Jungle era can be heard in tracks such as Johnny Jungle's *Flammable* (1993), DJ Hype's *Shot in the Dark (Gunshot Mix)* (1993), and DJ Red Alert and Mike Slammer's *In Effect (Dark Dub Mix)* (1993). In addition the S950 performed crossfade looping, which offered the ability to smooth the transition between loop end and start points. Many HJDB artists, such as Bay B Kane (Kane 2013), AK1200 (Minner 2013), Voyager (Parsons 2013), Playford (Holder 1998), Shy FX (Dellow 2004), and Doc Scott (McIlroy 2012) have used the S950.

Samplers were also made by major multinational music instrument manufacturers such as Roland, which produced its first samplers in 1986. The S-10 and rack-mountable MKS-100 contained a 12-bit ADC with either 15 or 30 kHz sample rate, with 256 KB of memory. The S-10 was capable of eight-note polyphony and four voices. Sample truncation, splicing, and looping functions were performed through the use of a rotary data encoder, specified buttons, and an LCD.

Roland released samplers capable of connecting to an external monitor and mouse for improved navigation. This allowed users the ability to more easily perform manipulations of sampled audio, such as adjusting loop start and end points with a large waveform display. This functionality was made available on the S-50 (pictured in **Figure 3.5**) and its rackmount counterpart, S-550. The S-50/S-550 offered 12-bit sampling at two possible sample rates: 15 and 30 kHz (Roland 1988). 1.5 MB of

sampler memory provided 28.8 seconds of sample time at the 15 kHz sample rate, and 14.4 seconds of sample time at the 30 kHz sample rate (Mellor 1988). The S-50/S-550 offered 16 notes of polyphony and a host of digital filters. The S-50 keyboard was velocity- and pressure-sensitive, and allowed users to incorporate splits and layers (Reid 2005). The S-50/S-550 could also be controlled by the RC-100, a remote controller that provided musicians with a number of control parameters associated with the functionality of the sampler. The S-550 (and the smaller S-330) was used by Roni Size and DJ Krust (Thompson 2013).

Figure 3.5: Roland S-50 sampling keyboard (courtesy Roland Corporation Japan).

In 1988, Ensoniq released the Ensoniq Performance Sampler, or EPS. The EPS was a 12-bit sampler with variable sample rates, from 6.25 to 52 kHz (Ensoniq 1988). The EPS came equipped with 480 KB of memory, but was upgradable to 2.1 MB. At 6.25 kHz sample rate, the EPS was capable of 41 seconds of sample time, and at 52 kHz sample rate it provided 5 seconds of sample time. The EPS used oversampling to improve the fidelity of its 12-bit ADC to the resolution of a 13-bit system (Manning 2004, 293). 8 voices could be played with a 16-note polyphony for higher sample rates and 20-note polyphony for lower sample rates. The EPS offered a digital filter with high-, band-, and low-pass functionality with a variety of pole settings (Ensoniq 1988).

By the mid-1980s, samplers began to challenge the established synthesizer market; however, audio quality (due to 12-bit samples and low-sample rates) was still an issue—a problem that would soon be overcome by the development and mass production of the compact disc, which provided the impetus for the creation of low-cost 16-bit, 44.1kHz converters (Manning 2004, 295). The first initiative in the 16-

bit sampler market came from Greengate, a small company that created accessory soundboards for the Apple IIe. In 1986, after the success of the DS:3 12-bit soundboard, Greengate developed the DS:4, an 8-voice, 16-bit, 44.1 kHz MIDI sampling soundboard (Mainframe Music 2012). Technical errors on circuit boards caused the DS:4 to fail, and ultimately caused Greengate to close (Mainframe Music 2012). Other than developing the first 16-bit sampling system, Greengate is notable for being the first company to produce a computer-based sampler—now the standard for sampling technology.

In 1987, Casio released the FZ-1 (the FZ-10M rack-version is pictured in **Figure 3.6**), the industry's first standalone 16-bit sampler, with three possible sampling rates: 9, 16, and 30 kHz (Manning 2004, 295). Up to 2 MB of memory could be used in the FZ-1 (the stock model shipped with 1 MB). With the stock memory, the FZ-1 could provide 58.2 seconds of sample time at 9 kHz, and 14.5 seconds of sample time at 36 kHz. The FZ-1 had an eight-note polyphony, a 64-voice architecture, and the capacity of storing 64 samples in memory at once. Sample waveforms were displayed on an LCD screen; data sliders and buttons were used in conjunction with the LCD to perform various editing tasks (Casio 1987). The FZ-1 also contained a digital low-pass filter, and storage was performed using a 3.5" HD disk drive. The first sampler used by DJ Krust was an FZ-1 (Thompson 2013). After his success with *Wishing On A Star* (1989), Thompson remembers learning how to use his brother's sampler:

> I lived in his [his brother's] back room for like three years, slept on the floor everything, until I understood how to use a sampler and it was a Casio FZ, so that was the very first sampler I had the use of, and I just mastered it. That's all I did for years, I just sat in that one room, and this kind of sums up part of my character. I'm very hard to move in one direction, but once I'm there, that's it, I'm stuck. It's almost a stubborn thing, I get it from my dad. You couldn't get me out of this room. I would just live there. My brother would come in—I'd have my headphones on—and he'd bring me beans on toast or something and I would just live in this back room learning how to use a sampler, and that's how I learnt really. (Thompson 2013)

Blame and Justice also used an FZ-1 in their first releases, including 1990's *Death Row* (Bowes 2013). Bay B Kane also used an FZ-1 (Kane 2013), as did Subject 13 in

Eternity (1990) (Stewart 2013). Hardcore artist N.R.G. used a Hohner HS-1, which was a white version of the same sampler sold in Germany (Rumney 2013).

Figure 3.6: Casio FZ-10M sampler (courtesy Perfect Circuit Audio).

In 1987, E-mu released its first 16-bit sampler, the Emulator III (EIII). The EIII is a 16-bit sampler with two possible sample rates—33.1 and 44.1 kHz—that shipped with 4 MB of memory, but was able to be upgraded to 16 MB (Anderton et al. 1988). There were 16 voices available in the EIII; depending on the voice configuration selected, the polyphony of the EIII varied. For example, if the number of voices for each note was doubled, polyphony was reduced from the standard 16 notes to 8. The EIII included a low-pass VCF for filtration, and contained a suite of digital effects including delay, compression, and equalization, as well as several modulation options (e.g., LFO, envelopes) for voice parameters. During sample editing (e.g., looping, truncation), users could utilize the pitch-bend controller (termed scrub wheel) for data entry along with a data slider and buttons. The EIII was one of the first samplers to offer the ability to load samples directly from CD-ROM drives (connected through a SCSI[17] port).

Akai's first 16-bit sampler, the S1000—perhaps the most popular hardware sampler in history—(shown in **Figure 3.7**), was introduced in 1988. The S1000 was one of the first samplers capable of stereophonic sampling at either 22.05 or 44.1 kHz, and came with 2 MB of memory (upgradable to 8 MB) (Akai 1989). Up to 200 samples could be stored in memory at one time. The unit had 16 voices, and in its standard mode, polyphony was 16 notes; however, polyphony was reduced if voice

[17] Small Computer System Interface

stacking was performed. In its base memory configuration, the S1000 was capable of recording 47.52 seconds of monophonic audio and 23.76 seconds of stereophonic audio at 22.05 kHz sample rate, and 23.76 seconds of monophonic audio and 11.88 seconds of stereophonic audio at 44.1 kHz sample rate. A second version of the software in 1990 provided users with the capability of resampling audio at lower bandwidths (Vigil 1990). The S1000 contained 18 dB per octave digital low-pass filters that were controllable per keygroup (i.e., when samples are combined with parameters in the program architecture). Sample editing functions, such as looping, truncating, and crossfading, were facilitated through the use of an LCD. The S1000 had similar timestretching and pitch-shifting functionality and crossfade looping as found in the S950. A 3.5" 2HD disk drive was used for storage, and external hard drives and CD-ROM drives could be connected through SCSI. The S1000's sample file format (of the same name) has become a sampler industry standard; it has been included on almost all samplers since (e.g., E-mu e-series samplers) including recent software samplers such as Native Instruments' Kontakt (Morgenstern 2009). Andy C and Ant Miles (under the Desired State alias) used the Akai S1000 to create *Turn On* (1991) and *Dance The Dream* (1991) (Atmosphere 1995c). Goldie used the S1000 with his engineer Mark Rutherford to create *Terminator* (1992) (Goldie and Gorman 2002, 122–5). *Terminator* was an influence for producer and label owner Nico (Nico Sykes) (Atmosphere 1996b). Nico had purchased an S1000 in 1990, and together with Ed Rush used the sampler in the production of several of their early tracks, including *Bludclot Artattack* (Sykes 2013). The S1000 was also used by Hardcore artist N.R.G. (Rumney 2013), and was the first sampler used by Alpha Omega (Lindo 2013).

Figure 3.7: Akai S1000 sampler (courtesy Akai Professional).

In 1990, Ensoniq released the EPS 16+, a 16-bit sampler that provided a range of possible effects and modulation possibilities, which was particularly popular with HDJB artists (pictured in **Figure 3.8**). The EPS 16+ was a 16-bit sampler capable of sampling at seven rates between 11.2 and 44.6 kHz (Ensoniq 1990). The stock unit was equipped with 2 MB of memory, which provided 34.4 seconds of sample time at 30 kHz for 20 notes, which was reduced if voices were stacked, or if certain effects settings were selected. There were two multimode digital filters per voice with a variety of pole settings, which were configured in series. While the EPS16+ did not provide a waveform display, sample editing could be performed through the use of a data slider and specified buttons, and on-screen messages from an LCD. A digital effects suite provided the EPS 16+ with a variety of effects combinations including reverb, delay, chorus, phaser, compressor, distortion, and wah. Modulation of various sample and effect settings—such as modulation of sample start position by keyboard aftertouch—was also possible. Storage was available through a 3.5" double-sided, double-density disk drive. An optional SCSI kit (SP-2) provided the possibility of connecting hard drives to the EPS 16+. The EPS 16+ has been used by N.R.G. (Rumney 2013), and was the first sampler used by The Spirit (Muniz 2003). Justice and Mercy used an EPS 16+ on their *Koncrete Jungle* EP (1992) and *Mixed Koncrete* EP (1992). On the creation of *Soothe My Soul* (1992) a track on the *Koncrete Jungle* EP, Wright (Mercy) recalls,

> […] it was very sample-heavy, which is something I'd usually tried to avoid. It was all written on the EPS [16+], and it really came around because [Justice] found the amazing synth and vocal break from [source removed]. Adding the "Soothe My Soul" sample from [source removed] just finished it off nicely! […] One of the interesting things in the track is that a bug in the EPS sequencer timing produced an interesting side effect. The bug affected the duration of notes randomly, as the EPS [16+] was not very precise. The lead instrument had a bit of noise after it, that should have been truncated off, but on some of the notes, it played a fraction of the noise, creating what sounds like another deliberately played instrument behind the lead sound. (Wright 2013)

Bowes (Justice) continues:

> As Andrew [Mercy] alludes to, it did just fall into place and I think the whole Koncrete Jungle EP is a great testament to the work we did together and also a snapshot of the scene and the era that we wrote it

> in. I think at the time it was probably the best tune either of us has done and certainly helped propel us forward in the scene. I remember hearing at numerous do's like AWOL, ESP and Camden Palace where it would make even the sweatiest ravers put their hands in the air and it would go off, it's a great feeling. (Bowes 2013)

Figure 3.8: Ensoniq EPS 16+ sampler (from the private collection of Scott London).

The Roland S-770 was released in 1990, and was Roland's first sampler capable of 16-bit sampling. The S-770 had four possible sample rates: 22.05, 24.0, 44.1, and 48 kHz (Roland 1990). The S-770 had a 20-bit output that was enhanced by oversampling (Manning 2004, 329). The stock sampler shipped with 2 MB of memory, but was expandable to 16 MB. The S-770 had a 24-note polyphony and 24 voices; as with many of the previously discussed samplers, however, the choice of voice architecture affected the polyphony. Users were able to select filter types from a multimode digital filter offering low-, band-, and high-pass filter types (Roland 1990). Storage was performed on an internal 40 MB hard drive, as well as a 3.5" 2HD disk drive. The S-770 was also able to connect to a CD-ROM drive through SCSI. As with Roland's previous samplers (S-50/S-550), the S-770 was able to connect to a video data port and mouse, allowing users to perform sample editing while viewing a waveform. Audio input and output was now available in the standard analog ¼" outputs as well as digital, through coaxial and optical connections (Roland 1990).

Perhaps the most famous HJDB artists that have used Roland S-series samplers are the Bristol-based members of Full Cycle, Roni Size (Ryan Williams) and

DJ Krust (Kirk Thompson), who used the Roland S-760 sampler (a single rack unit sampler released in 1994, which built on the functionality of the S-770) to create their *New Forms* album (Tingen 2008). The S-760 is pictured in **Figure 3.9**. Roni Size and Reprazent won a Mercury Award for *New Forms* in 1997. Thompson remembers their interest in the S-760 at the time:

> From the [Casio] FZ we moved on to the Roland S-760 samplers. […] That was really Roni, he was really into the Rolands. When the 760 came out he really flipped out, and said, "we've got to get it!" So we got that one with the monitor, and it was amazing, it would go backwards and forwards, sideways, and crazy shit man. It was amazing, and that's where all the loops came from, all the loops on the end of the samples, you could do that with the 760, you could add the release on it as well, so you would put your finger on it, you play the sample, you let it go, and it would do something else. So we got into that, and loops into LFOs, and loops into high-pass filters, it was just an incredible piece of machinery. I've still got it, I don't use it as much, but I've still got it. (Thompson 2013)

Figure 3.9: Roland S-760 sampler (courtesy Roland Corporation Japan).

E-mu released the EIIIX in 1992. The EIIIX shared many of the features with the EIII (E-mu 1992). The EIIIX had a 32-note polyphony with 24 voices. The EIIIX was equipped with 8 MB of memory, which could be expanded to 32 MB. Filtering was performed with a low-pass VCF. Audio input and output options now included a digital interface, with AES/EBU,[18] S/PDIF,[19] and XLR. While sample-editing functions could be performed in a similar manner to the EIII, a Macintosh-based editor and librarian program was available for storing and manipulating samples. The editor and librarian program had the potential of improving the standard sampler editing workflow by allowing a user to instead perform sample editing with the benefit of a larger screen, keyboard and mouse (Barnes 1994). The

[18] Audio Engineering Society/European Broadcasting Union

[19] Sony/Philips Digital Interconnect Format

EIIIX added several digital effects to the EIII effect suite, such as sound multiplication (for blending two different sounds), time-compression (E-mu time-scaling algorithm) and pitch shifting to an assortment of effects (E-mu 1992). The time compression transformation was content-specific; users could choose between categories of sounds that were specific to their samples, such as deep, bass, mid-1, mid-2, high, tight, broad, difficult, and noisy. E-mu also added an undo function, which facilitated experimentation with different transformations (Barnes 1994). Storage was performed with an on-board hard drive, 3.5" double-sided, double-density disk drive; additional drives and CD-ROM could be attached through SCSI.

In 1993, Ensoniq released the Advanced Sampling Recorder-10, or ASR-10. The ASR-10 was a 16-bit sampler that was capable of either 30 or 44.1 kHz sample rates. The number of voices was variable with the sample rate: at 30 kHz, 31 voices were available, while at 44.1 kHz, 23 voices were available (Ensoniq 1993). Each voice had a pair of digital filters connected in series; the first was a low-pass filter, and the second was a multimode low-pass/high-pass filter. The stock model was equipped with 2 MB of memory, and was upgradable to 16 MB. If upgraded, the ASR-10 could record a maximum of three minutes of monophonic 44.1 kHz audio with 16 MBs of RAM. An effects suite contained standard effects (e.g., delay, chorus, reverb), along with time-scaling and auto-looping (loop positions found automatically); the ASR-10 also had the ability to resample through effects. Samples could then be layered, filtered and modulated using the ASR-10's modulation matrix, which offered modulation of not only sample amplitude characteristics (e.g., by LFO) but modulation of several on-board effects as well. Storage on the ASR-10 was performed either through the on-board 3.5" double-sided, high-density disk drive or by connecting an external drive through SCSI. Justice created one of his most well-known singles, *Aquisse* (1996), with the use of an ASR-88, a keyboard version of the ASR-10 (Bowes 2013).

Following the Akai S1000, Akai released the S3000 in the early 1990s, which added resonant filters and modulation possibilities (Ward 1995). Additional S3000-series models were also produced, including the S3000i, the S3000CD (with an onboard CD-ROM drive), the S2800 and S2800i (smaller with less features) (Akai 1996). Later Akai released the S3000XL (containing additional filters, digital

inputs/outputs, and more effects made available through the EB-16 effects card) (Akai 1996). The S3000XL could transmit and receive sampled audio and program data with a Macintosh computer (later versions provided Windows support), which allowed users to perform waveform and program editing on a larger display (Akai 1996). The S3000XL was followed by the CD3000XL, which like the S3000CD, contained an onboard CD-ROM drive (Ward 1997). Many Jungle producers used the S3000 series samplers, such as Paradox and Nucleus (Dellow 2003), Voyager (Parsons 2013), and Alpha Omega (Lindo 2013). Lindo recalls, "The first thing I bought was an Akai CD3000XL to replace the borrowed S1000 and it was a complete revelation…just having resonant filters and the ability to have two different filters running at the same time was a trip. The Akai 3000 really changed things for me and a lot of Jungle producers at the time" (Lindo 2013).

The Akai S5000/S6000 series samplers were released in 1998. The S5000 is shown in **Figure 3.10**. Both the S5000 and S6000 were 18-bit, 44.1/48 kHz samplers with 128-voices (S5000 was sold with 64-voices but was upgradable to 128), and could provide up to one minute and 23 seconds of mono sample time at 18-bit, 44.1 kHz (White 1999; Akai 2000). The S5000 and S6000 samplers had the largest displays of any Akai sampler, with a 320-pixel by 240-pixel display, which was useful for visualization of sample looping or truncation functionality. During sample editing, the larger display allowed more information (e.g., original sampled note, memory free, sample length, tuning) to be available to users. In addition, users could select between logarithmic or linear waveform displays;[20] the logarithmic view was useful for viewing larger changes in the signal's energy, while the linear view was useful for viewing more subtle changes in the waveform's shape (e.g., tail of a cymbal). The S5000/S6000 was equipped with 8MB of memory but was upgradable to 256 MB. Both samplers came with 26 types of resonant filters, however the EB20 effects board was included in the S6000, and available as an option in the S5000; effects included reverb, distortion, equalization, delay, chorus, flange, pitch-shifting and timestretching. The timestretching function had 18 preset options, based on the class of sound being transformed (including among others, options for male and female

[20] Previous Akai models with waveform display provided only logarithmic displays.

voice; high-, mid-, and low-frequency rhythm; and percussion) (Akai 2000). Storage was performed using either the internal 3.5" dual density floppy drive, or through connection to SCSI drives. As an optional accessory, the S5000 and S6000 could also transmit and receive samples and programs through a Universal Serial Bus (USB) interface. Recordings existing on a computer could be loaded, segmented, and exported as segments with an Akai-format using the Propellerhead Recycle software (Carlson et al. 2003). The segments could then be transmitted to the sampler's RAM through USB. The S5000 and S6000 samplers have been used by a variety of Jungle and Drum & Bass producers, including Alpha Omega (Lindo 2013) and Amon Tobin (Young 2003).

E-mu released the Emulator 4 sampler, or E4, in 1994. Much like the Akai S5000/S6000, the E4 also had a large display (240 pixels by 64 pixels), which could show a waveform and sample values during editing. When performing looping, automated loop points could be found using autocorrelation (discussed in Section 4.3.2.3), once a user specified approximate start and end points. The E4 was capable of 16-bit sampling at either 22.05, 24, 44.1, or 48 kHz, or digitally (via AES/EBU, S/PDIF, or XLR) at 32, 44.1, or 48 kHz (E-mu 1994a). The E4 contained 8 MB of memory, and could be expanded up to 128 MB, which would provide over 24 minutes of sampling time. The polyphony was 128 notes, with 128 voices (64 stereo). The new operating system, termed E-mu Operating System, or EOS, provided offline transformations (e.g., compression, pitch correction, pitch change, transform multiplication, Doppler effect, exciter), as well as sample doubling effects (e.g., chorus, sample delay), 17 filter types, and the E-mu chords section, which allowed modulation of almost every parameter within each voice. Storage was performed either through the use of the an external hard drive connected through SCSI or the 3.5" 2HD disk drive—which because of its limited capacity had become more useful for updating firmware and operating system software, rather than storing samples. Also in 1994, E-mu released the smaller ESI-32, which became E-mu's best selling hardware sampler to date (E-mu 2012). The ESI-32 was a 16-bit sampler that offered two sample rates: 22.05 and 44.1 kHz. The stock memory was 2 MB and was upgradable to 32 MB. The ESI-32 had 32 voices (32 monophonic or 16 stereo) (E-mu 1994b).

The E64 was released in 1995 as a less-expensive version of the E4; however it was only capable of 64 voices, and could not be upgraded. In 1996, E-mu released the E4K (keyboard version of the E4) that incorporated a real-time dual effects engine into the EOS with 72 effects (Wiffen 1996). In 1996, E-mu also released the E6400, and two additional models—the E4X and E4X Turbo—which were built on the E6400 (E-mu 2012). This allowed musicians to purchase the less expensive E6400 model, and add functionality in a modular fashion. With all options, the E6400 could be equivalent to an E4X Turbo (Wiffen 1997). The Emulator series was upgraded a final time in 1999, with the release of the Ultra series samplers (E5000 Ultra, E6400 Ultra, E4XT Ultra) and E-mu's flagship sampler, the E4 Platinum—essentially an E4XT Ultra with an RFX-32 card that provided 32-bit effects. The E4-series samplers had been popular among Drum & Bass musicians in the late 1990s and early 2000s, including Roni Size (Tingen 2008) and DJ Krust (Thompson 2013). E4-series samplers have also been used more recently by Fracture and Neptune (Fieber 2013), Escher (Hanson 2013), Naphta (O'Shea 2013), and Villem (Wilson 2013). The E6400 is pictured in **Figure 3.10**.

Figure 3.10: E-mu E6400 Ultra (top) and Akai S5000 samplers.

Samplers were also made available in the form of drum machines that provided pads with which musicians could trigger events. In 1983, after the development of

the Emulator sampler, E-mu created the Drumulator drum machine (E-mu 2012). The Drumulator was replaced in 1985 with the SP-12, which retained preset drum samples for basic drum types, and added user sampling functionality with 27.5 kHz sample rate. The stock memory allowed only 1.2 seconds of sample memory, but a TURBO upgrade provided 192 KB, increasing sample time to five seconds. Up to 24 samples could be stored in the unit at one time, with an eight-note polyphony. Sounds could be edited (i.e., truncated and looped) and mixed using the LCD, eight sliders (Yeh et al. 2007) and eight velocity-sensitive buttons (Anderton 1985). Samples were stored with a 5.25" double-sided, double density floppy drive. The SP-12 had become popular amongst Hip Hop musicians in the late 1980s and early 1990s (Driscoll 2009).

The E-mu SP-1200 was released in 1987. Unlike its predecessor, the unit contained no preset samples, and instead stored up to 32 12-bit, 26 kHz user samples totalling 10 seconds of sample time. Samples were stored using a 3.5" double-sided, double-density disk drive (Anderton 1987b). Similar to the SP-12, sample editing could be performed using the LCD, sliders, and velocity sensitive buttons.

In 1988, a collaboration between synthesizer designer/manufacturer Roger Linn and Akai resulted in the Akai MPC60 sampling and sequencing workstation (Vail 2000, 28). The MPC60 was a 12-bit, 40kHz stereo sampler that provided up to 13.1 seconds of sample time—upgradable to 26.2 seconds. The MPC60 had 16-note polyphony, and the on-board sequencer provided up to 99 sequences, on which 99 tracks and 99 patterns could be used (Linn 1989). Perhaps the MPC60's most unique and identifiable feature was, however, the presence of 16 velocity-sensitive pads on the front panel that were used for real-time pattern data entry, live performance, or sample editing. The MPC series had been updated several times since its creation—beginning with the MPC60II (1991); followed by the MPC3000 (1994), which introduced 16-bit, 44.1 kHz sampling, filters, and effects (Linn 1994); the MPC2000/2000XL (1997), which added more functionality to the on-board sequencer and added timestretching along with an effects library (Akai 1997); and later, the MPC1000 (2003). Much like the SP-12 and SP-1200, Hip Hop producers and musicians have embraced the MPC series (Driscoll 2009). Several Jungle and Drum & Bass musicians have also used these samplers, such as Roni Size (Tingen

2008) and Justice (Bowes 2013). Bowes, who began using an MPC2000 in 1997, remembers the enjoyment he experienced using the device (shown in **Figure 3.11**):

> […] it wasn't until maybe 1997 that I got an MPC2000 and loved working on it. Just sampling, triggering the pads and get the sequencer going, just the rawness and natural swing was something else. I wrote my whole *Hears To The Future* LP on it. (Bowes 2013)

Figure 3.11: Akai MPC2000 sampling drum machine and associated peripherals (from the private collection of Tony Bowes).

3.1.1.2 *Software samplers*

By 2013, production of hardware samplers has all but ceased except for the niche market of drum machines that rely on user sampling for sounds (e.g., the Akai MPC series). This was due to the development of computing technologies that have allowed sampling to become wholly based in the personal computing environment. Personal computers began to be used for music production in the early 1980s and over two decades have developed sufficiently to handle recording and playback functionality required for processing digital audio, as well as sequencing functionality (covered in Section 3.1.3).

By the end of the 1990s, computer memory and processor speeds were sufficiently high to allow sampling programs to operate entirely in software.

Programs such as Bitheadz Unity DS-1 (1998) and Gigastudio (1999) were among the first completely software-based samplers, and were developed for use as "plug-ins" within modern digital audio workstations, or DAWs (e.g., MOTU Digital Performer, Steinberg Cubase). While most of these samplers were not capable of recording audio themselves—as did their hardware counterparts—they were typically used within a DAW capable of recording, which made this functionality unnecessary. Samples could then be loaded directly from the host computer.

Bitheadz Unity DS-1 sold for approximately £250 in 1999 (Johnson and Poyser 1999), and offered a range of features that were similar to hardware samplers of the time. Unity DS-1 provided variable bit-depths (8, 16, 24), a 64-note polyphony, and a 16-voice architecture. The modulation section contained 6 LFOs, 2 filters with a selection of 13 possible filters, 2 effects per voice, with sound shaping and effects processing options such as flanging, chorus, reverb, EQ, and overdrive and distortion. Sampling editing options included normalization, gain adjustment, and sample start or end fading.

Software samplers have several advantages over hardware samplers: First, the amount of sampling time available to the sampler is related to the amount of RAM available on the host computer, which is typically much larger than that of a hardware sampler. Second, multiple software samplers may be used concurrently on different channels in a DAW's mixer. This allows for more possibilities for generating complex signal routing. Third, the use of large displays connected to the host computer has simplified the processes of sample editing and parameter adjustments. Most hardware samplers could only show one display window at a time, due to limited space on a small screen. The user would need to toggle between separate screens in order to perform the various tasks necessary for use of samples—such as sample loading, sample editing, looping, and sample mapping. Modern computers can display most of this functionality to the musician at once as shown in **Figure 3.12**. Here a modern sampling program (Native Instruments' Kontakt) is used in a DAW (Apple's Logic Studio[21]). Fourth, and related to the previous point, this functionality is accessed through the use of modern computer peripherals, most

[21] https://www.apple.com/ca/logicpro/

commonly a keyboard and mouse, facilitating navigation of this functionality. Fracture explains: "Essentially I'm just doing the same stuff, it's just become a little less labour intensive with programs such as Ableton [Live]. I guess in a way you are more free to experiment because you don't have to invest a day into just getting a break or sample on to a key group in a hardware sampler any more" (Fieber 2013).

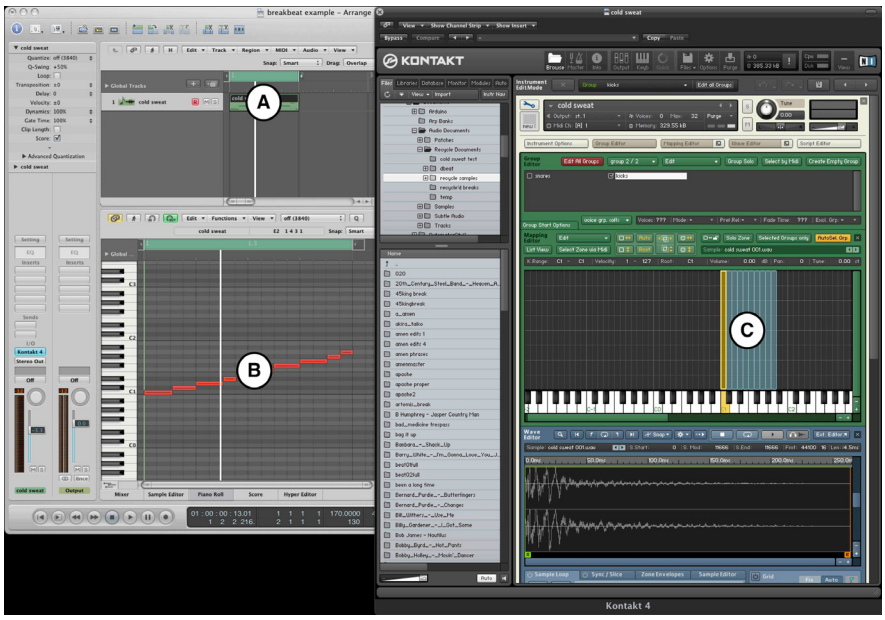

Figure 3.12: Native Instruments' Kontakt being used as a plugin in Apple Logic Studio. The MIDI track labeled *A* is seen in more detail in the piano roll representation, *B*. These MIDI notes correspond to the regions in Kontakt's key mapping region, *C*, with samples associated with them. The highlighted region in *C* corresponds with the sample in the waveform displayed below.

While software samplers have several advantages over their hardware counterparts, there are also disadvantages to using software. One such disadvantage is that they may not be supported by future hardware architectures. While several samplers (e.g., the E-mu E6400 Ultra) may connect to a computer via SCSI—a peripheral that is no longer supported—the sampler is at least capable of being used for its most basic operations of sampling and sample playback. Once a software sampler is no longer being developed, the only way to ensure the sampler's continued use is to keep a computer with an operating system compatible with the

sampler. An additional issue in early software samplers was that performance varied with the specifications of the host computer. As computer specifications have improved, however, this latter disadvantage has become less important.

Much of the functionality available in modern software samplers is somewhat similar, and because these are wholly based in software, they may be continually updated. As such, an exhaustive discussion of these programs is unnecessary. In 2013, several software samplers are currently available (e.g., Native Instruments Kontakt,[22] MOTU Mach Five,[23] E-mu Emulator X3,[24] Ableton Sampler,[25] Apple EXS24,[26] Steinberg HALion,[27] Propellerhead NN-XT[28]).

3.1.2 Home computers and sampling peripherals

The samplers of choice for HJDB creation in the 1990s were hardware-based. While the cost of hardware samplers had been drastically reduced, they were still expensive, and this made the use of computers for sampling more attractive for some (Clements 2013). As a result, many producers got their start using computers, often with additional peripherals that added sampling functionality (Davies 2013). The Atari and Amiga computers, and later IBM personal computers (PCs) were widely popular among HJDB musicians in the UK during this time.

The Atari ST series (1985) comprised three models, the 130ST, 520ST, and 1040ST, and was based on a Motorola 68000 processor (Manning 2004, 312–28). The STs were equipped with MIDI ports and a three-voice Yamaha sound chip capable of providing 8-bit sound with a 16 kHz sample rate. Third-party companies such as the UK's Microdeal later made programs available, such as Replay Professional (1988) and Quartet (1989), through which users could add sampling functionality to their computers. The ST was popular in Europe and its sound capabilities made it popular among musicians in the late 1980s. By 1990, 16-bit

[22] http://www.native-instruments.com/en/products/komplete/synths-samplers/kontakt-5/

[23] http://www.motu.com/products/software/machfive

[24] http://www.creative.com/emu/products/product.aspx?category=501&pid=17681

[25] https://www.ableton.com/en/packs/sampler/

[26] http://www.apple.com/logicpro/plugins-and-sounds/

[27] http://www.steinberg.net/en/products/vst/halion/

[28] http://www.propellerheads.se/products/reason/

sound cards were made available to the ST and Amiga computers, which allowed musicians to sample and output higher quality sound without the need for hardware samplers. Products such as Steinberg's Avalon (1989) for the ST series allowed musicians access to sample editing and looping functionality, as well as off-line modular synthesis. The ST has been used in the professional studios of Rob Playford (Davies 2013) and Monroe Studios (Parsons 2013), and has been mentioned as an early computer used for music production by several musicians, such as Bay B Kane (Kane 2013) Alpha Omega (Lindo 2013), ASC (Clements 2013), Subject 13 (Stewart 2013), Justice (Bowes 2013), Nookie (Murray 2005), The Spirit (Muniz 2003), and Shy FX (Dellow 2004).

The Commodore Amiga 1000 was released in the same year as the ST series. The Amiga 1000 was also based on a Motorola 68000 processor and came equipped with a four-channel synthesis chip that provided 8-bit sound with a 28kHz sample rate. The Amiga, like the ST series, was widely popular among HJDB artists of the early 1990s. Among its users were DJ Krust (Thompson 2013), Omni Trio (Henaghan 2003a), DJ Trax (Davies 2013) and Paradox (Dellow 2003; Davies 2013), Shy FX (Dellow 2004), and JB (Hamilton 2000).

The IBM PC (introduced in 1981) became capable of sound synthesis in 1987 with the development of the AdLib sound card (Manning 2004, 312–28). The AdLib synthesizer card used the Yamaha YM3812 voice chip, which was capable of playing 11 simultaneous sounds at one time, as well as FM synthesis and white noise generation. Jungle and Drum & Bass musician "0=0" made his earliest music using a PC with an AdLib soundcard (Chatzilias 2013).

3.1.3 Trackers and sequencing software

In the late 1980s music tracking software, or trackers, developed out of the need for low-computational methods for music creation in video games (K. Collins 2008, 58). At this time, computer processors and sound capabilities were relatively limited by today's standards—typically 8-bit sounds with a maximum of four voices. A disadvantage of MIDI in this context was that the score was independent of the sound, and given varied sound card components in different computers and gaming systems, different synthesizers would be used to regenerate these sounds. Tracking

software was created to provide reproducible sound on varied computer architectures that used sample playback for audio reproduction, and did so by storing not only the music score representation, but samples used by the score as well.

In 1987, game production groups found they had to develop their own code for graphics, music, and sounds. Karsten Obarski developed Ultimate Soundtracker for the Amiga in 1987. Obarski recalls:

> Soundtracker was actually a tool just to support some friends of mine with programmed music for their developed Amiga Games, instead of playing a long music sample loop only. The first running version with a small user-interface was in summer 1986. At the end of 1987 the company EAS asked me to sell it to them. (Obarski 2013)

Ultimate Soundtracker allowed musicians to use up to 16 different samples in a somewhat limited context of melody, accompaniment, bass, and percussion. Ultimate Soundtracker introduced the module format (MOD) to store both the score and the samples in a compact file; subsequently the MOD file became the standard method of file storage for tracking software.

While MODs were typically developed for games, they were also used by the so-called demoscene, a community of artist-programmers that produced demos, typically team-based efforts that showcased the group's programming and artistic prowess on limited systems. Hardcore musician Wright (The Moog) had his entry into electronic music through the demoscene, starting with Ultimate Soundtracker. "I loved how visual the trackers were. It felt so hands on," Wright continues,

> I'd never used any other kind of sequencer at that point, and when I did, I remember wanting to go back to a tracker! Being able to see and edit note for note was a big advantage compared to some of the "blind" MIDI sequencers that simply recorded MIDI events and played them back with a bit of quantization. Also the popularity of the trackers meant there were a lot of instrument disks out there, as well as other tracker tunes that you could easily rip the instruments out of, even if the module had been compiled into a demo. I also loved that it was a simple complete system. The hardware and tracker was one piece of equipment, with no mass of cables and other hardware to worry about. It all saved as one mod file. (Wright 2013)

In 1989, EAS released source code for the Ultimate Soundtracker, and it was subsequently copied and improved by other programmers (K. Collins 2008, 58;

Obarski 2013). Pex Tufvesson and Anders Berkeman created NoiseTracker, which increased the total number of possible samples used from 16 to 32. Teijo Kinnunen then developed Music Editor (MED) in 1989, which was followed by OctaMED in 1991. DJ Trax and Paradox had used the MED software on their earliest tracks (Davies 2013). MED was famously used by Urban Shakedown (comprised of Aphrodite and Claudio Giussani) to create *Some Justice* (featuring Micky Finn) in 1992 (Amiga Format 1992). *Some Justice* was well received, and Urban Shakedown and were featured on the cover of Amiga Format in August of 1992, as is shown in **Figure 3.13**. To make *Some Justice*, the duo sampled sounds from vinyl records using the AudioMaster II sampling software, and used MED to sequence the samples on two synced Amiga 500 computers (Amiga Format 1992). A similar technique had been used in 1991 by Bizzy B (recording as UMI) and Rawtrax (DJ Trax and DJ Raw) (Davies 2013). OctaMED was used in conjunction with ProTracker (1990) by Omni Trio to create *Renegade Snares* in 1993 (Henaghan 2003a).

Figure 3.13: Urban Shakedown featured on the cover of Amiga Format in August 1992 (photograph courtesy Ben Issacs). The duo constructed *Some Justice* (featuring Micky Finn) using the MED software on two Amiga 500 computers.

The early 1990s saw trackers gain popularity in the PC market with the invention of the 16-bit sound card (e.g., Creative Technologies (later Creative Labs) Sound Blaster in 1991) (K. Collins 2008, 48–51). Clements (ASC) began writing music on an Atari 1040STE using NoiseTracker, and remembers the limitations of his system.

> I got heavily into trackers, and the way of writing music on them on the ST and Amiga. Trouble was, the software and sound quality was very limiting. The one I was using, Noisetracker, had only 4 channels, a few command line effects, and not much else. It was great for a while, but I had come to a decision—either buy an Akai Sampler to use in conjunction with Cubase on the ST, or buy a PC and start using more powerful tracker software. Turns out the PC route was a hell of a lot cheaper and more appealing to me at the time, so I went with that. At this time, I had started to work with another friend of mine, Michael, who went by the name Future Link. […] We'd started out working on his PC before I got mine, making stuff primarily with samples and FastTracker 2. (Clements 2013)

Key improvements in these trackers included an increase in the number of simultaneous tracks with which musicians could work, the addition of effects and synthesis methods, and host-based instrument formats (e.g., Virtual Studio Technology (VST), Audio Unit (AU)). Modern trackers still remain popular among Jungle and Drum & Bass musicians. Buzz[29] is a modular music production framework that contains a tracker (amongst other sound synthesis and sound shaping signal processing effects) and is used by Martsman (Heinze 2013). A comprehensive mapping of the evolution of tracking software is available through the Claudio Matsuoka's Tracker History Graphing Project.[30]

Many musicians have also used more conventional MIDI sequencing software to control hardware samplers to make HJDB music. MIDI sequencing software had become available on home computers soon after the MIDI protocol was developed in 1983. Several companies had released MIDI software, many of which developed from notation software packages such as SCORE (1983), Personal Composer (1983), and Finale (1987) (Manning 2004, 322–6). Specialty MIDI sequencing software had also been developed, such as Steinberg Research's Multitrack Recorder (1984), which

[29] http://www.buzzmachines.com/

[30] http://helllabs.org/tracker-history/

provided 16-track MIDI sequencing for the Commodore 64. This program soon became Pro-16 in 1986, and Pro-24 for the Atari ST (later available for the Macintosh and PC). Steinberg Pro-24 was the MIDI sequencer used by Voyager during his early days at Monroe Studios (Parsons 2013).

"Dual purpose" programs existed that were intended for both notation and MIDI sequencing, such as C-Lab's Notator (1990), which was made available for the Atari ST (Manning 2004, 324). Notator was used by HJDB musician Subject 13 for his first releases, including 1990's *Eternity* (Stewart 2013), and by Goldie and Rob Playford in the production of the Timeless EP in 1995 (Holder 1998).

As computer processors became more powerful, home computers became capable of playing, editing, recording, and sequencing digital audio. These features were combined with MIDI sequencers to create the modern DAWs, such as Steinberg Cubase,[31] Digidesign Pro Tools,[32] MOTU Digital Performer,[33] Cakewalk Sonar,[34] Apple Logic, and Ableton Live.[35] Manning (2004) provides an overview of the development of several of these programs. Thompson (DJ Krust) recalls his first experiences with Cubase (in approximately 1989):

> A friend of ours gave us Cubase, and said, "this is going to be the future! Everyone's going to be using this to make music". I was like "what is it!?" He said, "Cubase!", and I said, "Cu-what?" [laughs] So he showed me and it was mind-blowing. You could move these blocks around the screen with your hands and I was like, "my god! This is so fucking futuristic! It's amazing!" And I went home and started to master that and that was it. I started to just figure out how to use this to make music and never looked back. (Thompson 2013)

A notable addition to the above list of DAWs is Propellerhead Reason.[36] Reason differs from the aforementioned DAWs in that it is a self-contained program that is organized into "racks" of gear through which the user may patch together signal chains between various software components (for example, a subtractive

[31] http://www.steinberg.net/en/products/cubase/

[32] http://www.avid.com/US/products/family/pro-tools

[33] http://www.motu.com/products/software/dp/

[34] http://www.cakewalk.com/products/sonar/

[35] https://www.ableton.com/en/live/

[36] http://www.propellerheads.se/products/reason/

synthesizer connected to a compressor, which is then low-pass filtered). Reason has been used by a number of HJDB artists, possibly most famously by A Guy Called Gerald (Computer Music 2009). Another Propellerhead program, Recycle (discussed further in Section 3.2.3), has been used to segment breakbeats, which could then be loaded directly in Reason through a dedicated player.

3.2 Breakbeat usage in HJDB

The previous discussion has focused on the development of technologies associated with sampling and sequencing digitized audio. This section will consider how breakbeats have been used within HJDB music, through a discussion of the motivation, sourcing, selection aesthetics, segmentation and sampling procedures, and arrangement and modification techniques.

When breakbeats first appeared in Hardcore music, they were typically used as full loops (i.e., repeating phrases of one, two, or four measures), with less focus on segmentation and resequencing. In successive years, rivalry in the HJDB community and the advance of technology brought about new techniques in breakbeat manipulation. These developments in HJDB can be heard in a variety of aspects related not only to a track's arrangement, but also to the sophistication of control over various instrument classes in the tracks—such as drums, bass, leads, and pads. One of the most obvious manifestations of this progression is the degree of control musicians have been able to apply to breakbeat manipulation (e.g., resequencing, multiple-breakbeat layering, multiple-breakbeat alteration).

HJDB music has been developed within a community of home-based musicians that build upon each other's work. Hardcore musician N.R.G. reflects on the iterative development of music in these genres:

> The majority of rave tunes were producers trying to replicate a style they'd heard in [other] productions. The piano stab from Carl Cox – *Let's Do It* must have been used in hundreds of rave tracks, some of them not so good, but others [had an] amazing use of it. Same as Frank de Wulf's or Joey Beltram's techno sounds from their R&S releases used by so many producers including the Prodigy to great effect. (Rumney 2013)

Development came not only through the simple refinement; competition among producers was also a source of innovation. Thompson (DJ Krust) explains:

> I'm going to take you out, with this tune. Its simple. I'm taking you out. It's very much like that. If you heard a track like that back then and it got you to that point, its like, "nah, I'm not having it, I'm going to take you out". I'm a b-boy. B-boyism is about taking you out. If you have better laces and trainers than me, I have to go out and get a better pair of laces than you. It's that simple. If you cut up better than me, I got to cut up better than you.
>
> […] I was inspired by [Roni Size and DJ Die's] *Mad Professor* to make *Warhead*. I didn't sit down and copy *Mad Professor*, I used the energy of it, I was inspired by it. I got angry. I wanted to make a better piece of music, and it worked. That's what we do. (Thompson 2013)

In the pursuit of this goal, several musicians adopted methods to protect the proprietary techniques in their tracks. HJDB musician Goldie explains:

> …Everything is covered meaning that the individual sounds had other sounds playing with them, so the hard work couldn't be ripped off, you can't break down what sample is from where. That was because I didn't want anyone to steal from it—it was the ultimate B-Boy trick. […] One person tried but with dire consequences. (Goldie and Gorman 2002, 126).

Goldie was attempting to protect work he had created with Mark Rutherford (his engineer at the time) in *The Terminator* (1992), in which he processed breakbeats using an Eventide H3000 Harmonizer. In an attempt to replicate the effected breakbeats in *The Terminator*, other musicians developed similar sounding techniques using the timestretching functionality of the Akai S950 and S1000 samplers (Goldie and Gorman 2002, 122–32).

Technological advances had provided the capacity for such developments. Rave producers of the late 1980s and early 1990s were able to create their music due to an increase in the duration of sampling time in samplers, which "gave rise to the sounds and sampling in Rave music…earlier tunes were using much more analog gear and drum machines, with samples being restricted in time, so [they were] used more sparsely" (Rumney 2013). Then, from the introduction of breakbeats in Hardcore to the collage-art production style of Jungle, breakbeat programming began to become more detailed. In this regard, the original breakbeat was segmented, or "chopped", and the term "edits" came to denote sections of intricate subtle breakbeat programming that were pieced together from the original sequence.

Edits have been created in a variety of ways, each with their advantages and disadvantages. Limitations on the amount and degree of edits were much more prevalent with older gear. Davies (DJ Trax) began working on music with the MED tracker software. "It was 8 bit and due to the sample time we had to sample [33 RPM] albums on 45 and then slow them down," Davies explains, "the sample time was such a big issue but its limitations were what I believe created the need to chop up breaks in those early days" (Davies 2013). Parsons (Voyager), a musician and engineer for several musicians within the HJDB timeline, such as DJ Seduction, DJ Crystl, and DJ Rap, also remembers such limitations during the Hardcore era:

> The main problem was that if I only had the [Akai] S950 to work with, then I couldn't go mad making loads of edits, so I mainly used only two or three edits on the beats, and sometimes only the one, as I had to conserve space for other samples. There was some beat chopping and edits going on, but it was mainly all about rolling loops with the emphasis more on the samples, stabs and other melodic parts. (Parsons 2013)

As Drum & Bass surpassed Jungle as the popular form of the genres after 1995–6, many musicians began to make music with an increased focus on production aesthetics. Thompson (DJ Krust) explains the process of how this change occurred:

> We were fortunate enough to work with […] Redman's [Hip Hop musician] producer at the time, and he broke it down to us. He showed us mixing techniques of how to layer kicks and snares and basses, to get the frequencies right. We brought that back. What we didn't realize was that we weren't getting the same effects because the beat was too fast. If the beat's moving at a certain pace, and Hip Hop is very slow, so between the kick, hat, and snare, you can get maximum fatness in it. In Jungle, its moving too fast, so you can't have a big fat kick and snare, or you couldn't do it at the time because we didn't know how to do it. That's when we started tweaking our own breaks because we had to figure out how to get the big kick and snare in and do rolls as well. Using a break that already exists, trying to get it to sound as fat as Hip Hop, we weren't doing it. So we realized, you get the break, you have to deconstruct it, chop it all up, and then put it together it its simplest form. […] Those beats were borne out of simplifying the beat so that you could get it to sound as fat as possible on your kick, high-hat and snare. That was the idea behind it. We wanted it to sound big, so if you listen to some the early tracks, some of the Full Cycle things, a lot of Ed Rush and Optical was doing it, and the Valve boys [Dillinja and Lemon D], its really stripped down, simple beats so you could get the maximum fatness out of it. Big fucking snares. Big fucking kick drums, and that's what we directly took from Hip Hop. You listen to a lot of

> the early Hip Hop stuff, especially Premiere, he was doing it a lot. Just a big kick, just a big fat slap in your face snare, you know what I mean? [Dr.] Dre took it to a whole other level. (Thompson 2013)

Not everyone was interested in following this trend, and some producers felt that there was "an increasing emphasis on technique and cleanliness over vibe and soul" (Macciochi 2013). The subgenre of Drumfunk focused on preservation of the breakbeat-oriented percussion of earlier Jungle styles. O'Shea (Naphta) explains the ethos behind this style:

> '92–'96 was the golden period for me, when the music still had analogue warmth and rhythmic urgency—and crucially: when people still didn't really know what it was. Once the 2-step rhythm became the industry standard and took all the urgency away from '97 on, people like Paradox were left fighting a rearguard action in an attempt to save the music—and from that point on, even the periodic good stuff that made it out felt somewhat like an attempted revival: the overall forward thrust of the music's evolution had ended. (O'Shea 2013)

In addition, several musicians related to the Warp Records label began experimenting with manipulations of breakbeats in a virtuosic manner. Artists such as Aphex Twin (Richard D. James), Squarepusher (Tom Jenkinson), and Autechre (Rob Brown and Sean Booth) have created music in and related to the HJDB genres—often exploring the possibilities of timbral and rhythmic deviations of breakbeats from their original form. This style of experimentation continued in the Breakcore genre, and was exemplified by artists such as Venetian Snares (Aaron Funk), Enduser (Lynn Standafer), and Shitmat (Henry Collins).

3.2.1 Sourcing

The earliest source for breakbeats for Hardcore and Jungle musicians was vinyl recordings. With the advent and development of the CD-ROM, sample CDs became a popular medium used by HJDB musicians. Later, these two early sources were surpassed by the resources available on the Internet.

Many Hardcore and Jungle musicians were attracted to sourcing older sample records in a similar aesthetic to Hip Hop (as discussed in Section 2.4.1). As such, many of these musicians had large collections of vinyl to sample by the time they began making their music. Of the Hardcore and Jungle musicians interviewed for this project, most were in some way influenced by Hip Hop, and have hundreds, if

not thousands, of vinyl records which they have sampled for breakbeats and other sourced material (Bowes 2013; Davies 2013; Kane 2013; Rumney 2013; Stewart 2013; Thompson 2013). In addition, vinyl records exclusively containing breakbeats, such as the *Ultimate Breaks and Beats* collections (compiled by Breakbeat Lenny and Breakbeat Lou (see Section 2.4.1)) would have been available to Hardcore and Jungle musicians.

In the late 1980s and early 1990s, sample CDs—compact discs containing royalty-free samples to be loaded on a sampler—began to be sold. Samples on sample CDs were accessed through connecting a sampler to a CD-ROM drive. Companies such as Zero-G produced sample CDs containing breakbeats using the Akai S1000 sampler format, initially used in HJDB music by Hardcore producers (Chatzilias 2013; Minner 2013).

Breakbeats were also created by labels seeking to develop a signature sound using proprietary techniques undisclosed to others. Dego and Marc Mac, label owners of Reinforced Records, created and performed processing on a large number of sounds that they then provided to artists signed to their label. Alpha Omega, who was signed to Reinforced Records remembers:

> …Mark [from Reinforced Records] hooked me up with tons of sounds, DATs, accapellas, percussion, breaks, everything really. Mark was always in the studio building sounds and programming, so much of the sounds were the fruits of his labours. Mark was always looking to help and guide young producers and DJs so whatever he could help out with he would try his best to make happen. When *2nd Wave* came about in 2000 he made a lot of sounds available to whoever was on the label and showing support to the cause. (Lindo 2013)

Breakbeats have since become much more accessible than they were in the early 1990s. Photek reflects upon the amount of sampling and the ease of finding breakbeats in a modern context:

> Sampling a break was in the dark ages when I started, but the use of sampling has changed a lot […] I remember sampling that first beat and saying, I've found this unknown beat so I'm going to sample this and speed it up and be the first to use it. You can forget that these days, there's so many sample CDs and libraries; even the process of finding the sound is automated now. There are no rare breaks anymore, put it that way. (Barcode 2008)

Whereas previously, musicians were limited to breakbeats that existed on physical media such as vinyl or CD (sample CDs and audio CDs), musicians soon were able to find and download most breakbeats through the use of various Internet forums (e.g., Dogs on Acid[37]) and through Internet searches. Wilson (Villem) states that along with the expanse of the HJDB community on the Internet came a surplus of breakbeats available to musicians. Regarding his collection, Wilson explains, "I haven't heard half of them" (Wilson 2013).

3.2.2 Selection

As HJDB musicians had a variety of breakbeats to choose from, how were producers able to make selections when creating music? Often the process was simply trial and error, while other times, breakbeats were sought based on particular attributes, such as sparseness and timbral characteristics (Bowes 2013). "Some would work, others would just sound too fast or would lose their feeling when introduced to a faster pitch" (Bowes 2013). These same criteria have been suggested by other musicians as well. Chatzilias (0=0) states, "certain breaks maintain their distinctiveness after they have been pitched up etc. and some breakbeats handle manipulation better than others in tempi and pitches" (Chatzilias 2013).

Macciochi (Macc) replies that his selection is based on a vague group of characteristics including the "sound of the drum kit," the "sound of the recording," the sequence played, and "what can be done with it" (Macciochi 2013). By the "sound of the drum kit," Macciochi means the tuning and timbre of the individual drums, and by the "sound of the recording", he refers the sound recording characteristics of the breakbeat itself (explained in Section 2.4).

In several of the interviews, musicians from throughout the timeline of the genres mentioned functional reasons for selecting some of the more familiar breakbeats (e.g., *Amen*, *Funky Drummer*, *Think*, *Apache*). O'Shea (Naphta) states "They have that urgency, they can be cut-up and re-sequenced easily, plus with [these breakbeats] you have a wide range of pitching options at varying tempos—and the breaks still retain their timbral quality" (O'Shea 2013). Parsons (Voyager) reiterates O'Shea's statement, recalling his work with DJ Crystl: "once we discovered [the

[37] http://www.dogsonacid.com/

Amen's] editability and how sick it sounded, we used it quite a lot, we messed with the tuning, compressed the hell out of it, reversed it, and generally stamped all over it, kicked into a corner and rinsed it hard!" (Parsons 2013). Davies (DJ Trax) states, "they are so versatile and distinct. The crowds also really react to those breaks. Even if they don't know the names as such or even understand that they 'know' them, the fact that they are familiar with them gives them a nostalgic quality" (Davies 2013).

In the above comments, the terms "cut-up and resequenced," "versatile," and "editability" all relate to the same activity of segmenting the breakbeats and rearranging the segments. The implication here is that these particular breakbeats are easier than others to manipulate into new arrangements that are in congruence with the aesthetics of the genre. This versatility may be related to the degree to which the drum hits can be isolated through temporal segmentation. Macciochi (Macc) touches upon this topic in his response as well.

> If you want to be able to totally rework something then tails are your enemy—so reverb and ride cymbals can be very tough […] so grabbing a snare from later in the break to replace an earlier one may sound completely unnatural. This might lead to a workaround whereby you have to take a little segment from later to use an entire ride part (which may encompass several other hits), thereby restricting the freedom you have in other drums—if keeping it natural is a concern of course. (Macciochi 2013)

"Tails" refers to decays of sounds, and the particular problem Macciochi is referring to is the vertical overlapping of the sounds (e.g., a single crash cymbal resonates across several other drums played in succession). In order for a drum segment from one section of the breakbeat to be used in a different ordering, it must be isolated from other events—that is, not contain a segment of another drum's envelope. If it does, then the remaining segments making up the drum's envelope should be used as well to preserve a sense of cohesion. This is demonstrated in **Figure 3.14**, which shows an idealized measure of a breakbeat with a crash cymbal (C) that spans multiple snare and hat segments (S2, H2, S3). If resequenced, the shaded regions would likely only be used in the given order while such restrictions are not relevant to the non-shaded regions.

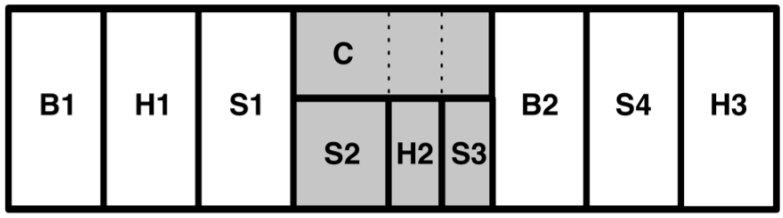

Figure 3.14: Idealized example of a measure-length breakbeat pattern including bass drums (B1 and B2), snare drums (S1, S2, S3, and S4), high hats (H1, H2, and H3), and a crash cymbal (C) that has an envelope that overlaps segments S2, H2, and S3. The non-shaded regions do not contain overlapping drums, and thus can be resequenced more easily. The shaded region denotes an area that is likely to remain intact if used when resequencing the breakbeat (due to the crash cymbal that encompasses multiple segments).

Whelan (2009) suggested that HJDB musicians selected certain breakbeats, such as the *Amen*, due both to their historic origins, and the legacy of use by other musicians. Use of the *Amen* can signify a specialized knowledge and appreciation of how the breakbeat has been used before, and demonstrate a musician's interest in advancing its use. Use of these breakbeats—in particular, the *Amen*—has achieved virtuosic proportions, as in the works of Bizzy B, Dub One, Equinox, Paradox, Nucleus, Squarepusher, Aphex Twin, and 0=0. Oftentimes musicians engage in a competition with one another over their techniques employed to create arrangements and edits of the *Amen* (Whelan 2009).

While the *Amen* is the most well-known breakbeat that is used in this context, several others, such as *Apache* and *Bongo Rock,* have achieved high levels of popularity among producers for the same reasons. Many musicians abstain from using these breakbeats because they are so ubiquitous. When asked about the *Amen* breakbeat, Thompson (DJ Krust) responded,

> It's been killed man. But it's still a fantastic break. You can hear how versatile it is, everyone's used it from Pop to Rock to Hip Hop to Jungle to Soul. I haven't got anything against it. I don't think it's my favorite break, it's a versatile break. [… James Brown's] *Soul Pride* is an amazing break, [Kool and The Gang's] *NT* breaks, they're amazing as well. […] [Bobby Byrd's] *Hot Pants* is a great break—very versatile.

> *Think* break is amazing as well, a very versatile break. We call those the commercial breaks. (Thompson 2013)

In an attempt to further individuate themselves, musicians such as Thompson and Rupert Parkes (Photek) have turned to piecing together their own breakbeats out of various sound recordings (of breakbeat and non-breakbeat origins). Parkes recalls creating his own breakbeats since as early as 1995:

> I made some new breaks…just completely programmed and re-sampled and they sound surprisingly like old breaks. […] I'll record them maybe twenty times with different effects on everything and re-record them with different [EQs]. In the end I got four or five distinct breaks out of about three days' work. (Awad 1995)

Other HJDB musicians have sought alternate means to differentiate their sound from others through the use of drum machines and one-shot samples (Bowes 2013).

> *Aquisse* was definitely a magical moment and happened in a quite naturalistic way. It was pre-[Akai] MPC I believe it was made on an Ensoniq ASR-88 sampling keyboard and Cubase primarily. […] I started to experiment with constructing breaks from an [Roland TR-]808 and [Roland TR-]909 kit and to take things in a different direction. (Bowes 2013)

The use of drum machine timbres in place of breakbeats in Drum & Bass music has become more popular with musicians from later genres such as Autonomic (e.g., Bop, Instra:mental, ASC) and experimental styles of Drum & Bass (e.g., Martsman, Sileni). "I hardly use common breakbeats but prefer one-shot samples I often bring together from various drum machine sample packs," Heinze (Martsman) explains. "Most of the sample preparation is done on the fly and I hardly save sounds and samples for later use" (Heinze 2013).

3.2.3 Segmentation

> Special attention is paid to chopping up the break. […] Chopping in general gives you a sense of intimacy with your samples. Sometimes musical ideas about arranging them can jump out at you in this stage.
>
> - 0=0 (Chatzilias 2013)

This section deals with the approaches HJDB musicians have undertaken to segment breakbeats for use in their own music. Segmentation affects the resequencing

possibilities, and was at first an extension of the limitations of the hardware sampling time.

Prior to this process, however, musicians will optionally modify the dynamics of the chosen breakbeat using techniques such as gain stage adjustment, equalization, compression, transient shaping, and normalization (Chatzilias 2013; Davies 2013; O'Shea 2013; Lindo 2013; Wilson 2013). This modification is performed to customize the breakbeat for use in a particular context. Once this is done, musicians will segment the breakbeat into regions that are appropriate for resequencing.

3.2.3.1 *Segmentation tools*

Segmentation strategies have been performed with the samplers discussed in Section 3.1.1, and later with a variety of audio editing software. In Hardcore and early Jungle, the segmentation process was wholly based on a musician's auditory capacity to identify the positions between drums, as the earliest hardware samplers did not contain waveform displays—although trackers did provide early visual editing (Davies 2013). Segmentation (often termed "chopping") was performed completely by ear, and was often a long and exacting process. Wright (The Moog) recalls, "I did very basic breakbeat slicing, mainly due to the fact that it was pretty laborious, especially on the EPS, with its non-visual sample editing" (Wright 2013).

As technology progressed, waveform displays on samplers provided a visual representation of the samples under analysis, which simplified the process of segmentation by providing visual cues of peaks and valleys in the waveform. The largest displays were on the latest hardware samplers, such as the Akai S5000/S6000 samplers and the E-mu E4-series samplers.

One of the advantages of using computer software was the larger display afforded by the computer screen. Performing segmentation in software with sample editors made the segmentation process even easier than on the later hardware samplers. Several such software packages have been used by HJDB musicians for this task, including Goldwave (Chatzilias 2013; Clements 2013; Fieber 2013),[38] Cool Edit Pro, and later Adobe Audition, (Chatzilias 2013; Macciochi 2013),[39] Sound

[38] http://www.goldwave.ca/

[39] http://www.adobe.com/products/audition.html

Forge (Bauer 2013; Macciochi 2013; O'Shea 2013),[40] and Zero X Beat Quantiser (Macciochi 2013).[41] Several producers also performed segmentation within the same programs they used for sequencing—for example, fastTracker2 (Clements 2013) and Cubase (Macciochi 2013).

3.2.3.2 *Segmentation methods*

Throughout the HJDB timeline, a variety of segmentation approaches have been used. Thompson (DJ Krust) provides an overview of the motivating factors associated with these approaches:

> When we started making the beats […] we had to speed them up. [The tempo] got to about 160 [BPM] and then it got to 170. But when you play [the tracks], it got pitched up again so we were realizing that the music sounded [tinny], so we had to figure out how to speed up the beats [breakbeats] without the pitch changing. That was quite a mission as well, and we had to figure that out. That took years of experimenting, and then we needed to learn how to make the beats roll, and the best way to use breakbeats, so we had to learn how to edit the breaks—taking kicks out, taking snares out. (Thompson 2013)

This section provides an explanation of the developments in segmentation techniques. While each of the following methods results in a breakbeat being played from a sampler and triggered through a sequencer (or alternatively being played and sequenced in a tracker), there are several methods by which this may accomplished, each allowing the musician a varying degree and ease of control over the resultant rhythms. Samples are associated with a key or a region on the keyboard. The sample may then be triggered through a sequencer by creating MIDI notes associated with the key or region.

The first and most basic method of using a sampled breakbeat is to trim the sample to a segment containing a repeatable phrase (e.g., a two-measure drum pattern) that may then be repeatedly triggered. In a MIDI environment, triggering is performed by a note-on event to start the breakbeat and a note-off event to stop it. In this most basic method, the only variation of the rhythm possible would be to release the sample (i.e., MIDI note-off event) before the completion of the recorded

[40] http://www.sonycreativesoftware.com/soundforgesoftware

[41] http://www.mixman.com/products/beatcreator.html

rhythm, and restart the rhythm by retriggering the sample (i.e., MIDI note-on event). Through the aid of a sequencer or tracker, events were recorded, and played back in real time.

Breakbeats could be sped up by lowering the note that preserves the original playback pitch on a sampler, also known as the root note, while maintaining the note being used to trigger the sample. For example, if the breakbeat sample were on MIDI note C3, lowering the root note below C3 would cause an increase in speed, as the sample would be played back at a faster rate (as explained in Section 3.1.1). A similar effect could be achieved by increasing the range of the keyboard associated with a sample, such that it extends above the root note, allowing the sample to be triggered at a note above the root note (from herein, these two techniques are termed the root-note adjustment method). A side effect of these techniques however, was that the pitch of the samples would also be raised. Bowes (Justice) recalls, "When I first started to produce or dabble in production [1990] I don't really think chopping as we know it [had] really started or taken off. It was really based around finding a break that we liked and work well when pitched up, this would be the primary concern" (Bowes 2013).

To allow for more rhythmic manipulation, producers would segment the sample into two or more parts, and associate these with different keys on the keyboard (for various breakbeat manipulation techniques, see Section 3.2.4). This allowed musicians to perform resequencing, or the rearranging the ordering of the constituent parts by triggering notes on a keyboard associated with the segments. Rumney (N.R.G.) recalls his method of segmentation: "[I] cut the sample in two to play the first kick up to the snare, and then the remaining 3 beats of the loop starting from the first snare. I could get the beats sounding very tight that way, and easily create better variations of the break by triggering kick and snare at different points" (Rumney 2013). Bowes (Justice) explains a similar method:

> As time went on I would start to play with the triggering of the break, maybe a double trigger on the start of the break to obtain a double kick at the beginning of the bar. After this rudimentary experimentation we started to realise that we could chop certain bits out that we wanted so would chop the kick, snare, hi-hat and any other slice and position them across the keyboard so they could be triggered in a new pattern. (Bowes 2013)

As samplers became capable of accommodating longer sample durations, producers were able to allot more storage space to breakbeats. One technique that took advantage of this capacity was to: 1) record the sample into the sampler and assign it to a particular note; 2) copy the same sample to another note; 3) remove the first drum hit from the start of the copied breakbeat; 4) repeat steps two and three until only the last drum hit remains. This allowed producers access to all points within the breakbeat, while retaining the pattern of the original. **Figure 3.15** demonstrates this segmentation process. A disadvantage to this technique was that the tempo was defined by the breakbeat's initial tempo. Samples would need to be sped up using the root-note adjustment method (with the resultant increase in pitch).

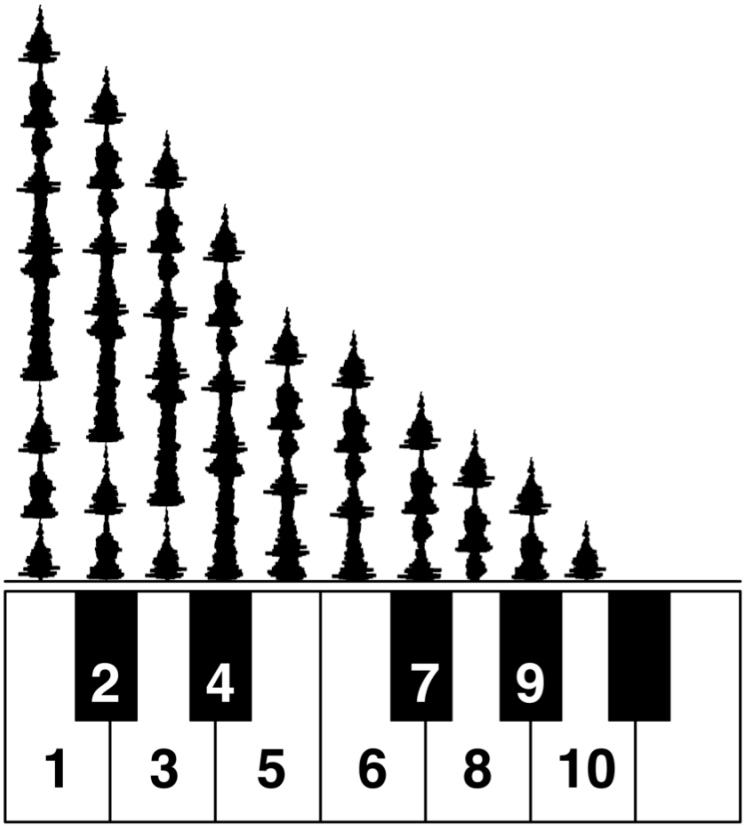

Figure 3.15: Breakbeat segmentation by copying and removing the first hit. The full breakbeat is sampled and placed onto a note (**1**). The breakbeat is then copied to another note (**2**), and the first drum hit is removed. This process is then repeated on notes **3** through **10**, until only one drum hit remains. This allows the musician to access any drum hit in the breakbeat, and can also preserve the breakbeat rhythm from that note onward by sustaining the note.

An alternative technique was to segment the breakbeat into individual drum hits. An advantage to this style of cutting was that if all the hits were separated, the breakbeat could be reproduced at any speed. Parsons (Voyager) recalls using this technique from early on in his career. "I had the original loop, plus snare and kick edits as well as ghost snares, ride cymbals and any other little snippets that were in the sample. I'd have them all lined up on the keyboard next to each other, tune the beat into the tempo and then play the samples off the keyboard" (Parsons 2013). **Figure 3.16** demonstrates breakbeat segmentation into individual drum hits.

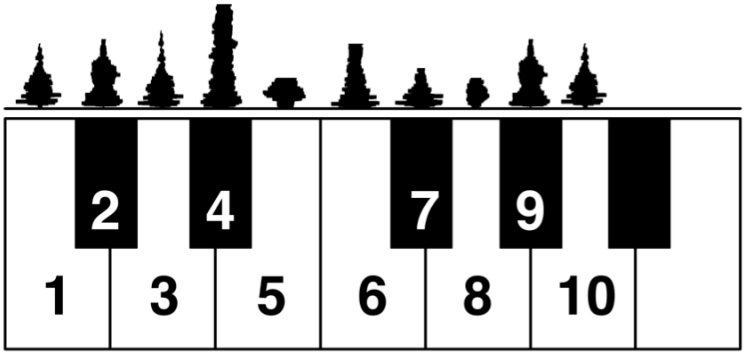

Figure 3.16: Breakbeat segmentation by separation of individual drum hits. The segmented breakbeat, on notes **1** through **10**, can then be triggered at any speed without an increase in pitch, but the pattern would need to be replicated.

A disadvantage of the method presented in **Figure 3.16** is that the pattern of the breakbeat would have to be replicated if the musician wanted to retain the rhythmic character of the original breakbeat. Breakbeat segmentation by copying and removing the first hit (as in **Figure 3.15**) allowed musicians to preserve the original pattern from the triggered note onward by sustaining notes, but musicians were restricted to the use of samples at the original tempo (typically too slow for HJDB music), or alternatively they could increase the pitch of the samples to produce sped-up versions of the breakbeat.

To mitigate this problem, several producers used Propellerhead Recycle (1994),[42] an audio segmentation package that not only provided segmentation of

[42] http://www.propellerheads.se/products/recycle/

samples, but also preserved the timing information of each slice in a MIDI file. Musicians could then load the MIDI file into a sequencer and trigger samples associated with the MIDI pitches at a faster tempo without pitch modification (Farrer 1995).

To use Recycle, musicians would load a breakbeat into Recycle on an Apple Macintosh or PC computer (shown in **Figure 3.17**). Musicians could then use Recycle's proprietary semi-automated segmentation functionality (controlled by a user-sensitive slider) to choose an appropriate slicing of the audio into individual hits. Segments could then be exported along with the MIDI file directly into samplers through SCSI connections (later through USB with Akai S5000/S6000 series samplers). Modifications of rhythm were easily possible by rearranging the MIDI slices or repeating phrases of the original MIDI sequence, and rhythms could be replayed exactly at any tempo without pitch modification. If pitch modification was desired, musicians could either use Recycle's built-in functionality, or use the root-note adjustment method as discussed above.

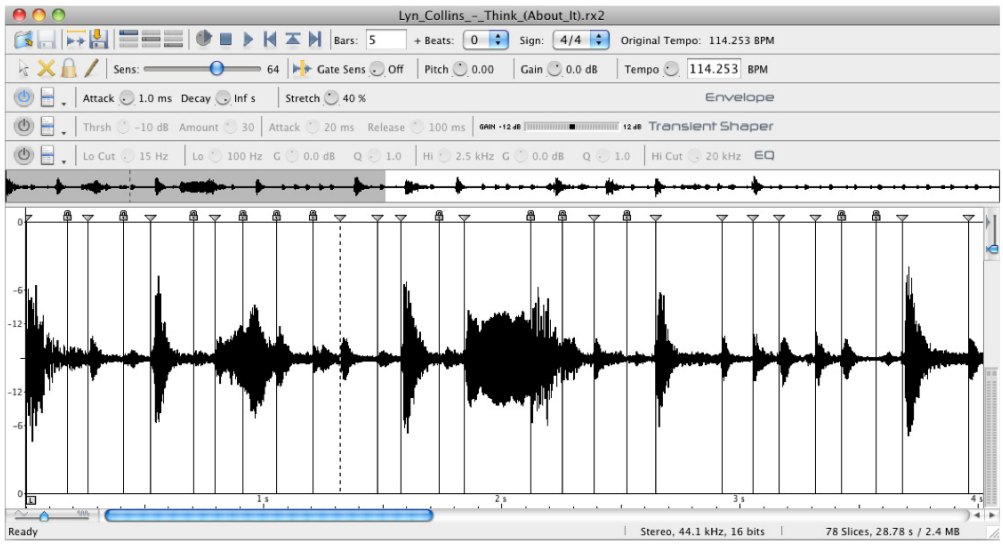

Figure 3.17: Propellerhead Recycle being used to segment Lyn Collins' *Think* (1972) breakbeat. Recordings can be segmented semi-automatically with a sensitivity slider, then by adding, editing, or erasing segmentation positions (vertical lines in waveform display) manually. Once segments are acceptable to the user, segments and a corresponding MIDI file may be output for use with a sequencer and sampler.

Later, as digital audio workstations (DAWs) became capable of multi-track recording, playback, and editing, some musicians began to perform breakbeat segmentation through the use of digital audio tracks and audio splicing tools inside DAWs (Chatzilias 2013; Macciochi 2013). This particular workflow circumvented the need for samplers and MIDI (as well as tools like ReCycle) for triggering breakbeat audio. Musicians could import breakbeat audio files directly into their DAW of choice and match the tempo of the sequencer to the breakbeat, perform segmentation, then adjust the sequencer tempo to the desired tempo. A breakbeat could then be edited, segments could be duplicated, and any number of transformations could be made.

3.2.4 Breakbeat arrangement and modification

> A lot of people think writing breakbeats is just about lifting a drum break and looping it, but there's more to it than that. We sample the breaks we want, add some noise to them, give them some horrible EQ, distort them and do anything else we can to give the break 'authenticity'. We get second- and third-hand breakbeats that are 20- or 30-years old or more that have been through some hideous processes in their time. For some of them, it's no good sampling the original breakbeat, because the people who sampled it first—normally early hip-hop artists—have done something to it on their crappy little DJ mixers that has added to the flavour.
>
> - Rob Playford (Holder 1998)

Except for more recent advances in digital audio workstation technology that allow for the arrangement and manipulation of breakbeats directly in audio tracks, breakbeat arrangement and manipulation in HJDB music has generally been performed through the use of samplers controlled by MIDI or through tracker software that replicates this functionality.

There are several ways in which musicians have modified breakbeats in their tracks. To determine the degree to which the interviewed musicians saw themselves as using these techniques, they were asked to rate their usage of nine techniques on a scale of 1 to 7 (7 being the maximum). Participants were encouraged to use the entire scale if possible. Interviewed musicians were also encouraged to provide additional

techniques if they were not covered by those in the questionnaire. The original techniques were proposed during pilot interviews. Table 3.1 presents the musicians' responses to the following techniques:

Resequencing: The process of rearranging segments of breakbeats, typically creating a new ordering (note that not all segments need to be used). Many of the interviewed musicians tend to use an ordering of segments that preserves the feeling of the original breakbeat.

Pitch modification: In many Hardcore and early Jungle tracks, pitch modification was used to adjust the speed of the drums. This was performed by triggering the sample using a different MIDI pitch than the sample on which it has been set (i.e., root note). As more recent segmentation practices find musicians performing segmentation of individual drums, pitch modification now is used for tuning of drums to the key of the piece.

Distortion: In this context distortion is the effect of intentionally overdriving an input signal, causing clipping of the signal. This effect is typically performed using the gain stages of a mixing board or guitar pedals (Sykes 2013).

Reversing: Playing a segment in reverse order, from its end to the beginning.

Multi-break layering: Drums of the same type from different breaks (or synthesized drum sounds) are layered to fill the spectrum in a method derived from Hip Hop production (Thompson 2013). More recent Drum & Bass musicians have layered several drums to "add diversity to the old breaks" (Hansen 2013). Alternatively, the *Amen* breakbeat is sometimes used to add shuffle to another breakbeat that is in the foreground (Minner 2013).

Multi-break alternating: Also known as breakbeat switching, this is the effect of switching between breakbeats, often in a call-response fashion. The technique was popularized by Jungle and Drum & Bass musicians such as Nico, who used the

technique in an attempt to emulate DJs who were performing the technique live (Atmosphere 1996b).

Timestretching: This effect is used to adjust the length of samples without changing the pitch, and was made first available by Akai on their S950 and S1000 samplers (1988). Timestretching is often used as an effect, as it adds a metallic sound when using large scaling values. The effect was popular in mid-1990s Jungle, and was often used with different parameter settings to create melody (as in Johnny Jungle's *Flammable* (1993)).

Filtering: There are a variety of uses for filtering as it relates to breakbeats in HJDB production. Filters may be used as a sound-shaping tool, for example, applying a high-pass filter to hats and snares to improve the clarity of lower-frequency sounds (Lindo 2013). Most samplers used in the creation of HJDB music have a filter section that has been used for this purpose, and modulation sources such as envelopes and low-frequency oscillators may be applied to the parameters of these filters (e.g., filter cutoff frequency, resonance).

Reverb: HJDB musicians will often apply reverberation to individual drum hits—often snares (Minner 2013) as a sound-shaping tool.

In addition to the above techniques, some of the musicians interviewed suggested additional modification techniques that they have used in the creation of their breakbeat sequences. Kane (Bay B Kane) suggested double-, half- and multi-tempo transformations (Kane 2013). Several producers have incorporated this technique, possibly to emphasize the intensity of regular-tempo drums. Half-time sequenced drums can be heard in the percussion of the introduction of Zinc's *Super Sharp Shooter* (1995).

Musician	Resequencing	Pitch Modification	Distortion	Reversing	Multi-break Layering	Multi-break Alternating	Timestretching	Filtering	Reverb
0=0	7	5	3	2	1	6	6	4	2
Alley Cat	7	2	6	3	7	4	5	3	7
AK1200	7	7	7	3	7	6	7	7	5
Alpha Omega	7	7	2	6	6	5	5	7	7
ASC	5	1	1	3	3	2	6	5	1
Bay B Kane	7	4	3	7	7	7	5	6	2
DJ Trax	7	3	2	2	6	6	3	3	7
Escher	6	6	7	4	5	4	3	4	7
Fracture	7	7	7	4	5	3	2	6	6
Justice	7	7	1	4	7	5	5	6	5
Macc	7	2	4	1	4	3	2	6	5
Martsman	4	3	5	2	1	1	4	7	6
Naphta	7	7	1	4	7	3	3	6	6
N.R.G.	6	7	1	2	7	6	2	2	1
Subject 13	5	5	4	4	4	6	4	6	5
The Moog	5	2	4	5	7	6	5	6	7
Villem	6	6	4	3	7	4	2	4	6
Average:	**6.29**	4.76	3.65	3.47	5.35	4.53	4.06	5.18	5.00

Table 3.1: Interviewed musicians' responses to the arrangement and modification question. Participants (rows) were asked to rate their usage of the techniques (columns) on a scale of 1 to 7, with 7 being the maximum. Averaging across participants, resequencing was rated as the most often-used technique.

Sound-shaping techniques were also recommended by a few of the participants. Bauer (Alley Cat), Davies (DJ Trax) and Lindo (Alpha Omega) mentioned equalization (Bauer 2013; Davies 2013; Lindo 2013). Equalization can be used for several purposes, and as Lindo states, "good [equalization] technique cannot be underestimated in all areas of music production, engineering and mastering" (Lindo 2013). Equalization has been be used to help facilitate the blending of multiple drums in the process of layering. Minner (AK1200) explained his approach for creating layered drums:

> Initially I would go through sample CDs and drum kits on there, find a couple kicks, snares, and hats. […] I try to find a few kicks and layer them together and EQ them differently so they stack. Of course I remove all of the frequencies I do not want the kick itself to have. I do the same thing basically with snares. (Minner 2013)

Davies (DJ Trax) suggested compression (Davies 2013), which was mentioned in response to other questions by others (Parsons 2013; Lindo 2013). Compression is the reduction of the dynamic range of an audio signal by reducing the volume of sounds above a set threshold (or alternatively increasing the volume of sounds below a set threshold).

Wilson (Villem) mentioned that equalization prior to compression is important to remove "frequencies that are boomy/ear piercing, so when you compress, distort, [and/or] limit, those problem frequencies don't get exaggerated" (Wilson 2013). He also uses transient shaping (i.e., the amplification of transients (for a technical definition of transients refer to Section 4.2.1)) and gating (i.e., attenuation of a signal below a threshold) techniques.

Hansen (Escher) recommends "tightening" the breakbeat using amplitude envelopes to temporarily separate segments in the sequence. The problem is that the segments are sequenced at a faster tempo than the original breakbeat while retaining their original lengths, and so they overlap. One solution is to truncate the segments; however, this can cause the drums to sound artificial because of the abrupt end of one segments as the next one begins. Fading out each segment with an amplitude envelope blends the drums more smoothly while preventing overlap. **Figure 3.18** shows an idealized example of this process.

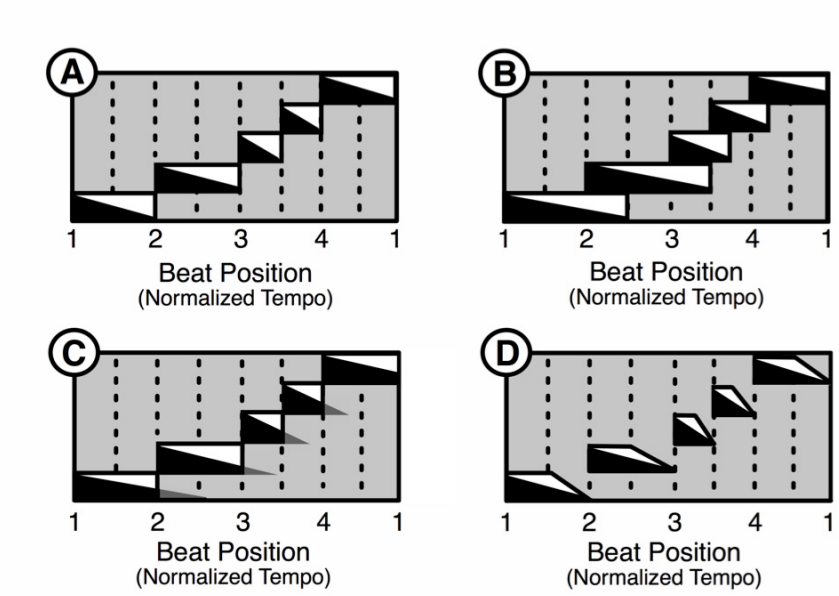

Figure 3.18: Idealized example of envelope tightening for a breakbeat (Hansen 2013). All graphs present the same ordering of breakbeats, and black triangles represent the actual duration of events. In **A** the breakbeat is played at its original tempo, and each envelope ends with the beginning of the next event. In **B** the tempo has been sped up, but because the samples remain at the same pitch and normalized measure location, actual note lengths remain the same, resulting in an overlap of note events. A possible solution is presented in **C**, which has the same global tempo as **B** and note events are truncated when the next ones begin. A side effect of this is that the note releases (faded ends of triangles in **C**) are not played. An alternative approach is presented in **D** in which shorter note lengths are used and envelopes are used to help the events blend into one another.

Several of the interviewed musicians also mentioned the process of resampling. Once a breakbeat has been sampled, a musician may choose to apply additional processing to the samples. In order to use the processing equipment for other purposes, the musician may wish to resample the breakbeat, which records the samples with the effects. Well-known HJDB musician Goldie explains the purpose of resampling multiple times through his term "Rufige":

> Rufige was the way you described things just lying around on the surface—more or less scum—which you collected together and turned into something new. I was using fourth and fifth-generation samples, just trash sounds, but they had the grittiness and roughness which identified with the feel of the street. (Goldie and Gorman 2002, 83)

Resampling is often an essential stage in individuating a breakbeat. Clements (ASC) explains that the effect-laden breakbeats in *Windchime* (2003) were created through a process of resampling. "The *Amen* was just chopped and programmed into FastTracker 2, then I'd make a ton of little loops, then I'd have to take them into GoldWave in Windows 95, since FastTracker2 was a DOS based program, and then run them through filters and FX that I didn't have access to in FastTracker" (Clements 2013). Lindo (Alpha Omega) is also a proponent of resampling. He states, "Every time you resample you start fresh and can take that sound in any direction your imagination allows with all of your CPU resources freed up and at your disposal. The new identity that you can impose on that sound from what it started out as can be mind blowing at times. I never get tired of resampling and the possibilities it brings" (Lindo 2013).

While software samplers have many benefits, hardware samplers are still used by several Jungle Drum & Bass producers for effects and filtering (Fieber 2013; Wilson 2013), or the characteristics imparted during sample or bit-rate conversion (Chatzilias 2013; Fieber 2013; Hansen 2013). Modern Drum & Bass musicians often incorporate a workflow wherein they prepare samples in an audio editor or software sampler, then record these samples from the computer into an older hardware sampler. Optionally, a filter is placed on the samples, and they are resampled back into the computer, and placed into the software sampler. Hansen (Escher) explains the reasoning for this process:

> Software is convenient, but it lacks something for me. I don't like really shiny pumping tunes, so it's all down to taste, but putting things through real wires, distorting things through hardware just gives a certain character, a certain dullness or grit. I remember hearing stories of Goldie resampling breaks again and again to get them as crusty as possible. That was the style, like digital punk.
>
> […] I only really use the [E-mu E6400] for putting my breaks into and smashing them with gain. Pretty limited use but it does wonders. (Hansen 2013)

"My biggest use of hardware samplers is to treat drums," explains Chatzilias (0=0), who similarly employs a variety of hardware samplers for the transformative effects they have on the signal.

> I have a few samplers that I would consider to be character-imparting devices. My E-mu Emax is a 12-bit sampler with analog filters. You can run samples pretty hot into the preamp, which gives a nice saturation/clipping. The low bit rate seems to reduce the dynamic range in a way that gets rid of unwanted room sounds and some of the hiss in breakbeats and makes the drums punchier. There is little to no interpolation when changing pitches so you get some heavy aliasing noises that enhance and define high frequencies. The analog filters do a great job of smoothing out that aliasing…or enhancing it with the resonance. I also have a Zoom ST-224 that also delivers similar pitch artifacts but acts on stereo material (where the Emax is just mono). This gives me a certain sound I can't achieve exactly in software (although theoretically it should be possible and some people have made great strides in this field, such as David Yeh and Native Instruments). (Chatzilias 2013)

3.2.5 Downbeat preservation

The HJDB musicians interviewed for this project were asked if they intentionally preserved an ordering of drum segments that preserved a sense of the downbeat. Many of the respondents expressed their intent to preserve the sense of downbeats and maintain the original breakbeat's "funk" or "groove" during the resequencing process. O'Shea (Naphta) responded, "preserving sections of the break in its original order can help retain the original funk to some degree" (O'Shea 2013). Bowes (Justice) similarly stated, "Yes I think trying to preserve the groove is essential if possible, or using the break that allows its elements to be recreated into the best groove possible. Of course it is not always possible, or it may not work in the way envisaged. But the snare on the offbeat and downbeat is always important in its placement to recreate or embellish the groove" (Bowes 2013).

Retaining a "natural" feel is important to Macciochi (Macc). "I think that if you have any intention of keeping something natural then you are obliged to have the feeling informed by the original break. That might be another way to define flexibility; being able to play whatever you want with the break, while not losing the feel. This might be why [the] *Amen* works so well" (Macciochi 2013). Stewart (Subject 13) voices a similar opinion:

> I try my hardest to stay true to the original break really, as it's the original form which inspired me in the first place…so I guess if I felt the processing had changed the break too much then I couldn't use it […] The fact that the tempo is already faster than normal had taken away a certain amount of groove already so it's important I keep as much left to the original source as possible. (Stewart 2013)

Kane (Bay B Kane) also likes to preserve the "'Funk' of the original break"(Kane 2013). He explains that if the programming deviates too far from the original, the feeling that the drummer had originally created may be lost:

> Sure some may feel that is the way to reconstruct a drum pattern but doing this has a cost and that cost is losing the original vibe of the break because broken down into individual hits you will lose the feel of the drummer and so even though you have drum hits which were done live by a real drummer the overall feel of the piece is lost and to me this becomes synthetic and not much more than a drum machine. (Kane 2013)

Breakbeat arrangements by Thompson (DJ Krust) are intentionally made to sound "effortless" and were described through an approach he termed "complicated-simple"(Thompson 2013).

> Listen to the drum edits, especially when it comes to the end of the bar. You'll hear all these intricate loops […] it sounds elegant, it doesn't sound cluttered. You'd be there for hours making sure it was smooth and it didn't distract your ear from the overall experience. The point was trying to make it elegant so it's still a part of the music. It's not supposed to take your ear away from the experience […] it's about not seeing the acting, […] we didn't want you to hear the edits, though they are quite intentional. (Thompson 2013)

Similarly, Chatzilias (0=0) states, "sometimes I want a natural order…as in something a drummer could play. It's a fun game to really deviate from the way the drummer played it but still have it sound organic and performed" (Chatzilias 2013). Chatzilias also suggested that he sometimes intentionally deviates from the original breakbeat patterns. "Sometimes I try to not have downbeats and really emphasize the non-linearity afforded to me with digital sampling and manipulation" (Chatzilias 2013).

Hansen (Escher) responds, "I don't consciously try and preserve the order of the break, [and I] just use them however [it] works, I'm open to trying whatever patterns, although saying that a lot of time things don't need to be changed."

Sometimes—albeit less frequent in the genres—such deviations are wholly intentional. In *Antifunk* (2007), Heinze (Martsman) explains that he attempted to "strip the drumbreak […] of all breakbeat funkiness and squeeze it into a quite un-funky, stiff and rigid pattern." He continues,

> Initially, I think I wanted to scatter all the kick and snare drum samples more or less randomly throughout the whole piece so that the listener would never know when one of them came next (but at least could expect them to be on the even beats). However, I gave up on this idea in favor of a more predictable pattern as you can hear. The percussive voice samples serve more or less as a rhythmic point of reference for the piece. The layered Photek break(s) are somewhat in between—both emphasizing the existing drum patterns and filling in on the gaps. (Heinze 2013)

3.3 Chapter summary

This chapter has outlined the main technologies and techniques that have been used to sample breakbeats in the creation of HJDB music. The HJDB genres themselves are closely coupled with the development of sampling technology (e.g., increased sampling time, new sampler functions and features) and personal computers (e.g,. development of the computer as a compositional and editing tool). The first generation of HJDB music can be seen as the result of a community of musicians that applied a pre-existing knowledge of breakbeats from Hip Hop to samplers, which they used as their primary instruments. The development of these techniques fostered an aura of creation and exploration, which in turn led to new musicians becoming interested in earlier developments (Chatzilias 2013; Fieber 2013; Hansen 2013) as the first generation had done with Hip Hop when it had been imported to the United Kingdom (Bowes 2013; Davies 2013; Rumney 2013; Stewart 2013; Thompson 2013).

One of the intended goals of this dissertation is to explain how breakbeats have been incorporated in HJDB music. The discourse thus far has remained on a global discussion, viewing breakbeats in the music from afar, through an explanation of the structures that had been in place (e.g., rave culture) or changed (e.g., a desire for faster music) sufficiently to allow breakbeats to be integrated into the music. The remainder of this dissertation is concerned with the provision of tools that are capable of locating the presence of breakbeats within HJDB music, and is built upon

much of the information that has been gleaned from the previous two chapters. Several of the responses to interview questions related to musicians' use of breakbeats were used to inform the algorithms presented in Chapter 5.

Interview responses showed that on average participants believed they performed resequencing more than other types of modifications. Most participants also created arrangements that were intended to maintain a sense of the downbeat. Further, the amount of overlapping drum sounds across individual drum hits (as seen in **Figure 3.14**) dictates the ways in which many breakbeats may be resequenced while maintaining a "natural" feel. Such considerations have been used in the development of the downbeat detection and breakbeat classification methods presented in Chapter 5.

Such tools will be able to help move the direction of this research from the global to the local level—whereby researchers are able to determine, with a degree of certainty, which breakbeats have been used and how they have been manipulated.

Chapter 4: Review of technologies used in the analysis of breakbeats in HJDB

The previous chapters have dealt with the history of the Hardcore, Jungle, and Drum & Bass (HJDB) genres (Chapter 2), and how HJDB music has been created (Chapter 3). The focus of the present and following chapters now shifts to the analysis of these genres through the use of computational techniques designed specifically for examination of breakbeat usage within these genres. As breakbeats supply the percussive foundation of these genres, a great wealth of information about the rhythm and meter of HJDB music stands to be learned from studying how musicians have incorporated breakbeats in their music. It is hoped that such automated analysis will allow an exploration of the relationships between the musical corpus and the means and methods of the artists that have created it. The analysis methods introduced in Chapter 5 are: an estimation of the original breakbeat used within HJDB tracks, location of downbeats in these tracks, and a description of how the breakbeat pattern has been modified (e.g., resequenced). These methods are achieved through a combination of techniques from the digital signal processing and machine learning fields, and involve subtasks including onset detection, beat tracking, and percussion detection. This chapter provides a literature review of work performed in these areas, and is divided into the following sections: Section 4.1 presents an overview of the research in rhythm and meter prior to audio-based methods. Section 4.2 covers onset detection, which is used in the identification of musical events in an audio signal. Section 4.3 discusses beat tracking, which attempts to replicate the perceptual synchronization with a heard piece of music. Section 4.4 considers downbeat detection, which attempts to identify the first beat in every measure. Taken together, the onset detection, beat tracking, and downbeat detection tasks form the basis of a machine listening system for rhythm and metrical structure. Additionally, percussion detection will be considered in Section 4.5, as determination of the presence of standard drum types (e.g., bass drum, snare drum, and hi-hat cymbals) will aid in the selection of drums for the estimation of the original breakbeat as well

as an estimation of how the original breakbeat has been modified. The chapter concludes with a summary in Section 4.6.

4.1 Rhythm and meter

Many of our processes and decisions depend on our innate and learned abilities to interpret the timing, salience, and sequential ordering of auditory events as they are presented to our ears. The recognition of event durations and the ability to interpret them in series shapes our notion of time (Fraisse 1984). Rhythm defines the patterns into which these events are grouped, and is based on the length, pitch, and accentuation of the events in sequence. Beats are the inferred pulse of a succession of events, which replicate how a listener might tap in response to music. Meter is a counting mechanism associated with the stressed and unstressed beats in every measure. The perception of both rhythm and meter is made possible through recognition of events and an inference of beats underlying the music; however, the beats do not need to be associated with any particular sound events (Rosenthal 1992). Time signature is a way of indicating the meter in notated music, and consists of two numbers: The lower number provides the metrical duration of a beat (e.g., quarter note, eighth note), and the upper number provides the number of such durations present in a measure.

Research related to our ability to identify rhythmic structure in music has been conducted for well over a century (Mach 1886), and theories regarding perception of rhythm and meter have been offered from the fields of music theory, psychology, and cognitive science. These theories range from structural assessments of symbolic music notation (e.g., Cooper and Meyer 1960; Lerdahl and Jackendoff 1983) to psychological models of listener attention and timekeeping (e.g., Jones and Boltz 1989; Huron 2001; Temperley 2001; London 2012). Sensorimotor studies have also been performed that demonstrate humans' intuitive capacity to synchronize and remain in synchrony across a wide range of both metronomic and musical stimuli (e.g., Fraisse 1982; Repp 2003). These studies dually serve to suggest optimal ranges and boundaries for our percept and reproduction of rhythm, beat, and meter.

The earliest computational models of rhythm perception were rule-based approaches comprising a series of simple commands replicating theoretical rules.

Mostly due to the computational limitations of the time, these systems were applied to symbolic music representations. Steedman (1977) presented the first such method for extracting the perceived pulse from a list of note onset times for Bach fugues. Longuet-Higgins and Lee (1982) presented a model of musical meter that estimated metrical note durations (e.g., half-note and quarter-note) for inter-onset intervals (IOIs) from a list of monophonic note times. An initial hypothesis would associate a future beat location at a distance equivalent to the first IOI. Upon the receipt of successive notes, the hypothesis would be updated through a set of rules from a generative grammar derived from traditional music theory (Lerdahl and Jackendoff 1983).

These early rule-based rhythm models were not capable of handling expressive timing. Quantization and adaptive oscillator models were proposed to mitigate this problem. Desain and Honing (1989) applied a connectionist model resembling an artificial neural network to adjacent pairs of notes, in an attempt to associate metrical durations with IOI lengths performed through expressive timing. This technique was later extended to include anticipation of possible future events at fractions and multiples of the most recent IOI. Alternatively, adaptive oscillator models developed for physiological research (Glass and Mackay 1988) have been applied to track the dynamic tempo of symbolic music through the frequency- and phase-locking functions of an adaptive oscillator (Large and Kolen 1994). Synchronization and estimation of future events were achieved through the use of the sine circle map, which would update the period and phase values for the oscillator as a function of previous period and phase values and a driving signal derived from the IOIs. Similar systems have since been applied to extract the tempo of a live performance, to create a real-time interactive MIDI accompaniment (Toiviainen 1999), and to follow Jazz and Blues accompaniments (Pardo 2004). Multiple linked oscillators have been used to model musical meter (Eck 2000; Large and Palmer 2002).

The preceding approaches for rhythm and meter analysis require a symbolic list of music events. However, the intended analysis pertaining to HJDB music focuses on the automatic extraction of meter and rhythm information directly from input audio signals. Towards this goal, the subtasks of onset detection, beat tracking, and downbeat detection are now discussed. Taken together, these tasks may be used

to form a system for metrical analysis of audio signals through identification of the note start times (onsets), the inferred pulse of the music (beats), and the measure boundaries (downbeats). Of these three tasks, onset detection is the lowest-level task, associated with identification of note start times or onsets, often through the use of signal processing techniques. Beat tracking makes use of onset detection to identify events prior to inferring a likely regularized pulse, and downbeat detection determines which of these beats are associated with the first beat in each measure. Figure 4.1 presents a sample input audio signal, and the idealized output of onset detection, beat tracking, and downbeat detection methods. The following sections provides a theoretical background for these areas, a review of existing systems, and standard methods and metrics of evaluation. This is not intended to be an exhaustive review of all systems that have been proposed in these areas. Such reviews of the literature are available for onset detection (Bello et al. 2005), beat tracking (Hainsworth 2006; Gouyon and Dixon 2005), downbeat detection (Hainsworth 2006; Davies 2007), and percussion detection (FitzGerald and Paulus 2006).

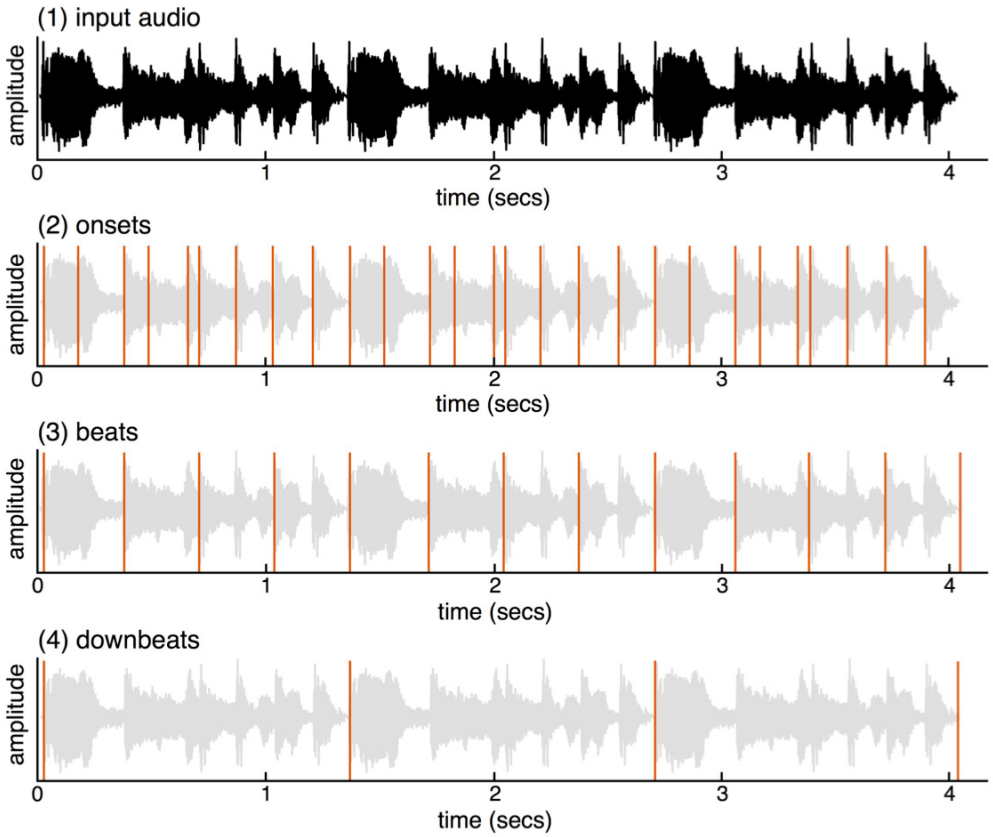

Figure 4.1: Algorithm output (orange vertical lines) for three levels of metrical event analysis for audio, depicting: (1) An input audio signal; (2) Onsets representing time markers at positions of musical events; (3) Beats extracted at an interpreted pulse and phase associated with these recognized events; and (4) Downbeats at the first beat of every measure—the result of both a time signature and a counting mechanism (meter).

4.2 Onset detection

Towards the eventual goal of a comparison of breakbeat sample usage in Hardcore, Jungle, and Drum & Bass tracks, the first and lowest-level task considered is generation of a set of time points associated with the starting positions of musical events, or onsets, within the audio signal—a process known as onset detection. Onset detection is utilized in several computer music tasks, such as beat tracking, score following, and music transcription. In Sections 5.1 and 5.2, onset detection is

used to generate feature vectors used in the classification of the original breakbeat and in the calculation of downbeats.

This section begins with an explanation of several key terms (Section 4.2.1) used in the remainder of this text. This is followed by a discussion of the various methods that have been proposed for the extraction of event onsets from audio signals. The format of this discussion follows a similar structure to that of a tutorial on the subject by Bello et al. (2005), in which the various techniques may be understood through a three-stage procedure of preprocessing (Section 4.2.2), reduction (Section 4.2.3), and peak picking (Section 4.2.4), a structure reflected in Figure 4.2. Section 4.2.5 will then provide an explanation of onset detection evaluation methods.

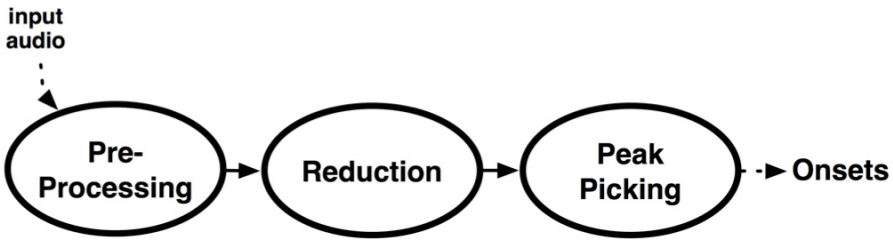

Figure 4.2: Overview of typical stages in onset detection algorithms. Following an optional preprocessing stage, input audio undergoes reduction, and peak picking resulting in onsets.

4.2.1 On the relationship between onsets, attacks, and transients

In the analysis of dynamic signals, an often-researched area of study is the identification of time positions at which the signal drastically changes due to the likely presence of an event. Onsets are markers (without duration) that denote the beginning of events within a signal, and the detection of these events is studied in a variety of fields in which change point detection is required, for example, in seismology (Allen 1978) and in EEG analysis (Gotman 1982).

In music signal analysis, onsets are associated with the beginning of musical events. In general, onsets are found at the start of the left-most edge of the attack, or the leading edge of an event's envelope. Figure 4.3 demonstrates the relationship between an example input audio signal, an idealized envelope of the input audio

signal, along with the associated attack and decay sections, and the position labeled as an onset.

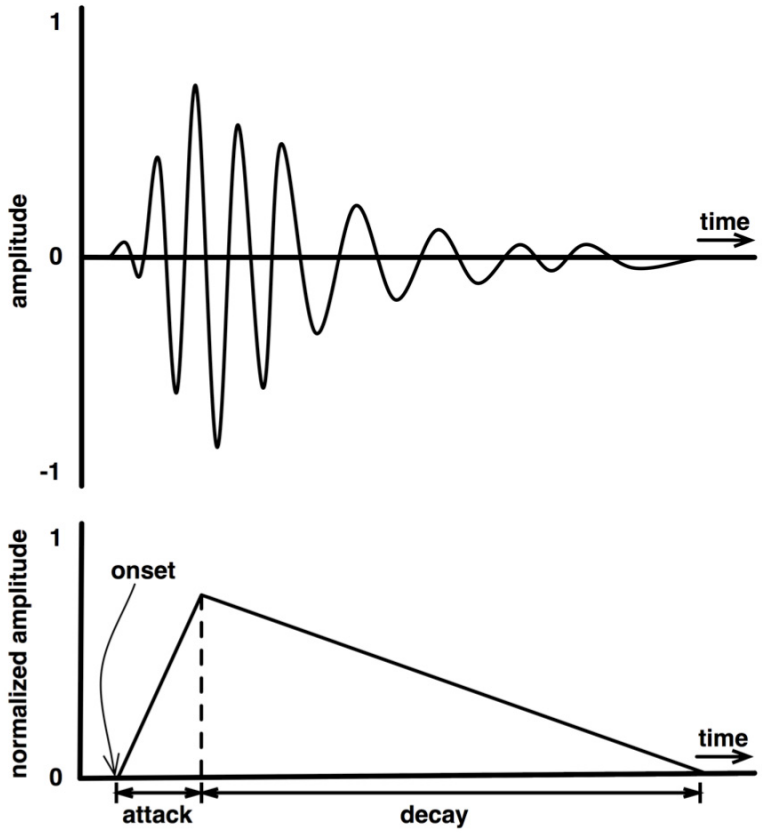

Figure 4.3: An example input audio waveform (top) and its idealized envelope (bottom) consisting of an attack and decay section, separated by the dotted line. The onset exists at the left-most position of the envelope's attack section.

The attack is often characterized by transients, which Bello et al. (2005) describes as "short intervals during which the signal evolves quickly in some non-trivial or relatively unpredictable way". Typically, transients occur when the signal changes abruptly, disturbing the otherwise steady-state character of the signal. Several onset detection methods (e.g., Masri 1996; Duxbury et al. 2002) seek to exploit the presence of these transients associated with the attack—also known as attack transients—as they tend to exhibit wide-band energy. Such onset detection strategies are well suited for percussive onsets. Alternatively, many musical events such as legato strings have comparatively longer attack sections, which are not

characterized by attack transients. To detect onsets of this nature, alternative measures (e.g., pitch changes) tend to perform well.

4.2.2 Preprocessing strategies

Preprocessing of the audio signal is conducted prior to reduction and peak-picking stages, to amplify desired signal attributes (e.g., transients) or reduce unwanted signal characteristics (e.g., interference between instruments in different frequency ranges) prior to reduction. While not a mandatory stage in all onset detection algorithms, preprocessing has been demonstrated to improve onset detection results (Bello et al. 2005; Stowell and Plumbley 2007) and can be categorized into either transient identification and modification techniques or sub-band decomposition.

4.2.2.1 *Transient identification and modification techniques*

Transient identification and modification techniques are data-driven methods for either the extraction or enhancement of transient components within an input signal. One such method may be derived from spectral modeling synthesis (McAuley and Quatieri 1986), in which transient components are extracted from the input audio signal by removal of steady-state components. Goodwin and Avendano (2004) present a different method, in which transients may be amplified through parameterized perceptual attributes (e.g., punch or warmth). Stowell and Plumbley (2007) proposed another transient modification method, by which the spectrum was adaptively whitened to enhance the presence of transients. These approaches modify the input signal through an exploitation of transient presence; however, their usefulness is dependent on the subsequent reduction method chosen and the amount of transients in the underlying signal.

4.2.2.2 *Sub-band decomposition*

Another common preprocessing strategy is sub-band decomposition (Klapuri 1999; Duxbury et al. 2002), in which the frequency axis of the input signal is divided across multiple channels or sub-bands. As opposed to the adaptive nature of the above transient modeling techniques, sub-band decomposition tends to rely on fixed parameters (e.g., filter cutoff frequencies and roll off). The rationale behind this process is to reduce the interference between instruments that occupy different

frequency ranges of the spectrum. Filter frequencies are often chosen for their perceptual relevance. Smith (1994) incorporated a filter bank intended to mimic the auditory functionality of the cochlea by splitting the input signal into 32 bands prior to reduction as in Moore and Glasberg (1983). Klapuri (1999) also approximated the functionality of the cochlea by scaling a signal to 70 dB as in Moore et al. (1997), before dividing the signal into 21 critical band-pass filters. Additional processing is then performed in each of these filters before combining the results to produce a sum detection function.

Logarithmic transformations of the frequency axis allow different notes to be assessed as frequency shifts of one other; an ideal characteristic in the assessment of non-percussive onsets, whose detection is more associated with pitch change. The constant-Q transform provides an equal number of filters per octave, and was used by Zhou et al. (2008) as a front-end to their onset detection algorithm. Pertusa and Iñesta (2009) assessed STFT (Short-Time Fourier Transform)-derived magnitudes within a semitone filter bank to capture the fundamental frequencies along with many of the related harmonics associated with pitched musical events.

4.2.3 Reduction techniques

Of the three stages involved in many onset detection methods, reduction is considered the most important (Bello et al. 2005). The purpose of this stage is twofold: to simplify the input audio signal, and to emphasize characteristics that are useful in the detection of onsets (e.g., attack transients). The output of the reduction stage is a highly-downsampled continuous feature vector termed either a detection function (Bello et al. 2005) or a novelty function (Foote 2000). These simplified waveforms are often employed as features in subsequent tasks such as beat tracking or downbeat detection. Several methods have been proposed to perform reduction. While all the methods presented in this section are window-based signal analysis techniques that produce a single value for the entire window under analysis,[43] the calculation undertaken to achieve this value differs. Early methods performed reduction exclusively in the time domain, while more recent methods have been

[43] A typical window size might be in the range of 256 to 4096 audio samples for a signal with a 44100 Hz sample rate (approximately 6–93 msec).

performed through the use of spectral analysis. Another recent trend is the incorporation of statistical models and probability in the process of reduction in an attempt to overcome noise associated with the features chosen for the reduction process (Davy and Godsill 2002; Lacoste and Eck 2007; Eyben et al. 2010).

4.2.3.1 *Time-domain reduction techniques*

Prior to analysis of musical signals, reduction strategies were developed by speech analysis researchers to identify boundaries of the spoken word. The first techniques used were time-domain techniques, such as the root mean square (RMS), short-term energy, average magnitude, and zero-crossing rate (Rabiner and Schafer 1978, 132–81). Gordon (1984) and Schloss (1985) were among the first researchers to apply reduction techniques to musical signals; both researchers applied reduction using time-domain amplitude calculations in the estimation of onset positions within musical audio signals.

4.2.3.2 *Time-frequency reduction techniques*

More recent reduction strategies have been achieved through the use of time-frequency representations (TFR), which transform an input audio signal into a spectral representation over time. The short-time Fourier Transform (4.1), or STFT, is an often-used signal decomposition method that has been applied in several frame-based reduction strategies. The value of each frequency bin k of spectral frame $\mathrm{X}_k(m)$ is derived from input audio signal $x(m)$, using a window function $w(n)$ of length M, and a window-overlap size (hop size) h:

$$\mathrm{X}_k(m) = \sum_{n=-\frac{M}{2}}^{\frac{M}{2}-1} x(mh+n)w(n)e^{-j2\pi nk/M}. \qquad (4.1)$$

For input signals containing onsets characterized by sharp attacks, energy-derivative methods offer a good representation of high-frequency information. A variety of spectral energy-based detection functions have been achieved through the use of the magnitude spectrum derived from the absolute value of $\mathrm{X}_k(m)$. A measure of local energy (4.2) may then be generated for each frame of audio by:

$$\Gamma(m) = \frac{1}{M} \sum_{k=-\frac{M}{2}}^{\frac{M}{2}-1} |X_k(m)|^2. \quad (4.2)$$

Masri (1996) presented high-frequency content or HFC (4.3) produced by a linear weighting W_k of the magnitude by its corresponding frequency bin, resulting in an emphasis on higher frequencies. This method was used for improvement of onset detection towards resynthesis of percussive sounds.

$$\Gamma(m) = \frac{1}{M} \sum_{k=-\frac{M}{2}}^{\frac{M}{2}-1} W_k |X_k(m)|^2. \quad (4.3)$$

Masri (1996) also presented a detection method based on spectral dissimilarity (4.4), which was formulated through the sum difference of the magnitudes in frequency bins in spectral frames two frames apart:

$$\Gamma(m) = \sum_{k=-\frac{M}{2}}^{\frac{M}{2}-1} \frac{|X_k(m)|^2 - |X_k(m-2)|^2}{|X_k(m-2)|^2}. \quad (4.4)$$

A similar approach, spectral difference (4.5), was presented in Bello et al. (2005) (an earlier formulation was proposed by Duxbury et al. (2002)) and was calculated as:

$$\Gamma(m) = \sum_{k=-\frac{M}{2}}^{\frac{M}{2}-1} \{H(|X_k(m)| - |X_k(m-1)|)\}^2, \quad (4.5)$$

where negative values are set to zero by $H(x) = (x + |x|)/2$.

Bello and Sandler (2003) assessed the sum derivative of phase kurtosis between successive STFT frames, useful for interpreting tonal variation in music signals without substantial attack transients. This approach relied on the assumption that a steady-state signal will contain minimal phase deviation between spectral frames and sections containing onsets would demonstrate much greater deviation, resulting in large peaks. The differential angle (phase change) $\Delta\varphi_k$ (4.6) for each bin was determined by:

$$\Delta\varphi_k(m) = \varphi_k(m) - 2\varphi_k(m-1) + \varphi_k(m-2), \tag{4.6}$$

which should be near zero in frames not containing onsets, and far from zero in frames with onsets. N. Collins (2005) presented an alternative reduction approach for this class of audio signals making use of fundamental frequency detection, which finds the lowest frequency of a periodic waveform. Reduction is performed using the derivative of a normalized pitch contour, and smoothed by vibrato suppression.

Bello et al. (2004) presented the complex-domain approach, a method by which both phase- and energy-based approaches could be merged to provide emphasis for onsets containing both high and low frequencies. Here, a target magnitude $\hat{X}_k(m)$ was predicted by incorporation of spectral information from the previous two frames, and phase deviation $\Delta\varphi_k(m)$ was calculated as in (4.6). Stationarity was then assessed for each spectral bin k as:

$$\begin{aligned}\vartheta_k(m) \;=\; \{&\left|\hat{X}_k(m)\right|^2 + |X_k(m)|^2 \\ &-2\left|\hat{X}_k(m)\right|\,|X_k(m)|\cos\left(\Delta\varphi_k(m)\right)\}^{\frac{1}{2}},\end{aligned} \tag{4.7}$$

and the complex-domain detection function (4.8) was then created by summing across the frequency domain:

$$\Gamma(m) = \sum_{k=1}^{M} \vartheta_k(m). \tag{4.8}$$

Other TFRs have also been used as a basis for reduction. Gillet and Richard (2005) derived a detection function from analysis of the noise subspace extracted from the Exponentially Damped Sinusoid model. Zhou et al. (2008) transformed input audio through a resonator filter bank to achieve a resonator time-frequency image. The energy spectrum was first transformed through a harmonic grouping stage, and a pitch-energy detection function was produced from the lower fifth of the spectrum.

Reduction has also been performed through the use of the source-filter model. After sub-band decomposition, Lee and Kuo (2006) combined the error signal from adaptive linear prediction filters with the energy from the highest sub-band. Linear prediction coefficients were determined using least mean squares, and the prediction

error from the deterministic assumption of the model was used to generate a detection function.

4.2.3.3 *Statistical models and probabilistic reduction techniques*

Reduction is also possible through the use of statistical models and probabilistic inference. Traditional change-point detection models from other disciplines (e.g., seismology) typically rely on the assumption that the observed signal is the result of a few well-defined events within random noise; these assumptions are not usually held in musical onset detection, as there are generally a large number of musical events in a given musical audio signal. However, change-point methods have been established for phonetic segmentation of continuous speech. Sequential probability ratio tests (SPRTs) were developed for use with speech signals, and continually test the appropriateness of a derived model to an observed signal. Andre-Obrecht (1988) compared two SPRTs, the first being a divergence test derived from the Kullback divergence, and the second being Brandt's Generalized Likelihood Ratio method. Both methods were intended to find transients within an input signal by making probabilistic assumptions of the auto-regressive model. Jehan (1997) extended the latter method for use with musical signals. Davy and Godsill (2002) presented a hybrid probability/time-frequency technique, which determined similarity between adjacent Cohen's class TFR frames using support vector classification (SVC).

An alternative approach by Lacoste and Eck (2007) introduced a supervised classification method using a trained feed-forward artificial neural network (ANN) with two hidden layers. At every time step, the feed-forward ANN performed a binary decision regarding the presence of an onset. Input features included spectral magnitude and phase calculations from the present and surrounding frames. The algorithm required training data, and learning was performed by conjugate gradient descent. A conceptually similar model was proposed by Eyben et al. (2010), who applied a recurrent ANN to emulate the capacity of memory through the use of a delay-line architecture in the hidden layers of the ANN. The particular form of ANN was a bidirectional long short-term memory (BLSTM) network, which parsed the signal forwards and backwards, thus taking both past and future information into

account when assessing onsets. Reduction was performed by the BLSTM in response to an input of two Mel-spectrograms with different window sizes.

4.2.4 Peak-picking strategies

Once reduction has been performed on an input audio signal, discrete time locations of onsets are determined through the process of peak picking, in which peaks of the reduced signals are identified and associated with the positions of onsets. Peak-picking methods may span from simple local maxima calculations to adaptive threshold techniques to probabilistic determination. A simple local maxima method (4.9) may be formulated by selecting peaks as the subset of samples from the detection function Γ that satisfy the following three conditions:

$$\begin{aligned} \Gamma(m) &> \Gamma(m-1), \\ \Gamma(m) &> \Gamma(m+1), \\ \Gamma(m) &> \kappa(m), \end{aligned} \tag{4.9}$$

where κ is a static threshold below which no onsets are selected. The threshold, κ, may also be data-driven and dynamic, as proposed by Bello et al. (2004):

$$\kappa = C \times median(k_v), \qquad k_v \in \left[v - \frac{M}{2}, v + \frac{M}{2}\right], \tag{4.10}$$

in which k_v is a sliding M-length segment of the detection function Γ, where v is consistently the central point within k_v, and C is a scaling factor for the threshold.

Recent onset detection methods have also incorporated statistical models and probability in the peak-picking stage. Röbel (2007) presented an onset detection algorithm based on a modified time-domain attack transient modeling technique, originally created for the minimization of artifacts from phase vocoder transformations. An initial binary classification of the center of gravity (CoG) of the group delay was used to determine the presence of transients within regions containing peaks. The CoGs for transient peaks at the start of musical sounds tend to be in synchrony, and are different than those within noise. To remove peaks associated with noise, a secondary classification compared the time locations of all peaks with each another, and discarded those peaks that were not in synchrony. Towards the identification of vocal onsets, Toh et al. (2008) presented another

statistical peak-picking model. This particular class of onsets is usually difficult to detect as the sung voice often blurs word boundaries. Here, a binary classification regarding the presence of an onset was performed using a Gaussian mixture model. The model was trained using a fusion of multiple timbral features.

4.2.5 Evaluation of onset detection algorithms

The performance of several of the aforementioned algorithms has been formally assessed in the Music Information Retrieval Evaluation eXchange (MIREX) campaign. The MIREX onset detection task has been conducted in 2005, 2006, 2007, 2009, 2010, 2011, and 2012 (Downie 2012). Performance of algorithms in each evaluation has been determined using the MIREX 2005 dataset. This dataset is comprised of 85 files and consists of nine classes of music. These classes include solo instrumentation, e.g., sung voice, sustained strings, and drums, as well as complex mixed music including multiple instruments playing concurrently (Downie 2005b). Each file has been annotated by at least three researchers. Algorithms were evaluated using the F-measure, a score based on the combination of two other metrics: precision and recall. These metrics are in turn based on the correctness of the observations, which is determined using a tolerance window placed around each of the annotated onsets. There are two possible types of errors: If an algorithm falsely detects an onset, this event is labeled as a false positive, or f_p. If it fails to detect an onset, the event is labeled as a false negative, or f_n. Precision, P, is the proportion of the correctly found onsets c_o to the number of found onsets:

$$P = \frac{c_o}{c_o + f_p}, \tag{4.11}$$

and recall R is the measure of the correctly found onsets to the number of onsets that should have been found:

$$R = \frac{c_o}{c_o + f_n}. \tag{4.12}$$

The F-measure F is then calculated as:

$$F = \frac{2PR}{P+R} \times 100. \quad (4.13)$$

The highest-performing algorithm to date is that of Eyben et al. (2010), which achieved an F-measure of 85% across all music types. This is followed by Zhou et al. (2008) with 81%, Lee and Kuo (2006) and Röbel (2007) with 80%, and Lacoste and Eck (2007) with 74%.

The MIREX audio onset detection task assesses the performance of full systems. As reduction produces a feature vector used in other tasks (e.g., beat tracking and downbeat detection), evaluation of the usefulness of reduction strategies in these further tasks is also of importance. Davies and Plumbley (2005) performed a comparison of seven reduction strategies and the effect each had on the subsequent task of beat tracking. The spectral difference method (e.g., Duxbury et al. 2002) was found to contribute to the best beat-tracking results for their beat tracker using a test database comprised of a variety of popular music genres. Beat-tracking accuracy was reduced substantially with the inclusion of a peak-picking stage (thus using onsets alone). The authors attributed this result to a reduction in the salience of peaks of the autocorrelation function used for periodicity determination in beat tracking.

4.3 Beat tracking and tempo induction

Beat tracking is a computational task that attempts to replicate the psychological phenomenon of a perceptual synchronization with a heard piece of music. Beats themselves are isochronous markers on the temporal axis, generated at likely positions where a listener might tap during the listening process. They are perceptual constructs existing on several related metrical levels; traditional music theory stipulates that beats on higher metrical levels correspond with beats on all lower levels (Lerdahl and Jackendoff 1983). The most influential of these levels is the tactus, which typically controls the local timing of a musical piece. It is this beat level that all beat-tracking algorithms attempt to identify. In order to do this, beat tracking algorithms must identify both the beat period and the beat phase—in other words, the duration between beat events and the temporal location of the events, respectively. Some beat trackers also locate additional beat levels such as measure

boundaries and the tatum (Bilmes 1993), the smallest subdivision of the perceived beat period (often represented as an eighth or sixteenth note). Tempo induction involves the extraction of the beat period alone and the output is often displayed in beats per minute (BPM).

Research in beat tracking and tempo induction has been driven by its relevance in several areas. A large portion of early research was devoted to the development of auditory models of pulse perception (Desain and Honing 1994; Large and Kolen 1994), an outgrowth from prior psychology and physiology studies (Michon 1967). More recent approaches have been proposed by researchers in computer intelligence (Ellis 2007; Klapuri et al. 2006; Davies and Plumbley 2007; Davies et al. 2009). Beat tracking and tempo induction methods have been utilized in several music-related research areas, including music information retrieval tasks (Tzanetakis and Cook 2002; Dixon et al. 2004), automatic music transcription (Klapuri et al. 2006), and automated accompaniment (Allen and Dannenberg 1990; Toiviainen 1999; Rowe 2001; Davies 2007). Beat-tracking techniques have been incorporated in other research fields, such as physical therapy (Li et al. 2010), and have been incorporated in systems for synchronization of audio with sensor data (Hockman et al. 2009). In addition, developments in beat tracking and tempo induction research have relevance to commercial music production and performance. Commercial sequencers (e.g., Ableton Live[44] and Apple Logic[45]) have become increasingly reliant on content-aware synchronization, and provide specialized mixing and processing techniques that rely on audio beat tracking and tempo induction. Additionally, beat- and tempo-based effects processing (N. Collins 2006; Ravelli et al. 2007; Sethares 2007; Stark et al. 2007; Hockman et al. 2008) have become increasingly popular within several music genres (including Drum & Bass).

The general procedure used in most audio tempo-induction algorithms is comprised of three steps: First, the audio signal undergoes a process of onset detection. This simplifies the signal, creating either a series of discrete onsets or a continuous detection function. Second, frame-wise beat periodicity analysis is performed on the reduced signal to extract a likely beat period. Third, the algorithm

[44] http://www.ableton.com/en/live/

[45] http://www.apple.com/ca/logicpro/

identifies which period is most likely, and assigns this value as the tactus. Beat-tracking algorithms undergo an additional stage of beat phase selection to extract beat times (the location of beats within the timeline), which are somewhat similar to meter, but without prescribing an ordering of beats within a measure. Figure 4.4 provides an overview of these stages for both tempo induction and beat tracking.

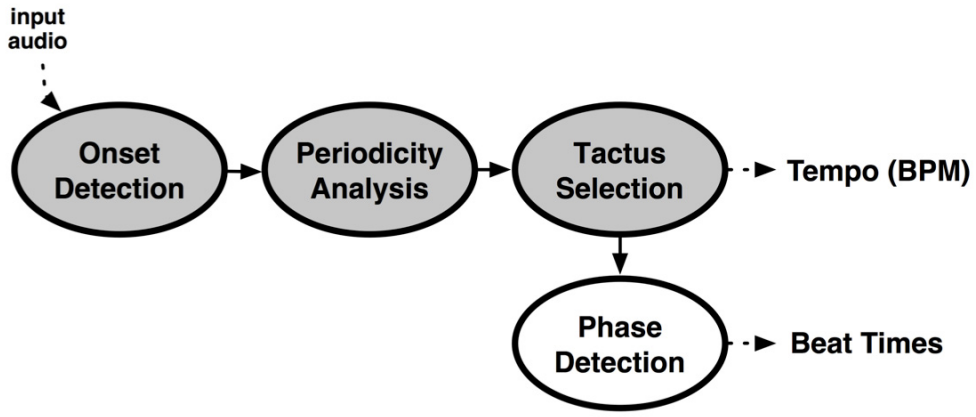

Figure 4.4: Overview of typical stages in audio beat-tracking algorithms. For tempo induction (shaded region), the input audio undergoes a three-stage process of onset detection, periodicity analysis, and tactus selection for the extraction of tempo in beats per minute (BPM). Beat tracking systems (both shaded and unshaded regions) undergo an additional stage of beat phase selection to extract beat times.

4.3.1 Onset detection for beat tracking and tempo induction

Onset detection in beat tracking is identical to the task discussed in Section 4.2. The output of the onset detection stage depends on the method, and is either a discrete set of onset times (Goto and Muraoka 1995; Dixon 2001; Raphael 2001; Cemgil and Kappen 2003; Hainsworth and Macleod 2004) or a continuous curve known as a detection function, a mid-level representation, or a driving function (Scheirer 1998; Klapuri et al. 2006; Seppänen et al. 2006; Davies and Plumbley 2007; McKinney et al. 2007).

4.3.2 Periodicity analysis

Beat-period estimation provides the distance between beat points, and is typically achieved through a frame-based periodicity analysis of the signal (frame lengths of approximately five seconds are typically used). There are three standard methods by which this calculation is most often performed: IOI histogram, comb filter bank, and autocorrelation.

4.3.2.1 *IOI histogram*

The IOI histogram is often used in methods that output a discrete set of onset times from onset detection (Dixon 2007). Once note IOIs have been extracted, note lengths are tallied in bins covering discrete time intervals that represent the possible beat periods—also known as lags. Tallies are then aggregated into a vector spanning the range of lags; lags displaying large tallies are understood to be more likely beat periods than those that do not.

4.3.2.2 *Comb filter bank*

The comb filter bank was first applied in beat tracking by Scheirer (1998). Beat period estimates were created by measuring the resonance generated when passing the input signal through each of the filters in the filter bank. Each filter was comprised of a number of comb elements, equidistant to one another and set to a distance associated with a particular beat phase. Output energies were then aggregated creating a similar lag space as in the histogram method mentioned above. An advantage of this technique is that once the beat period has been chosen, the beat phase is directly accessible through the internal states of the selected filter, and beat times can be subsequently derived. Several authors since Scheirer have used the comb filter bank for periodicity analysis (Jehan 2005; Klapuri et al. 2006; Kurth et al. 2006).

4.3.2.3 *Autocorrelation*

An autocorrelation function assesses the identity and strength of periodicities in a signal, and is performed through a dot multiplication of a signal and a time-shifted version of itself. Indices of the autocorrelation output, or lags, represent the length of the periodicities found in the input signal. Brown (1993) applied autocorrelation to

symbolic melodies of Classical music to extract musical meter. It has since been used towards detection of metrical periodicity and tempo in detection functions derived from audio signals (Alonso et al. 2007; Leue and Izmirli 2006; Seppänen et al. 2006; Davies and Plumbley 2007; Ellis 2007). Autocorrelation has the advantage of being computationally less complex than the comb-filter bank approach, but has the disadvantage that it does not preserve phase information; an additional calculation is required to recover this information.

It has been argued that the beat period may be calculated by any one of the above techniques without much difference between results (Klapuri et al. 2006; McKinney and Moelants 2004), making the choice of periodicity function for beat tracking not crucial. The bulk of recent research in beat tracking has instead been in the areas of onset detection (see Section 4.2) and the incorporation of musical knowledge for the selection of the tactus.

4.3.3 Tactus selection

Once periodicity analysis has been performed, there are several possible lags that may be associated with the beat period. To help choose between them, most beat trackers use some form of parameterized knowledge by either listener synchronization habits or musical characteristics. This knowledge may take several forms, from a limitation of possible lags to musically plausible candidates, to a conditional dependency of the present tempo on the previously chosen value defined within a probabilistic model. The need for such knowledge comes from the ambiguity faced in periodicity analysis of real signals, which may include intra-measure timing variations (e.g., the swing factor in Jazz (Prögler 1995, Friberg and Sundström 2002, Butterfield 2010)), syncopation, and local tempo shifts. Often, inspection of the periodicity lags in a section of most musical signals will demonstrate peaks in several lag positions, due to the octave-related resonances (e.g., in music in duple meter, half- and double-time periods will compete with the tactus), as well as other peaks due to competing rhythms and noise; often the presence of these additional peaks may overshadow the desired period. As a result, a selection of beat period based on lag energy alone at each frame will result in a highly unsteady tempo over time for many music sources.

This effect is not unique to algorithms for tempo induction and beat tracking, as synchronization studies demonstrate musical tempo and beat localization for humans to be variable and highly subjective as well (Fraisse 1982; Parncutt 1994; Snyder and Krumhansl 2001; Toiviainen and Snyder 2003). However, MIR applications such as music recommendation often require single BPM values as tempo estimates. In recent years, methods have been proposed to mitigate this problem, either through a comparison of features extracted from several plausible levels (Smith 2010), through the use of statistical models for learning the association between timbral features and different BPM values (Xiao et al. 2008), or through probabilistic classification incorporating listener supplied labels associated with the perceptual attributes of a tempo range (Hockman and Fujinaga 2010; Levy 2011; Peeters and Flocon-Cholet 2012).

4.3.4 Beat tracking and tempo induction methods

In this section, several well-known methods for computational beat tracking and tempo induction are presented. The methods are categorized into techniques that first extract IOIs through a discrete onset detection stage prior to periodicity analysis and those that use the continuous detection function generated from the reduction stage in onset detection.

4.3.4.1 *Methods based on discrete onset detection*

Early beat tracking systems operated with symbolic data as input, initially converting note onset lists to IOIs. Allen and Dannenberg (1990) presented one of the first of these systems, which incorporated a real-time beam search method to explore multiple concurrent interpretations of a symbolic performance. IOIs were attributed to metrical durations (e.g., quarter note) and hypotheses were created based on this assignment. A multiple-agent architecture was used to associate a degree of credibility with each hypothesis. Improbable hypotheses were then pruned through the use of musical rules.

The first audio beat-tracking algorithm was the Beat Tracking System (BTS) by Goto and Muraoka (1995). BTS incorporated an onset detection stage to reduce input to a series of IOIs, and a multiple-agent architecture was used to assess the merit of several hypotheses. Beat times and types (i.e., "strong" or "weak") were

realized in a two-stage process of event detection and beat prediction. The event detection process included both discrete onset detection and bass drum and snare drum detection. Input audio was decomposed into sub-bands, from which onsets were extracted by multiple independent onset detection routines. BTS learned the characteristic frequencies for the bass drum tones in each input signal. Each IOI was then surveyed for its frequency content and compared with the learned bass tone. Snare drums were detected by searching for wideband noise activity. Twenty-eight multiple agents tracked the beat period, beat phase, and beat type hypotheses, and a manager selected the most likely hypothesis based on a reliability measure established from a prior estimate.

The BeatRoot system by Dixon (2001) was another multiple-agent beat tracking system developed to study expressive timing within performances. Input audio was reduced to onset times through peak picking a time-domain detection function that was subsequently replaced (Dixon 2007) by the spectral flux calculation (equation 4.5). IOIs were then clustered together and hypotheses were generated regarding durations present in the clusters, creating a ranked tempo hypothesis list used for beat tracking. Multiple agents were used to test the validity of each hypothesis initialized. Each agent was assigned a tempo hypothesis and initial onset, from which it estimated the time of the next beat. If the next onset was found within a small window surrounding this predicted time, the system identified this time as a beat. Agents were created as needed to follow beat period and phase possibilities that were not being investigated by other agents, and were terminated when similar hypotheses were being followed concurrently, or if no beat times were reported.

The quantization approach (discussed in Section 4.1) proposed by Desain and Honing (1989, 1994) has also been adapted for tempo induction of an input audio signal. Raphael (2001), Cemgil and Kappen (2003), and Hainsworth and Macleod (2004) extracted tempo and rhythmic structure from a list of note onsets generated through onset detection. Each observed IOI was assumed to be the result of the product of a hidden metrical duration and hidden tempo. The tempo was initially modeled as a Gaussian process. Upon future observations, the tempo was updated as a function of the previous tempo and a zero-mean Gaussian noise term with a variance given by the length of the metrical note. This results in a dynamic tempo

process with an increased range of possible tempi for longer notes. Probabilities of all possible metrical values for a given IOI were tested for validity by overlaying Gaussian kernels representing the joint probability of the metrical position, IOI and tempo. The assumption underlying this approach was that at the end of the sequence, the path with the highest score would demonstrate the most likely note durations and tempo evolution. Raphael (2001) identified the most likely path by computing *maximum a posteriori* (MAP) estimates from the joint probability density function comprised of metrical position, tempo and onset interval. To keep the number of tractable states within reason, he introduced a selection method that discarded those solutions that did not add to the overall likelihood calculation—a process termed thinning. In place of this process, Cemgil and Kappen (2003) and Hainsworth and Macleod (2004) applied probability distribution sampling strategies such as Markov chain Monte Carlo and particle filtering to reduce the state-space and discard solutions with low likelihoods.

4.3.4.2 *Methods based on continuous onset detection*

The methods presented in Section 4.3.4.1 infer tempo and beat through an intermediate step of identifying note lengths or drum type. The following beat tracking and tempo induction methods extract beat and tempo directly from signal trends and characteristics, through the use of either comb filters or autocorrelation for periodicity analysis.

Scheirer (1998) introduced the use of a comb filter bank to track the beat period and phase of a music signal. The input signal was first divided into six sub-bands to isolate rhythmic activity into frequency bands that best characterize them. The signal in each sub-band was then reduced to a detection function (termed an envelope by Scheirer (1998)) and passed through a bank of 150 comb filters equivalent to tempi between 60 and 240 BPM. The beat period (and subsequently the beat phase) was selected as the filter displaying the maximum energy from the aggregated comb filters.

Klapuri et al. (2006) extended Scheirer's (1998) model, with the use of a hidden Markov model to extract the temporal evolution of a hidden metrical sequence exhibited in the comb filter bank output over time. The joint-state estimates of the

present tactus, tatum, and meter periods were achieved through a first-order Markov process, in which the present filter bank output and transition probabilities between periods were used to generate a probabilistic determination of the present state. Selection of measure-length periodicities and tatum helped to reduce incorrect tactus attribution. The strength of this model lies in its ability to reinforce a metrical framework within sections displaying less prevalent metrical observations.

For periodicity analysis, Davies and Plumbley (2007) applied an autocorrelation function to an input audio signal that had been reduced using the complex spectral difference (Bello et al. 2004). The autocorrelation output (ACF) is weighted by one of two possible functions based on consistency with previous estimates. The weighted ACF was then sent as an input to a bank of comb templates, representing tempi between 40 and 240 BPM, and the template exhibiting the most energy was selected as the period. Beat alignment was achieved through the use of a similar bank of comb templates; the template exhibiting the maximum energy when cross-correlated with the detection function frame was selected as the starting point for beats in the frame.

Ellis (2007) presented a beat-tracking method used as a front-end segmentation algorithm in a cover song identification system. Autocorrelation was performed on a detection function, and the output was weighted with a Gaussian distribution centered at the autocorrelation lag associated with 120 BPM. Beat times were recovered using dynamic programming with the maximum value of the weighted ACF chosen as a likely beat period. Alonso et al. (2007) and Davies et al. (2009) have also used dynamic programming to estimate beat locations once periods have been estimated.

Autocorrelation has been the method of choice for periodicity analysis in other beat tracking and tempo induction methods. Towards analysis of drum performances, Battenberg (2012) generated a pulse hypothesis through the short- and long-term autocorrelation of detection function and drum detection signals. This serves as the basis for beat locations and a measure and tatum model. To overcome the inherent loss of phase associated with the autocorrelation calculation, Eck and Casagrande (2005) proposed the autocorrelation phase matrix, an alternative

formulation of the autocorrelation function, which could be used for a periodicity function by calculating the Shannon entropy at each lag.

4.3.5 Beat tracking and tempo induction evaluation

Several methods have been proposed for measuring beat tracking and tempo induction performance. Evaluation of these algorithms has the potential to offer a measure of success of an individual algorithm, a comparison between algorithms, and a quantifiable measure of an algorithm's ability compared to human abilities. However, beat tracking evaluation is more problematic than it might otherwise seem. Unlike a task like onset detection evaluation (Section 4.2.5), beat tracking and tempo induction attempt to replicate cognitive tasks. A listener infers beats; the presence of an event may not have signal attributes associated with it. In addition, choosing the appropriate beat level and phase is somewhat ambiguous, as there are a variety of interpretations of beats or tempi that may be perceptually relevant. Nonetheless, several evaluation methods have been proposed, and will be discussed in this section.

The majority of evaluation methods that have been proposed have focused on objective evaluations, for which ground-truth annotations must be collected for comparative purposes. At present, only one publicly available database (Goto 2006) exists, a revealing effect of the cost due to copyright restriction, and the labor involved to ensure the preciseness required in the generated data.

As in onset detection evaluation, several researchers (Goto and Muraoka 1997; Dixon 2001; Hainsworth and MacLeod 2004; Klapuri et al. 2006; Davies and Plumbley 2007) have constructed a window surrounding each annotation to delineate the boundary between correctly and incorrectly identified candidate beats. Goto and Muraoka (1997) used a dynamically-sized window, the length of which was dependent on the inter-beat interval (IBI) of annotations. Informal listening tests performed by Goto and Muraoka (1997) served as motivation to limit the acceptable range ψ of a beat candidate's deviation from annotations to be $\pm$17.5%. The metrics assessed were based on the construction of beat error signal E, in which each beat candidate B_d was first associated with the closest beat annotation A_l that was within one half of the inter-beat interval IBI_l of the annotation beats, if the following conditions were true:

$$A_l - \tfrac{1}{2} IBI_{l-1} \leq B_d < A_l + \tfrac{1}{2} IBI_l, \tag{4.14}$$

$$where: \quad IBI_l = A_{l+1} - A_l. \tag{4.15}$$

Each pair of points, B_d and A_l, were then compared to produce E_l:

$$E_l = \begin{cases} \dfrac{|B_d - A_l|}{r_l} & when\ A_l\ is\ paired\ with\ B_d \\ 1 & otherwise, \end{cases} \tag{4.16}$$

$$where: \quad r_l = \begin{cases} \dfrac{IBI_l}{2} & B_d \geq A_l \\ \dfrac{IBI_{l-1}}{2} & B_d < A_l. \end{cases} \tag{4.17}$$

To find the longest correctly tracked period, E was then reduced to E', the subset of points that correspond with $E < \psi$; in (4.16), ψ was associated with points less than 0.35. The mean, standard deviation, and maximum value were then extracted from E'. An overall measure of accuracy was achieved through the calculation of three values based on the following statistics: (1) V_1, the start time divided by the end time when E' starts less than ¾ through the excerpt (otherwise zero); (2) V_2, the mean of values of E' when less than 20% of the half-beat interval (otherwise zero); and (3) V_3, the standard deviation when less than 20% of the half-beat interval (otherwise zero). A final accuracy was provided by:

$$acc_{Goto} = V_1 V_2 V_3. \tag{4.18}$$

Hainsworth and MacLeod (2004), Klapuri et al. (2006) and Davies and Plumbley (2007) have partially adopted Goto and Muraoka's (1997) framework (equations 4.14–4.18) and incorporated the additional step of resampling the annotations to half and double the original time, to account for beat periods of half and double the metrical level of an annotation. Hainsworth and MacLeod (2004)

additionally encoded a continuity constraint, which requires the current IBI to be similar to the inter-annotation interval (IAI), and is restricted by the following criteria: (1) The present beat candidate must be within a range of η_1 on either side of the present annotation, where $\eta_1 = \pm 15\%$ of the IAI. (2) The previous candidate must also have been within η_1 of the previous IAI on either side of the associated annotation, and (3) the present IBI must be within η_2, where $\eta_2 = \pm 10\%$ of the IAI. Klapuri et al. (2006) and Davies and Plumbley (2007) also encoded similar continuity constraints, with η_1 and $\eta_2 = \pm 17.5\%$.

Hainsworth and MacLeod (2004), Klapuri et al. (2006), and Davies and Plumbley (2007) used two continuity metrics for accuracy (equation 4.19–4.20); both were based on finding each set q of continuously correct beats ε. The first measure is produced as:

$$acc_{continuity1} = \frac{\max(\varepsilon_q)}{K} \times 100, \tag{4.19}$$

where K is the number of actual beats in the entire file. The second accuracy measure is more lenient, as it includes all sections of ε:

$$acc_{continuity2} = \frac{\sum_{q=1}^{Q} \varepsilon_q}{K} \times 100. \tag{4.20}$$

Dixon (2001) defined correct beats, c_b, as those lying within 70 msec on either side of the annotated beats. Beats outside of this range were labeled false positives, f_p, and if completely absent between beat annotations, they were labeled false negatives, f_n. An accumulated score was then provided by:

$$acc_{Dixon} = \frac{c_b}{c_b + f_p + f_n} \times 100 \tag{4.21}$$

An alternative metric, the F-measure (discussed in Section 4.2.5) has also been adopted in Dixon (2007) for beat tracking evaluation. The principal difference here was that beats were the subject of the evaluation instead of onsets.

As an alternative to window-based methods of evaluation, the 2006 MIREX beat-tracking task evaluation (McKinney 2006) instead used a cross-correlation between impulse trains derived from ground-truth annotations and the model output. A potential advantage of this approach was its ability to gauge the presence

of multiple possible beat levels simultaneously. Annotation impulse trains, p_y, were created with unit response for each annotation, and similarly a beat tracker impulse train, p_b, was generated from the beat candidates. Then, as in (4.22), the cross-correlation of p_y and p_b, was performed with the use of a sliding window. This was repeated for each of the annotations, and averaged over the total number of annotations, Y, to create a final score for a given file.

$$acc_{MIREX} = \frac{1}{Y}\sum_{y=1}^{Y}\frac{1}{\max\left(\sum p_b, \sum p_y\right)}\sum_{t=-W}^{W}\sum_{i=1}^{I} p_b(i)\cdot p_y\,(i-t), \qquad (4.22)$$

where W was the sample position of the window under analysis, and I was the index of the beat under analysis.

For evaluation of tempo induction algorithms, Gouyon et al. (2006) presented two accuracy metrics for tempo induction that used a tolerance range, T, defined as an acceptable range of $\pm$4% divergence from the ground-truth tempo annotation. Accuracy metric 1 (AC1) was the percentage of tempo estimates within T of the annotated tempo, and accuracy metric 2 (AC2) was the percentage of tempo estimates within T of either the annotated tempo, or half, double, triple, or one-third of the annotated tempo.

4.4 Downbeat detection

This chapter has thus far presented methods for the detection of onsets (Section 4.2) and beats (Section 4.3) in an input audio signal. Detection of beats produces a grid of isochronous time points on the temporal plane, which denotes where a listener might tap when listening to music. Beats do not, however, provide the counting mechanism that is needed in the analysis of rhythm and meter. While the beat grid is useful in the analysis of breakbeat usage in HJDB music, to determine how a breakbeat has been modified, we must also be able to identify where the breakbeat pattern begins. In HJDB music, as in most DJ-oriented electronic music, drum patterns begin at downbeats. These are higher-level pulse patterns that are associated with the first beat in every measure, or if counting beats, the "one". The task of downbeat detection involves: (1) the estimation of musical meter—a counting mechanism for hierarchical stressed and unstressed beats within a measure—and (2) the beat that

denotes the start of the measure. This two-stage process is analogous to that of periodicity detection and beat phase detection in the task of beat tracking (Davies 2007) described in the previous section.

Robust downbeat detection would benefit information retrieval tasks such as structural analysis (Dixon et al. 2004) and would facilitate analysis of phrase structure and hypermeter, both useful in improving automated mixing and DSP effects that rely on musically relevant change-point positions. More relevant to our interests, downbeat detection provides key segmentation points that allow for a comparison of HJDB artists' drum usage. Recent DJ software packages, such as Native Instruments' Traktor[46] have begun to provide a synchronization feature through which users may automatically align two pieces of music through beat and downbeat detection. This synchronization feature has been implemented to facilitate DJing by performing this task automatically, leaving users to focus on other subtasks associated with DJing (e.g., track selection and crossfading between tracks).

4.4.1 Downbeat detection methods

Relatively few algorithms for downbeat detection currently exist—far fewer than in the literature for either onset detection or beat tracking. A possible reason for this imbalance may be related to the increased complexity of the task; prior to extracting downbeats, the estimation of additional subtasks (e.g., onset detection and beat tracking) is often required, which can propagate errors into downbeat estimation.

The first subtask involved in downbeat detection, the estimation of the musical meter, involves the identification of the number of beats per measure, and the overall length of the measure. Towards the first of these goals, there have been a number of approaches that approximate the metrical duration of the beat and the number of these durations per measure (e.g., Brown 1993; Gouyon and Herrera 2003). While relevant to the task of generalized downbeat detection, time-signature estimation is not necessary in HJDB music (like most DJ-oriented electronic music) as the time signature is almost always 4/4. In this dissertation, quadruple meter (4/4) is treated similarly to duple meter.

[46] http://www.native-instruments.com/en/products/dj/traktor-pro/

Of the proposed methods for downbeat detection, most are generalized models, a distinction that implies their applicability to a variety of musical styles without specific training or parameterization. Goto (2001) employed rhythmic template patterns to the output of a drum detection algorithm. Downbeats were assumed to be present at temporal locations of large spectral change, and were detected through a process of peak-picking spectral frames, grouping of the resultant segments into beats, and a comparison of beats for harmonic change. The model assumed music with a 4/4 time signature and a tempo between 61–120 BPM. Davies and Plumbley (2006) present a similar approach to Goto (2001). An initial binary decision was made in regard to the time signature (i.e., duple or triple) based on energy displayed in the output of comb templates. Then, downbeats were found by selecting beat positions that maximized spectral change.

Klapuri et al. (2006) extracted the temporal evolution of a hidden metrical sequence exhibited in the output of a comb filter bank with the use of a hidden Markov model (HMM). Estimates of the beat, sub-beat, and meter periods were made through a first-order Markov process. The state sequence was determined based on the previous state, observed filter bank output (as in Scheirer 1998), and parametric prior and transition probabilities. Estimated phase sequence was approximated similarly, using the output of the comb filters as an observation. The measure period and tatum were assumed to be functions of the tactus, and the model was simplified by encoding this dependency. Viterbi back tracing was used to achieve the optimal state sequence. Downbeats were extracted using a template matching technique. Phase estimation was achieved through selecting one of two patterns that best fit a detection function output created by summing detection functions generated in four sub-bands.

Papadopoulos and Peeters (2010) proposed a method for joint estimation of harmonic structure and downbeats using an HMM that models chords and their metrical position. They presented an additional method (Peeters and Papadopoulos 2011) that also formulated the problem within an HMM framework, in which beat templates were first estimated from the data, and beats were then associated with positions in a measure by reverse Viterbi decoding. Krebs et al. (2013) utilized an

HMM to simultaneously estimate the beats, downbeats, tempo, meter, and rhythmic patterns in ballroom dance music.

Unlike the aforementioned algorithms, which are generalized for arbitrary musical input, Jehan (2005) presented a regression model that predicted downbeat positions based on learning style-specific characteristics from training data containing rhythmic and timbral characteristics akin to those in the testing data. Timbre, pitch, and loudness features were extracted from either onset- or beat-synchronous segments of both the training and testing data, creating a training feature matrix and a test feature matrix. As in the HMM methods presented above (Klapuri et al. 2006; Papadopoulos and Peeters 2010; Peeters and Papadopoulos 2011), time dependency is also encoded within this system. Here, features were shingled—that is, time-lagged, and linearly weighted such that the features of the previous segment lay below those of the present segment in the feature matrix, with values proportionately reduced to their time rank. A training class vector was created using downbeat annotations in the training data, and a value was associated with the segment based on its position within a measure. A support vector regression (SVR) model was then created using the training class vector. The test class vector was generated using the trained model, and performing the regression on the test feature matrix. A downbeat detection function was then created by taking the first-order derivative of the test class vector, which ideally resulted in strong peaks at downbeat positions. Downbeats were then extracted from the detection function through peak picking.

4.4.2 Downbeat detection evaluation

At the time of this writing, there has yet to be a formal external evaluation (e.g., MIREX task) of downbeat-detection algorithms. Each of the methods presented in Section 4.4.1 provides an evaluation of the performance of its system; however, there are no standard approaches or metrics. Some researchers have utilized evaluation metrics also used in onset detection and beat-tracking evaluation.

Goto (2001) evaluated his downbeat detection system using the same methodology (equations 4.14–4.18) as in his previous beat-tracking evaluations (Goto and Muraoka 1995, 1997). Both Klapuri et al. (2006) and Davies and Plumbley (2006) evaluated their systems using an extension of Goto and Muraoka's (1997)

approach, with the added criterion that the downbeat candidate must be within ±10% of the inter-annotation interval on either side of the present downbeat annotation. Papadopoulos and Peeters (2010) used precision, recall, and F-measure (equations 4.11–4.13) to evaluate their systems.

Jehan's (2005) evaluation of the SVR method for downbeats relied on an subjective methodology and was presented in constrained circumstances, in which testing was performed on part of the same song used for training, or on a test song from the same album as other songs used for training.

4.5 Percussion detection

The previous sections of this chapter have dealt with association of time markers with events in the audio stream. So far, these events have been either actual notes or interpreted synchronization points such as beats and downbeats (with the exception of Goto and Muraoka's BTS (1995), which found bass and snare drums as a subtask in beat tracking). The marking of these onsets, beats, and downbeats is necessary in determining when events occur in musical time (i.e., within a metrical framework). However, in order to associate drums in HJDB tracks with those in original breakbeats, the drums found in the HJDB tracks must be compared to the same type of drums in the original breakbeat (e.g., bass drums, snare drums, and hi-hat cymbals). The present section deals with percussion detection, or the identification of the type and timing of percussive instruments within an audio signal. Figure 4.5 demonstrates an example of percussion detection analysis with three possible drum types (note that segments could contain multiple drum types, such as a bass drum with a hi-hat cymbal). Early methods focused on identifying individual drums in a solo context, but have more recently attempted to detect percussion within polyphonic music containing multiple instruments. Solutions fall under either pattern recognition or source separation approaches. The following discussion provides an overview of these systems using this categorization.

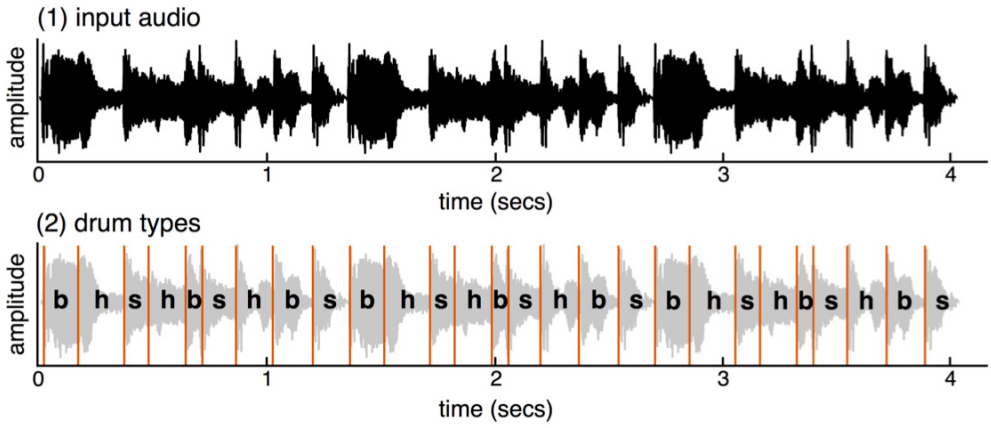

Figure 4.5: Example of percussion detection analysis. (1) The audio signal is input to a percussion detection algorithm (here with three possible drum types: **b**=bass drum, **s**=snare drum, and **h**=hi-hat cymbal), resulting in (2) segmentation and a list of drum types associated with the segments. Note that segments could also contain multiple drum types (e.g., bass drum and hi-hat cymbal).

4.5.1 Percussion detection by pattern recognition

Pattern recognition techniques segment an input audio signal by either onset detection or temporal grid processing (i.e., beat or tatum segmentation), extract features, and classify each segment. Features commonly used in these approaches are Mel-frequency cepstral coefficients (MFCCs), linear predictive coding (LPC) coefficients, and energy-based descriptors (e.g., equations 4.2–4.5). The approaches may be categorized by their use with either percussive or complex audio. The earliest method for percussion detection is attributed to Schloss (1985), who was able to differentiate between various conga sounds using amplitude thresholding for segmentation and binary classification via spectral similarity. To label tabla sounds, Gillet and Richard (2003) performed segmentation by amplitude envelope thresholding and classification by a *k*-nearest neighbor (*k*-NN) classifier, with feature vectors comprised of Gaussian Mixture Models (GMM) adjusted to the shapes of the idealized drum type spectrum. An HMM is used to enhance accuracy though language modeling. Chordia (2005) also analyzed tabla sounds, and found that artificial neural networks (ANNs) performed best amongst the tested classification techniques (GMMs, ANNs and tree-based classifiers). For classification of subtle

differences between snare drum playing techniques, Tindale et al. (2004) determined that *k*-NN classifiers provided more consistent results than those achieved by support vector classification (SVC) or ANNs. SVC was shown to be effective for 3-class classification of drum loop sounds by Gillet and Richard (2004). Bello et al. (2006) presented a similar system using *k*-means clustering (with $k=3$) of selected bins from STFT frames.

Detecting percussion in audio signals containing both percussion and other instruments is a more difficult problem, as the system must not only determine if the region under analysis contains a musical event, but it must also make the distinction between drum sounds and other instruments. To perform percussion detection in mixed instrument audio, Tanghe et al. (2005) first extracted temporal features (e.g., RMS, zero-crossing rate, and temporal centroid) and spectral features (e.g., spectral moments and spectral centroid) after an onset detection stage. Classification was achieved through the use of SVC.

To aid in the identification of drum sounds in audio containing multiple instruments, researchers have proposed the use of template adaptation techniques, in which a likely time-frequency representation (e.g., spectrogram) of the desired sound is used to detect its presence in the audio signal. Templates can be adapted through a variety of methods. Dittmar and Uhle (2004) first segmented the input audio signal using onset detection before extracting spectrogram templates for the segments. The templates were then modified through a two-step process of principal component analysis (PCA) for data decorrelation and reduction, and independent component analysis (ICA) to extract the initial components in the segments. A *k*-NN classifier was used for classification of these prepared segments. Yoshii et al. (2007) presented AdaMast, an application for polyphonic drum detection through template adaptation and harmonic suppression. Initial templates were created from a spectrogram representation of solo drum priors. Frames of the input audio found to resemble these templates were entered into a weighted adaptation phase, in which the templates were iteratively modified to resemble the frame audio. Harmonic suppression was then used to minimize the effect of steady-state signal components associated with non-percussive instruments.

4.5.2 Percussion detection by source separation

A potential drawback of the aforementioned pattern recognition methods for percussion detection in multi-instrument mixtures is that amplitudes are not easily determined for individual sounds (FitzGerald and Paulus 2006). Source separation methods instead allow for the direct acquisition of activation functions—continuous waveforms that resemble the detection function signals generated from the reduction stage in onset detection (Section 4.2.3). These activation functions are derived from a basis factorization stage, and are segmented into individual sounds using peak-picking methods similar to those discussed in Section 4.2.4. The family of basis factorization methods seeks to segregate and learn independent source structure (i.e., the spectrum of a source sound) directly from the signal, and includes algorithms such as independent component analysis (ICA), sparse coding, and non-negative matrix factorization (NMF). A requirement in several of these approaches is that input signals be non-negative in their values (e.g., magnitudes from spectrograms). Just as with the pattern recognition techniques, these approaches may be categorized based on their applicability to either percussive or complex multi-instrument audio signals.

For percussive signals, FitzGerald (2004) performed separation and identification of bass drums, snare drums and hi hats/cymbals through two-band sub-band decomposition, followed by separate ISA (a variant of ICA with an eigendecomposition stage prior to factorization) calculations with two basis functions. Prior subspace analysis (PSA) introduces prior basis functions—that is, idealized simple spectral models that serve as templates from which the actual basis functions are learned—into the ISA technique, which ultimately allows PSA to overcome issues related to model-order estimation (FitzGerald 2004). In this same class of audio signals, Paulus and Virtanen (2005) also used basis priors with non-negative matrix factorization (NMF). Battenberg (2012) tracked isolated drum types using non-negative vector factorization (NVF), a variant of NMF. Drum sources were learned during training, and drum activations were achieved by reducing each spectrogram time segment into a likely mixture of these events. A key difference in this method from other basis factorization methods was the inclusion of an onset

detection stage prior to NVF, which was used to segment the audio into segments containing individual or layered drums.

To extract bass drum and snare drum sounds from audio containing a complex mixture of instruments, Virtanen (2003) used sparse coding with trained template prior basis functions, followed by onset detection. Gruhne et al. (2004) presented a rhythmic description algorithm for the MPEG-7 audio format. Principal component analysis was performed on a spectrogram to extract the frequency basis functions. ICA was then applied to these functions to retrieve spectral profiles used to identify the time-varying activation functions of the individual instruments. Next, onsets were extracted from the envelopes, and were quantized to a tempo-based grid.

In work similar to that of Yoshii et al. (2007), Gillet and Richard (2005) attempted to suppress the harmonic component of the signal, however they sought to do so through subspace analysis. Onset detection was performed on the output of the noise subspace after high-resolution harmonic/noise decomposition. Onsets were then classified by SVC. If beat and meter estimation was performed, periodic *N*-gram language modeling could be employed to encode a form of musical knowledge related to a likely ordering of drum sounds.

4.5.3 Percussion detection evaluation

The performance of a few of the aforementioned percussion detection algorithms has been assessed in the 2005 MIREX drum detection task (Downie 2005a). Five algorithms were assessed using a dataset comprised of over 50 polyphonic mixed-instrument audio files. Algorithms were evaluated using the F-measure (equations 4.11–4.13). For a given event to be deemed correct, the onset had to be detected within a tolerance window of ± 30 msec surrounding each annotation, and the correct drum type (i.e., bass drum, snare drum, and hi-hat cymbal). The top-performing algorithm in this evaluation was that of Yoshii et al. (2005)—an earlier version of the AdaMast system (Yoshii et al. 2007) without the harmonic suppression component—which achieved an overall classification of 67%. The algorithms were also evaluated on the individual tasks of onset detection (65.9%) and individual detected drums (bass drum: 72.8%; snare drum: 70.2%; hi-hat cymbal: 57.4%).

4.6 Summary

One of the main contributions of this dissertation is the development of computational techniques for the estimation of the original breakbeat used within HJDB tracks, and a description of how the breakbeat pattern has been modified. Both of these analysis methods are covered in the subsequent chapter. This chapter has presented both a review of pre-existing methods for the subtasks associated with the extraction of time points and drum types in audio recordings, and an overview of evaluation metrics used in the assessment of their performance. While not exclusively related to breakbeats, the fields of onset detection, beat tracking, and downbeat detection are directly relevant to the analysis of breakbeats within HJDB tracks, as they form a basis for segmentation of the audio stream that is both metrically and rhythmically relevant. Additionally, percussion detection is useful for labeling the drum types present in these segments, which in turn may provide an estimate of how a breakbeat has been modified in comparison to its original drum pattern ordering.

Chapter 5: Analysis of breakbeats in HJDB

This chapter presents methods for automatic detection of breakbeats and their usage in HJDB music, including breakbeat classification and HJDB-specific downbeat detection. As shown in **Figure 5.1**, these techniques are then used to provide example analysis of rhythmic modifications of breakbeats in HJDB music. Analyses of this kind are necessary to understand the relationships between musicians and the material they have sampled in the creation of their music, as well as to understand the range of ways the HJDB community has used technology to manipulate various breakbeats. As demonstrated in Section 3.2.4, rhythmic modification through rearranging segmented breakbeats was the highest-ranked modification across the interview participants. Breakbeat classification is essential to rhythmic modification description as the modifications performed by HJDB musicians are relative to the sequential ordering of drum hits in the original breakbeat. At the time of writing, no systems have been presented that perform this task; however, breakbeat classification would also be useful in learning, for example, which breakbeats are most popular among individual artists or different subgenres of HJDB.

Downbeats provide structural markers that are useful in the comparison between the percussion in HJDB tracks and that in original breakbeats. Downbeat detection is the automated estimation of the time locations of the first beat of every measure. The presented method determines downbeats through the combination of three forms of metrical information: low-level onset event information; periodicity information from beat tracking; and high-level information from a regression model trained with well-known breakbeats.

This chapter is organized as follows: Section 5.1 presents the breakbeat classification method and an evaluation with a generalized music classification system for the same task. The downbeat detection method and evaluation are presented in Section 5.2. In Section 5.3, an example of breakbeat modification analysis is presented, which is built upon the combination of output from the breakbeat classification and downbeat detection methods, along with output from a percussion

detection method (a component of the breakbeat classification system). A summary is then presented in Section 5.4.

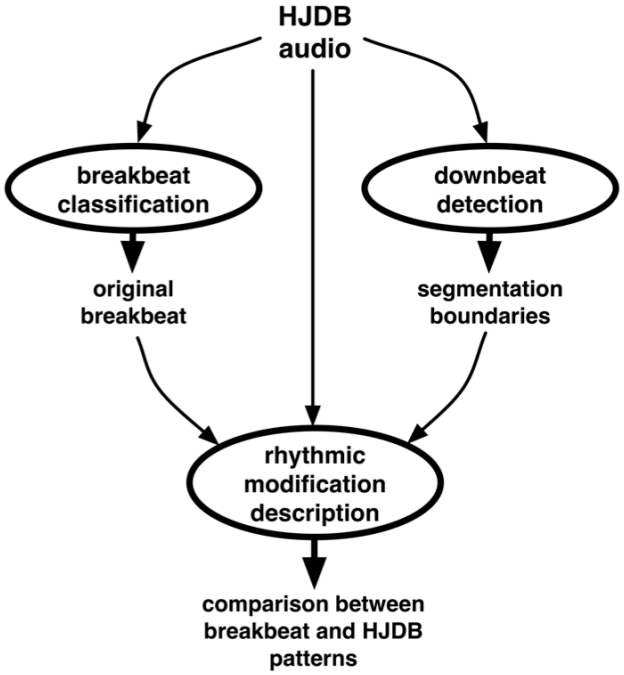

Figure 5.1: Relationship between breakbeat classification, downbeat detection, and rhythmic modification description system used to provide a comparison between percussion in measures of the original breakbeat and measures of HJDB audio. Once the original breakbeat being used in the HJDB track is classified, measure-length segments of the HJDB track are compared to the measures of the original breakbeat.

5.1 Breakbeat classification

Breakbeat classification is the task of identifying the sampled breakbeat used in the creation of an HJDB track. Breakbeat classification is a type of computational music classification—processes by which music may be automatically separated into categories (e.g., genres, vocal or non-vocal, fast or slow tempo). The particular approach undertaken in this dissertation is a supervised machine learning method, which estimates which breakbeat is being used from candidate breakbeats through the following steps: First, features are extracted from a number of ground-truth labeled audio examples from each class (i.e., labels are associated with the breakbeat name). Second, a classification model is trained that attempts to divide the features

extracted from these examples into regions associated with the specified classes. Third, using the trained model, new audio examples (unused in training) are automatically provided with class names. Features are extracted in the same manner as the first step, and the trained model is used to provide a class label for these extracted features.

Three well-known breakbeats were selected based on their widespread use throughout HJDB's history; the popularity of these breakbeats was confirmed through several interviews conducted with musicians for this dissertation (Bowes 2013; Chatzilias 2013; Clements 2013; Davies 2013; Fieber 2013; Hansen 2013; Heinze 2013; Kane 2013; Lindo 2013; Macciochi 2013; Minner 2013; O'Shea 2013; Parsons 2013). The chosen breakbeats were the *Amen* (from The Winstons' *Amen, Brother* (1969)), the *Apache* (from Michael Viner's Incredible Bongo Band's *Apache* (1973)*)*, and the *Funky Mule* (from Ike Turner's *Funky Mule* (1969)). **Figure 5.2**, **Figure 5.3**, and **Figure 5.4**, provide transcriptions of the bass drums, snare drums, and high-hat cymbals used in the *Amen*, *Apache*, and *Funky Mule* breakbeats, respectively. **Figure 5.3** additionally shows the bongo drums in the *Apache* breakbeat.

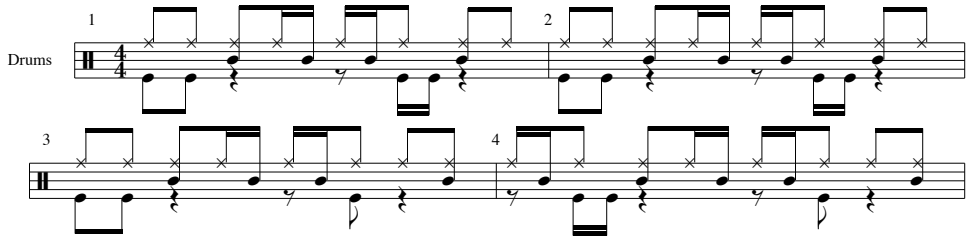

Figure 5.2: Drum transcription of the bass drums (bottom notes), snare drums (middle notes), and high-hat cymbals (top notes) used in the four measures of the *Amen* breakbeat.

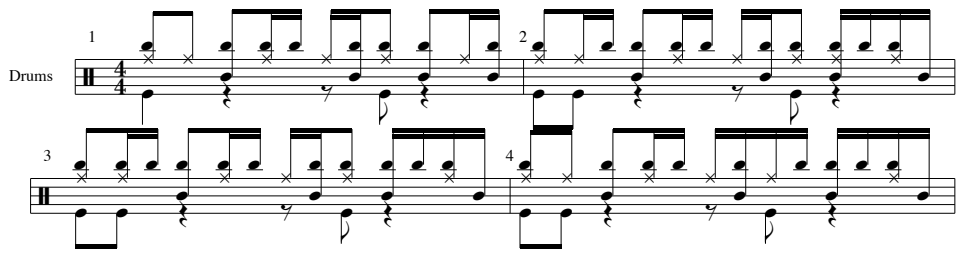

Figure 5.3: Drum transcription of the bass drums (bottom notes), snare drums (lower-middle notes), high-hat cymbals (upper-middle notes), and bongo (top notes) used in the four measures of the *Apache* breakbeat.

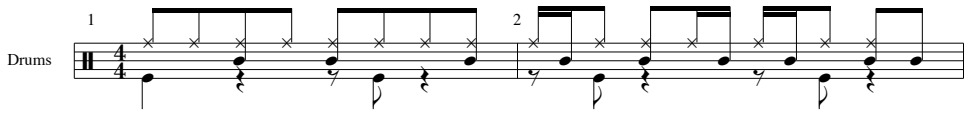

Figure 5.4: Drum transcription of the bass drums (bottom notes), snare drums (middle notes), and high-hat cymbals (top notes) used in the two measures of the *Funky Mule* breakbeat.

The initial approach undertaken for breakbeat classification attempted to provide a single classification for each excerpt using standard music classification features (a similar baseline method is presented in Section 5.1.5.2), resulting in marginal results. A specialized approach was therefore constructed, which attempts to extract individual drums from the audio stream, and to provide individual classifications for each of the extracted drums. Majority voting is then used to provide a single breakbeat classification for an excerpt. The inspiration for this approach is derived from informal discussions with breakbeat musicians, who explained their ability to identify breakbeats upon hearing individual drum sounds.

5.1.1 Method overview

The presented breakbeat classification method seeks to take advantage of the uniqueness of salient individual drums' timbres (e.g., bass drums) in each breakbeat.

HJDB musicians have reported the ability to differentiate between these timbral characteristics; a computational approach was developed that attempted to replicate this same task. **Figure 5.5** presents an overview of the breakbeat classification method. Classification of bass drums is performed with the use of a support vector machine (SVM) algorithm (Boser et al. 1992; Cortes and Vapnik 1995). The SVM model is trained using spectral features extracted from segments of HJDB audio containing bass drums. Bass drums are separated from the audio signal through a two-stage process of harmonic suppression and drum detection. For additional training examples, bass drums are extracted from the original candidate breakbeats and are modified in pitch and distorted to reflect actual usage in HJDB tracks.

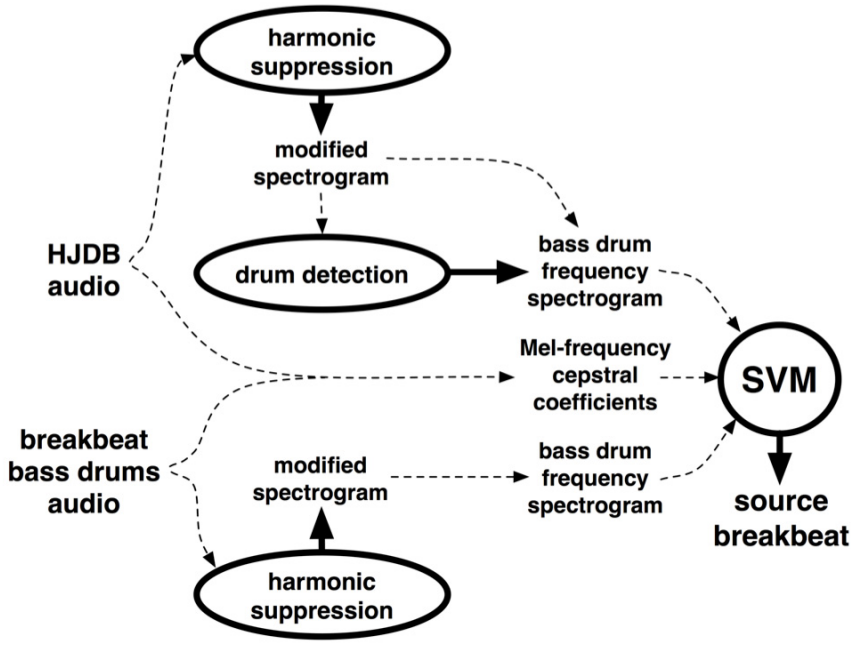

Figure 5.5: Overview of breakbeat classification method. Circles denote stages in the method. Features are extracted from bass drums from both HJDB audio and original breakbeats.

5.1.2 Feature extraction

A feature matrix, J, is created by aggregating feature vectors, j_b, which are extracted from each bass drum event, b. j_b is comprised of the means and standard deviations drawn from both columns and rows of bass drum frequency spectrograms (BFS) and Mel-frequency cepstral coefficients (MFCCs). Features are extracted from 16-bit, 44.1 kHz mono WAV audio files. The BFS are extracted from each audio example through a two-step process of harmonic-percussive separation and drum detection. Separation of harmonic and percussive sections is performed using a median-filter approach (FitzGerald 2010). The modified bass-frequency spectrogram, M (with a frame size of 4096 and hop size of 1024), is created by cross-correlating a drum mask—the mean spectrum of three drums from each breakbeat being assessed—with the spectrogram of the percussive signal. M contains 25 bins (columns) representing approximately 40 to 220 Hz. A bass drum detection function is achieved through spectral difference of M. The creation of the bass drum detection function is similar to the approach of Goto (2001).

Audio excerpts ranged from 15 seconds to two minutes in length; thus the number of bass drum events within each audio file varied significantly. To maintain an equal number of examples from each audio excerpt during training, a set number of drum events g were extracted from each audio file (g=7). In addition, selection of all events found in the bass drum detection function could result in the inclusion of some snare drums misclassified as bass drums. Selection is therefore limited to the most salient peaks in the bass drum detection function, which is used to find the position of g bass drum events in the signal. While a precise value of g is not critical, odd numbers are useful to prevent classification ties (in conjunction with repeated classification stages with tied classes) during majority voting. The BFS of each bass drum is six time frames in length (approximately 210 msec). The BFS for seven concatenated bass drums from HJDB examples of the *Amen*, *Apache*, and *Funky Mule* breakbeats are presented in **Figure 5.6**, **Figure 5.7**, and **Figure 5.8**, respectively. Drums within each track as well as within each class exhibit similar relative time-frequency arrangements. j_b is created by taking the mean and standard deviation across each row (frequency) and across each column (time). In addition to the BFS,

13 MFCCs are extracted from the same positions in the original signal using the positions of bass drums as found by the bass drum detection function.

In addition to bass drums automatically extracted from HJDB examples, training examples also included bass drums from the breakbeats under analysis. Three bass drums were manually segmented from each breakbeat. An effort was made to replicate the pitch shifting and distortion processes of breakbeats in HJDB music. Each drum was modified using a combination of a pitch shifting method mimicking MIDI note pitch adjustment as described in Section 3.1.1, and a hard-clipping distortion technique intended to replicate the behaviour of overdriven transistors in a solid-state amplifier. 13 possible semitone-spaced pitch settings from [-6,-5,…,5,6] and five distortion settings resulted in 195 different drums for each breakbeat class. Each drum was then processed as in the above description.

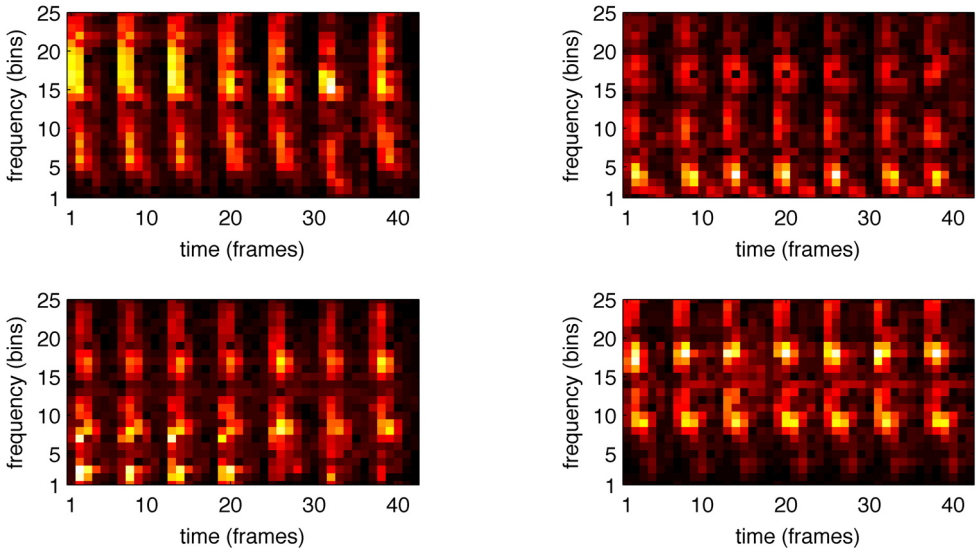

Figure 5.6: BFS features extracted from concatenated sets of bass drums (seven drums, six frames per bass drum event) from four HJDB tracks using the *Amen* breakbeat. Clockwise from top left: Yolk – *Bish Bosh* (1992), Tekniq – *A New Dawn* (1994), Danny Breaks – *Step Off* (1994), Doc Scott – *Toyko Dawn* (1996).

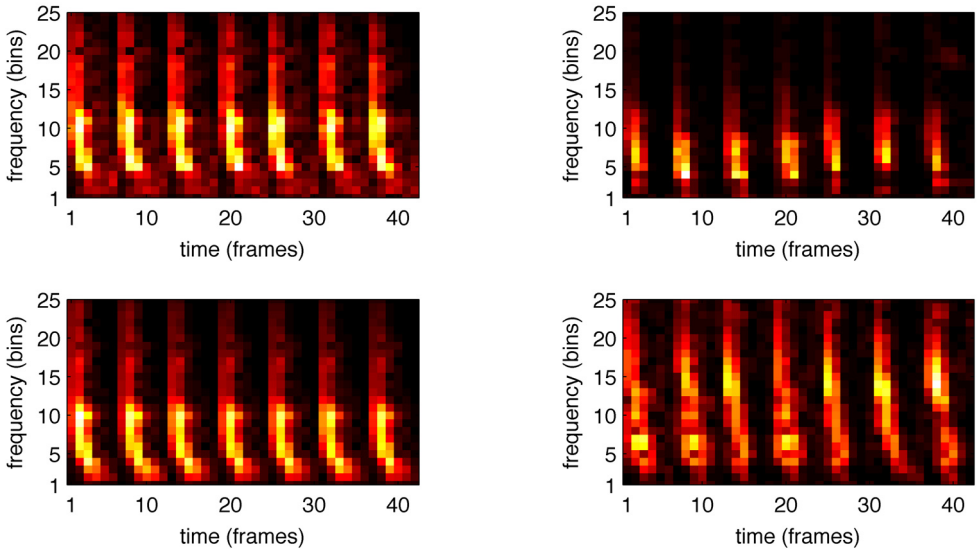

Figure 5.7: BFS features extracted from concatenated sets of bass drums (seven drums, six frames per bass drum event) from four HJDB tracks using the *Apache* breakbeat. Clockwise from top left: Digital – *Metro* (1997), Seba & Paradox – *Fire Like This* (2006), Wax Doctor – *Heat* (1996), Glide – *All Right (All Night Mix)* (1992).

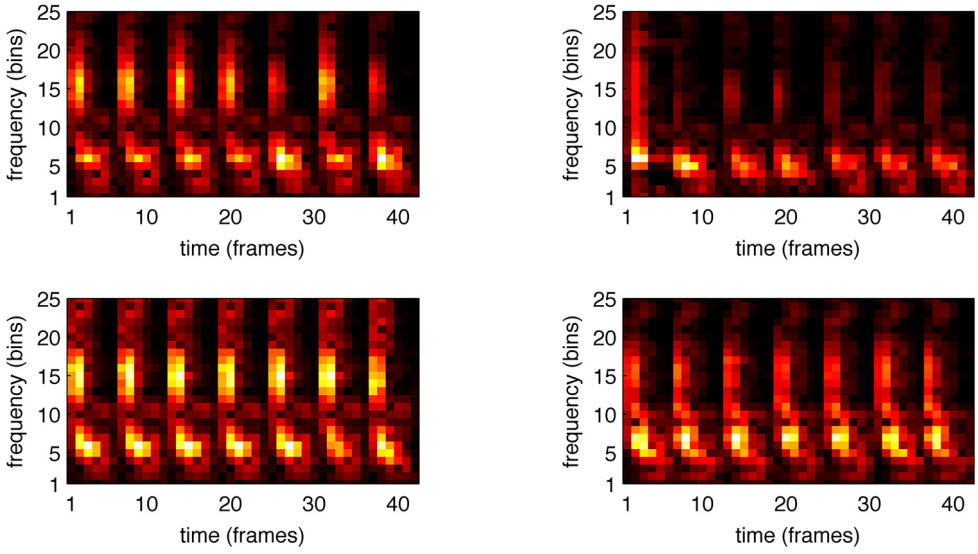

Figure 5.8: BFS features extracted from concatenated sets of bass drums (seven drums, six frames per bass drum event) from four HJDB tracks using the *Funky Mule* breakbeat. Clockwise from top left: DJ Krome & Mr. Time – *The License* (1994), Top Buzz – *Livin' In a Dream* (1994), The Committee – *Profound Love* (1995), Black Grape – *Fat Neck (Goldie Remix)* (1996).

5.1.3 Support vector classification for original breakbeat

Classification is performed using support vector machines (SVM)—supervised machine learning algorithms that have been applied to a wide variety of data analysis and pattern detection problems. SVMs seek to find optimal paths of separation, or hyperplanes, between data types (i.e., classes) by attempting to maximize the width of the borders between them using the data points nearest to the hyperplane (Cortes and Vapnik 1995). Non-linear SVMs take advantage of kernel functions, which cast the data into higher dimensions to improve the effectiveness of the hyperplane in separating features of different classes (Boser et al. 1992).

5.1.4 Training procedure

All training procedures using audio from the HJDB tracks are performed in an unsupervised manner; bass drums are automatically segmented from HJDB tracks in the manner described in Section 5.1.2. Sections of tracks including breakbeats were selected to reflect the various instrumentations encountered in HJDB tracks (e.g., solo breakbeats, breakbeats and bass, breakbeats with all other track elements).

Training of the SVM model requires a feature matrix, J, comprised of feature vectors extracted from each bass drum, and an associated class vector, H, containing the breakbeat class names associated with each bass drum. Principal Component Analysis (PCA) feature reduction is applied to J to extract the top features across all bass drums training examples, creating J'. A model is then trained using J' and H. The classification was implemented using the LIBSVM *C*-SVC algorithm with an RBF kernel (Chang and Lin 2011). Parameters for the SVM and PCA were established using grid search with cross-validation using ten tracks in each class.

To perform classification of the test audio, A, feature matrix J_A is created in a similar fashion to feature matrix J. After feature matrix J_A is created, the PCA model prepared in the training step is applied to J_A for feature reduction, resulting in $J_A{}'$. A classification decision is made for each extracted bass drum within $J_A{}'$, resulting in multiple classifications for each test example. An overall classification name is determined using majority vote. Ties are resolved using additional classification stages performed with only those classes that are tied.

5.1.5 Evaluation

To evaluate the efficacy of the presented breakbeat classification approach, it was tested on a dataset consisting of HJDB music containing specific breakbeats. In addition to the presented method, a general music classification technique was also tested that uses standard music features (MFCCs) and Gaussian mixture models (Aucouturier and Pachet 2007).

5.1.5.1 *HJDB breakbeat dataset*

The HJDB breakbeat dataset used for the evaluation is comprised of 93 audio excerpts of between 15 seconds and 2 minutes in length.[47] All tracks were originally in WAV or MP3 format (of 192 kbps or higher). HJDB DJs and producers (the term producer is used here to distinguish between musicians that create the music and musicians that play the finished tracks (i.e., DJs)) provided ground-truth breakbeat annotations through a social network. Data was requested by queries made in separate threads, whereby DJs and producers were asked to list their favourite HJDB tracks that use a particular breakbeat. Participants provided at least one candidate track. In addition, several of the participants confirmed or rejected candidate tracks provided by others. HJDB tracks mentioned in interviews by participants were also added as candidate tracks along with several tracks from the downbeat dataset (Section 5.2.5.1) and two of the author's own tracks containing the desired breakbeats. The author of this dissertation (an HJDB musician with approximately 15 years experience writing music with breakbeats) also confirmed that candidate tracks included the requested breakbeat. Audio for the candidate tracks was gathered from several sources, including this author's private collection. If the musicians who created the music and label owners that released the music were known by the author, they were asked for the music directly.

5.1.5.2 *Methodology*

Evaluation was performed using a 3-class (*Amen, Apache,* and *Funky Mule*) leave-one-out cross validation using the HJDB breakbeat dataset described above containing 93 excerpts. In order to test the merit of the extracted features, three configurations of

[47] For the track list, see: http://ddmal.music.mcgill.ca/breakscience/breaksclassifier

the presented HJDB-specific system were tested: The first configuration was trained using MFCC-based features (M-SVM); the second configuration was trained using only BFS-based features (B-SVM); the third configuration was trained using both BFS-based and MFCC-based features (BM-SVM).

In addition to the presented system, a classification method built upon the system discussed by Aucouturier and Pachet (2007), was used to assess the problem of breakbeat classification as a generalized music classification problem (e.g., genre classification). This system—referred to as M-GMM—uses Gaussian mixture models (GMMs) to learn parameters from MFCCs extracted across frames of entire audio excerpts. Class membership is assigned to the set of extracted features based on the smallest measured negative log-likelihood distance from trained class models.

5.1.5.3 *Results*

Table 5.1 summarizes the results of each of the tested methods (M-GMM, M-SVM, B-SVM, and BM-SVM) using the HJDB breakbeat dataset; accuracies are provided in percentages for each breakbeat class, and total accuracies are calculated as the mean across classes for each system. **Table 5.2** displays confusion matrices for each breakbeat classification system tested, which allows for a closer inspection of the misclassifications performed by each system for each class under analysis.

The generalized audio classification system, M-GMM, performed reasonably well in classifying tracks from the *Amen* and *Apache* breakbeat categories (74.2% accuracy in each class); however, performance was drastically lower for the *Funky Mule* breakbeat class (41.9%). Inspection of the confusion matrix for the M-GMM system in **Table 5.2** shows that all eight misclassifications of tracks containing the *Amen* breakbeat were erroneously found to contain the *Apache* breakbeat. Six of the eight misclassified *Apache* tracks were classified as *Funky Mule* tracks, and two were incorrectly classified as containing the *Amen* breakbeat. Thirteen of the eighteen misclassified excerpts containing the *Funky Mule* breakbeat were classified as containing the *Apache* breakbeat. The large number of the misclassifications of the *Funky Mule* examples as *Apache* and the imbalance in misclassifications of the *Apache* as *Funky Mule* indicated that the M-GMM system was not able to differentiate between examples of these classes well.

As can been seen in **Table 5.1**, the M-SVM system achieved slightly better results than the M-GMM system for the *Amen* and *Funky Mule* breakbeat classes, with a slight reduction in performance in the *Apache* breakbeat class. Inspection of **Table 5.2** shows that the six misclassified examples of tracks containing the *Amen* breakbeat were evenly spread across the *Apache* and *Funky Mule* breakbeat classes. Eight of the ten incorrectly classified *Apache* tracks were misclassified as containing a *Funky Mule* breakbeat, and two were misclassified as containing an *Amen* breakbeat. While there were two more *Apache* misclassifications in the M-SVM system than the M-GMM system, errors for the *Funky Mule* examples were less frequent, and these were spread more evenly across the *Amen* and *Apache* classes than those of the M-GMM system. These results, when considered with the improved *Amen* breakbeat class performance, indicated the potential of breakbeat classification based on individual drum sounds rather than entire tracks.

As compared with the M-GMM and M-SVM systems, the B-SVM showed improved results (**Table 5.1**) for the *Apache* and *Funky Mule* breakbeat classes—77.4% and 93.5%, respectively. Of interest, however, was the accuracy for the *Amen* breakbeat class, which was substantially lower than that for the M-GMM and M-SVM systems (while misclassifications were mostly evenly distributed between the two other breakbeat classes as seen in **Table 5.2**). In comparison to the *Apache* and *Funky Mule* breakbeats, the *Amen* is sonically a much brighter breakbeat, having a greater idiophone presence above the bass drums than the other two breakbeats.

A potential reason for the lower accuracy of the *Amen* breakbeat class in the B-SVM system is the lack of spectral modeling for frequencies not represented by the BFS-based features, which focus only on frequencies approximately between 40–220 Hz. Using both BFS- and MFCC-based features, the BM-SVM system achieved the highest accuracies for the *Amen* breakbeat class (83.9%) and *Apache* breakbeat class (90.3%), the second highest for the *Funky Mule* breakbeat class (87.1%), and the highest overall accuracy for the tested systems (87.1%).

Breakbeat Classification System				
	M-GMM	**M-SVM**	**B-SVM**	**BM-SVM**
Amen	74.2%	80.6%	61.3%	**83.9%**
Apache	74.2%	67.7%	77.4%	**90.3%**
Funky Mule	41.9%	54.8%	**93.5%**	87.1%
Totals	63.4%	67.7%	77.4%	**87.1%**

Table 5.1: Accuracy of each breakbeat classification system (M-GMM, M-SVM, B-SVM, and BM-SVM) as tested on HJDB examples containing the *Amen*, *Apache*, and *Funky Mule* breakbeats along with cumulative mean accuracies (Totals). Bold scores denote the best scores in each breakbeat class and total score.

	Amen	*Apache*	*Funky Mule*
		M-GMM	
Amen	**23**	8	0
Apache	2	**23**	6
Funky Mule	5	13	**13**
		M-SVM	
Amen	**25**	3	3
Apache	2	**21**	8
Funky Mule	6	8	**17**
		B-SVM	
Amen	**19**	5	7
Apache	2	**24**	5
Funky Mule	2	0	**29**
		BM-SVM	
Amen	**26**	1	4
Apache	0	**28**	3
Funky Mule	2	2	**27**

Table 5.2: Confusion matrices for breakbeat classification systems (M-GMM, M-SVM, B-SVM, and BM-SVM) as tested with HJDB examples of the *Amen*, *Apache*, and *Funky Mule* breakbeats. Bold numbers denote correctly classified instances for each breakbeat class in each system.

5.1.6 Discussion

This section has outlined the development and evaluation of a classification system that may be used to determine the breakbeat used in a HJDB track from a few possible candidates. The presented system was based on a classification of bass drums that were found in the audio signal through a two-stage process of harmonic suppression and drum detection. Classification was performed through the use of an SVM classifier using both standard (MFCC) and bass drum-specific features (BFS). Classification was performed several times per excerpt and a final classification was provided through majority voting. The presented system was shown to outperform a generalized classification system, which provided classification based on features extracted from an entire excerpt. The HJDB breakbeat dataset was comprised of tracks that were suggested by DJs and music producers (musicians that have created the tracks) as their favorite tracks that used particular breakbeats. While the examples found within the HJDB breakbeat dataset reflect the suggestion of these musicians, it is important to note that in some circumstances a single breakbeat classification for an entire excerpt may not be sufficient. For example, several HJDB tracks begin with an introductory breakbeat, then switch to an *Amen* breakbeat in the main section. It is for this reason that the presented system has been designed to provide classification based on individual drum sounds rather than attempting classification based on entire tracks. Nonetheless, the M-GMM classification system has been included in the evaluation as it provides a baseline for the breakbeat classification task as a generalized solution.

A possible direction in which to improve the presented system would be through detection of other drum types (e.g., snare drums), or though the incorporation of additional features that might highlight class-specific characteristics (e.g., hand percussion in the *Apache* breakbeat). In addition to timbral attributes, rhythmic characterization might also be of use in the improvement of classification results.

5.2 Downbeat detection for HJDB

Downbeats mark the first beat of every measure and provide structural markers for the analysis of breakbeat usage in HJDB music. In the breakbeat modification analysis discussed in Section 5.3, downbeats provide segmentation points used to align HJDB tracks with original breakbeats.

Section 4.4.1 presented available methods for downbeat detection—most of which are generalized methods that are intended to function with a wide variety of music genres. While generalized methods performed well in many circumstances, there remain niche genres that fall outside the scope of these methods, such as Brazilian Maracatu (Jehan 2005). Initial testing with several downbeat detection algorithms indicated that HJDB also proved to be difficult (a full evaluation is presented in Section 5.2.5), possibly due to its characteristic fast tempo, high note density, non-characteristic use of harmony and melody, and emphasis on offbeats.

5.2.1 Method overview

The presented downbeat detection method seeks to leverage knowledge of breakbeat timbres and patterns, as it is these characteristics that form the foundation of HJDB music, and are very much at the forefront in musicians' productions. **Figure 5.9** presents an overview of the downbeat detection method. At the center of the model is a top-down support vector regression (SVR) technique (Vapnik 1995), which extends that of Jehan (2005). This model is trained using breakbeats from the 1960s–80s. While HJDB musicians perform resequencing of segmented breakbeats, the rearranged patterns often reflect knowledge of the original breakbeat pattern (Section 3.2.5).

Jehan's method relies on a close relationship between the testing and training data. As a result of the discrepancy between the patterns and timbres of breakbeats and full HJDB tracks, the contrast between training and testing data is increased. To mitigate this divide, additional processing stages are applied. Beat tracking and low-level onset detection stages are included to improve the robustness of this model by identifying likely tatum (eighth-note) positions for downbeats, and a focus on bass drum frequencies. A dynamic programming algorithm is also incorporated to improve selection of the downbeat from a final downbeat detection function.

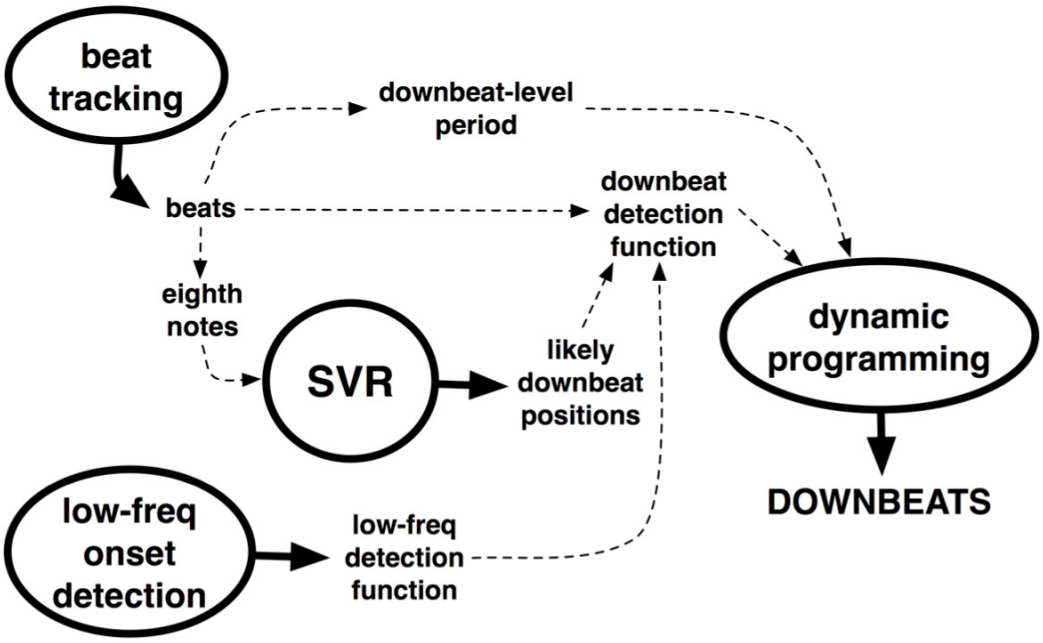

Figure 5.9: Overview of downbeat detection method. Circles denote stages in the method.

5.2.2 Support vector regression for downbeats

As in Jehan's (2005) model (discussed in Section 4.4.1), a top-down support vector regression (SVR) model is used to detect the likely position of downbeats in test audio based on similarity to rhythmic and timbral characteristics found in training data. The underlying assumption is that the rhythmic and timbral features extracted from breakbeats will resemble those from the HJDB tracks that incorporate them. If metrical time points (from beat one to the end of the last beat in the measure) are associated with the breakbeat segments, a regression model may be used to associate features from the HJDB segments to those of the breakbeat segments, resulting in a continuous detection function that represents the estimated position within a measure.

This technique is nearly identical to that of Jehan (2005), except for the use of structural material (breakbeats) used in training that is hoped to be found in the testing data (HJDB tracks). The method diverges from Jehan's approach, in that the

output is not intended to be used directly to detect downbeats. Because HJDB musicians incorporate a variety of modifications to the ordering of breakbeat segments in their tracks (as well as including additional instruments), the output of the SVR is unreliable for a direct detection of downbeats. However, by training with often-used breakbeats, the model is intended to reflect typical breakbeat usage—in particular around downbeats, which is often similar between breakbeats and HJDB tracks. The output is subsequently used to weight a detection function that provides positions of likely downbeat events.

5.2.3 Training with breakbeats

Input monophonic audio (16-bit, 44.1 kHz) S is segmented using an eighth-note grid. Each audio segment is associated with a metrical position t in a measure with downbeats at $t=0$, and last eighth-note before the next downbeat at $t=4$. The regression was implemented using the LIBSVM epsilon-SVR algorithm with an RBF kernel (Chang and Lin 2011). Kernel and parameters were selected through grid search with cross-validation on a withheld subset (Section 5.2.5.1) of the testing data during the parameter tuning evaluation stage.

Training of the SVR model requires feature matrix F and an associated class vector C—the positions within the measure; both F and C are both derived from breakbeats. Two Jungle and Drum & Bass artists selected 29 breakbeats from several lists of breakbeats commonly used in HJDB. Several of these breakbeats also appeared on the lists of breakbeats provided by the interview participants (see Appendix C).

Processing of the breakbeats follows a similar method by which musicians prepare breakbeats for use in HJDB tracks. Audio for each breakbeat is trimmed to the portion of the signal containing only the percussion solos. Each breakbeat β is segmented into individual drum hits using the Propellerhead Recycle audio processing tool (discussed in Section 3.2.3), which outputs both individual drum segments and a MIDI file associated with the metrical timing associated with each hit. The breakbeat audio is then placed in a sampling software where it could be triggered using the MIDI file in the sequencer. Segments containing non-drum instruments (e.g., the occasional horn, vocal shouts) are replaced with other

candidate sounds of the same drum type by changing the MIDI note. This is done to ensure that the percussion-only sections of the breakbeats were used in the training. MIDI files are then extended to 16 measures in length, regardless of the number of measures in the original phrase length (typical lengths are two, four, or eight measures) to ensure an equal number of measures from each breakbeat is used during training.

During model training, the MIDI file of each breakbeat undergoes a quantization process, by which the note-on time of each segment is adjusted to the nearest position on an eighth-note grid. The class vector for each breakbeat, c_β, is created using the modulus (mod=8) of the metrical position of each eighth-note segment. The feature matrix f_β of β is created by appending feature vectors extracted from each eighth note segment. Similar to Jehan (2005), f_β is comprised of 58 features, including: mean-segment Mel-frequency spectral coefficients; loudness of sum spectral difference of spectral features (segment-length detection function) at onset position (dB) of each segment; maximum loudness of sum spectral difference of spectral features (dB); and chroma. Segments are then associated with metrical positions in c_β as in Jehan's (2005) method.

f_β is normalized to have zero-mean and unit variance across each row (all segments). To add time-dependency to the features, f_β is shingled—that is, time-lagged and weighted linearly (Jehan 2005). **Figure 5.10** demonstrates the resultant class vector and feature matrix for Bobby Byrd's *Hot Pants* (1971) breakbeat. The sawtooth form of c_β displays the succession of metrical time from the first downbeat until the last segment before the next downbeat.

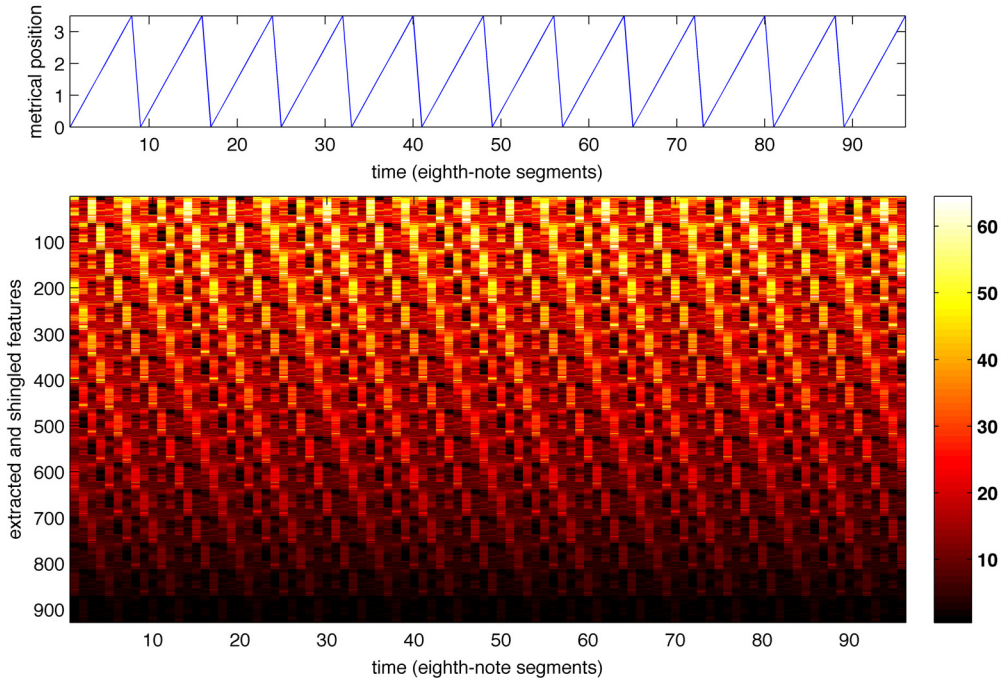

Figure 5.10: Class vector c_β (top) and feature matrix f_β for Bobby Byrd's *Hot Pants* (1971) breakbeat. Downbeats are present at the segments where metrical position equals 0. Features are extracted from the eighth-note breakbeat segments and shingled (with shingling length of 16 segments) such that they are time-lagged and linearly reduced in value as in Jehan (2005).

Feature matrices and class vectors are then aggregated across all breakbeats, creating an aggregate feature matrix F and aggregate class vector C. A feature and parameter optimization stage found best results using 40 Mel-frequency spectral coefficients, and shingling with 16 previous segments (equivalent to two measures). Principal Component Analysis (PCA) feature reduction is applied to F to extract the top ten features across all breakbeats, resulting in F'. An SVR model is then trained using F' and C.

To perform regression with the trained SVR model on test audio, A, feature matrix F_A is created. The audio is first segmented using an eighth-note grid created by interpolating the temporal location of beats (assumed to be found on the quarter-

note level) γ as found by the Beatroot beat tracking algorithm (Dixon 2007). F_A is created using a similar method to f_β. The PCA model prepared in the training of the SVR method is applied for feature reduction, creating $F_A{}'$. The trained model is used in conjunction with $F_A{}'$ to predict class values C_A, which contain the estimated metrical position of each segment.

Figure 5.11 shows the feature matrix F_A, estimated output C_A, and the idealized output for a segment (beginning and ending with annotated downbeats) of DJ Krome & Mr. Time's *The Slammer* (1993). As can been seen in the top graph (with C_A and the idealized output), C_A mostly follows the idealized output, with occasional slight deviations possibly due to modifications in drum sequencing or interference from other sounds.

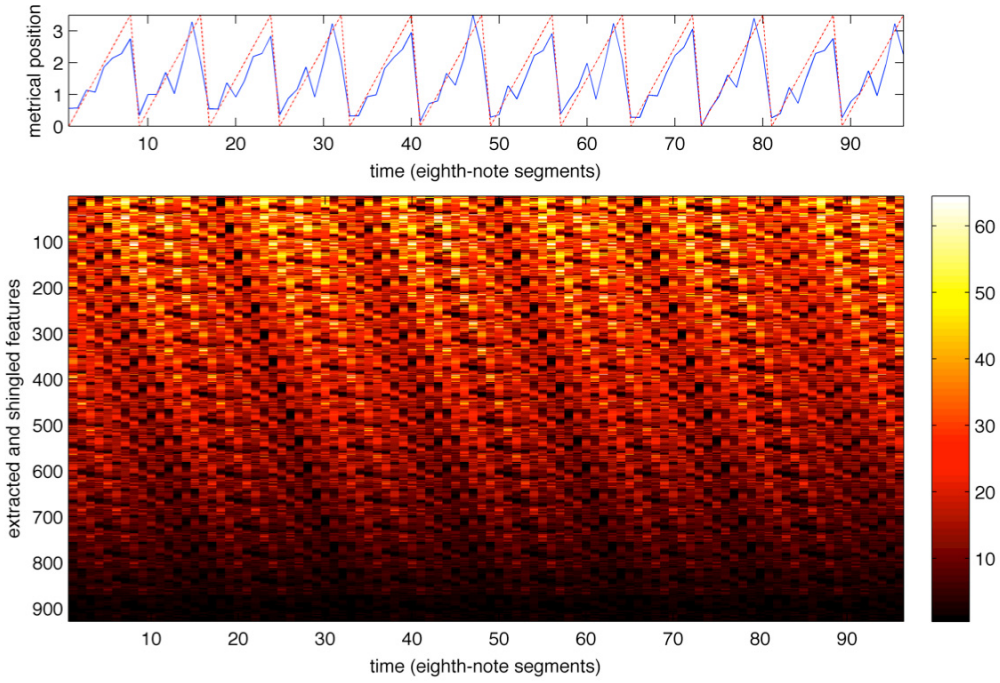

Figure 5.11: Top graph displays estimated metrical positions C_A (top graph, solid blue line) and idealized model output (top graph, dotted red line) for a segment of DJ Krome & Mr. Time's *The Slammer* (1993); Bottom graph shows feature matrix f_A (with shingling length of 16 segments). In this example, C_A follows the annotated metrical positions with only the occasional deviation.

While often following the idealized output, C_A has a tendency to diverge substantially from the ideal form. **Figure 5.12** shows the feature matrix F_A, estimated output C_A, and the idealized output for a segment (beginning and ending with annotated downbeats) for DJ Peshay's *Gangsta* (1993). This example demonstrates an overestimation of the presence of downbeats in the signal potentially caused by a percussion arrangement that is dissimilar to that of the breakbeat training examples. This can be seen in points between annotated downbeats (e.g., see C_A between downbeats at segments 25 and 33). In addition, segments 41 through 48 contain a measure-length removal of the percussion before its return in segment 49. Due to feature shingling, there is a tapered effect of this period that affects the following two measures (in particular, see C_A in annotated downbeat segments 57 and 64).

There are three conditions that could potentially cause these irregularities in C_A. First, breakbeat patterns are not universal; that is, while one breakbeat may employ a snare drum on beat two, another may have a snare drum on the offbeat of beat two. As a result, C_A may not increase from segment to segment between downbeats. Second, as discussed throughout Section 3.2, HJDB musicians typically reorder slices, which will also cause undesirable output between downbeats. However, breakbeats almost invariably begin with bass drums, and the drum-types most associated with HJDB downbeats are bass drums. This is also the case for breakbeat usage within HJDB, where musicians often apply transformations that preserve the perception of downbeats (Bowes 2013; Kane 2013; Macciochi 2013; O'Shea 2013; Stewart 2013). Third, C_A may diverge due to a mismatch in training and testing data. The training data contains percussion-only sections of audio, while the testing data is comprised of excerpts of full HJDB pieces, which may include a variety of transformations (e.g., pitch modifications) to the original breakbeats in addition to other sound sources.

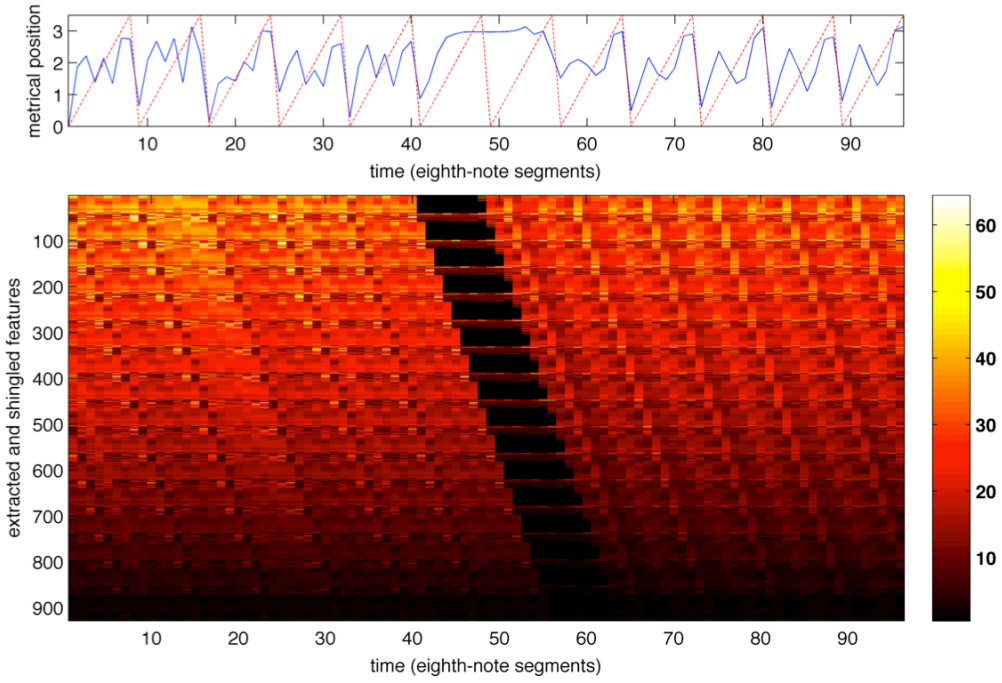

Figure 5.12: The top graph displays the estimated metrical positions C_A (top graph, solid blue line) and idealized model output (top graph, dotted red line) for a segment of DJ Peshay's *Gangsta* (1993); the bottom graph shows feature matrix f_A (with shingling length of 16 segments). In this example, C_A diverges more substantially from the annotated metrical positions in the inter-downbeat annotations. In addition, a non-percussive measure has lasting effects on C_A due to feature shingling.

5.2.4 Additional processing stages

To overcome the potential problems mentioned above, C_A is used for a coarse indication of the presence of downbeats and the following stages are added to the above model to improve performance: (1) post-processing of C_A (Section 5.2.4.1); (2) extraction of additional metrical information—namely, a low-frequency detection function (Section 5.2.4.2); (3) weighting at beat-times (Section 5.2.4.3); and (4) information fusion with a final estimation of downbeats by dynamic programming (Section 5.2.4.4).

5.2.4.1 *Post-processing of SVR output*

A likely downbeat position function E is created as the first-order coefficient of the linear regression at each eighth-note position, by applying linear regression of a sliding buffer of eight segments (equivalent to the length of a measure) across C_A. If the eight points of C_A under analysis resemble a positive linear slope, as they do at downbeats, the value of E will be positive. As the buffer shifts, such that it no longer begins on a downbeat (but now includes a downbeat at buffer position 8), the value of E will decrease as it will no longer maintain a positive linear slope. Once the buffer has reached the end of C_A, E is normalized to values between 0 and 1.

5.2.4.2 *Low-frequency onset detection*

The likely downbeat detection function has a resolution of one eighth-note. A low-level onset detection function is incorporated to convey information related to low-frequency event salience and timing. The low-frequency onset detection function L is introduced as follows: as in Davies et al. (2009), the input audio is segmented into 40 equivalent rectangular bandwidth (ERB) spaced sub-bands and calculate complex spectral difference (Bello et al. 2004) across each is calculated (with a temporal resolution of 11.6 msec per onset detection function sample). Since drum types found at downbeats are likely to be bass drums, the detection function focuses on the lower frequencies by summing the output of the lowest ρ bands to produce L. While the precise number of bands is not critical, ρ=5 was found to provide adequate results.

5.2.4.3 *Beat-time weighting*

In Section 5.2.3, beat time locations γ are used to create the eighth-note grid used in the segmentation of the test audio for the SVR model. γ are also used to generate a beat-time weighting U for emphasis in L. At γ (here quantized to the resolution of L), U=ω, and otherwise U=1. The precise value of ω is not crucial, however ω =1.3 was found to perform well. To contend with alignment issues of beat times and peaks in L, U=ω is additionally weighted at ±2 detection function samples of γ.

5.2.4.4 *Information fusion and decision*

In this stage, low-frequency onset detection function L is combined with the beat-time weighting U and likely downbeat position function E to create a final detection function Θ, which is used in the determination of downbeat times.

The motivation in combining these three forms of information is as follows: L provides low-level information pertaining to event location and salience, while E provides informed knowledge of likely downbeat positions based on similarity of the test segment patterns to patterns of drums in the breakbeat training set. The integration of beat-time weighting U provides alternate possible downbeat positions that E has either missed or erroneously measured.

As none of these information sources alone is capable of accurate downbeat detection, the purpose of this approach is to fuse them in a meaningful way to create a hybrid detection function that imparts the key attributes of each, resulting in a more robust detection function from which downbeats will be selected. First, E is interpolated to match the temporal resolution of L. L, E, and U are then combined as:

$$\Theta = (L(1 + E)) * U, \tag{5.1}$$

where $*$ refers to element-wise multiplication.

An example of the usefulness of both E and U in emphasizing peaks of L at likely downbeat positions (and suppressing peaks not likely associated with downbeats) is presented in **Figure 5.13**. The top graph shows L (blue line) without scaling by E (red line), and annotated downbeat positions (vertical black lines). The middle graph shows L after scaling by E (blue line). The bottom graph depicts L after scaling by E and U (blue line).

For the final selection of downbeat positions from Θ, a peak-finding method is required that is capable of finding strong peaks that exist at regular intervals. Dynamic programming has been shown to be useful for such purposes in beat detection (Ellis 2007). Dynamic programming is similarly adopted to find downbeats within Θ, with a likely downbeat period τ. Given a high probability of a 4/4 time

signature and steady tempo in HJDB, it is sufficient to estimate τ as 4 times the median of all inter-beat intervals derived from γ.

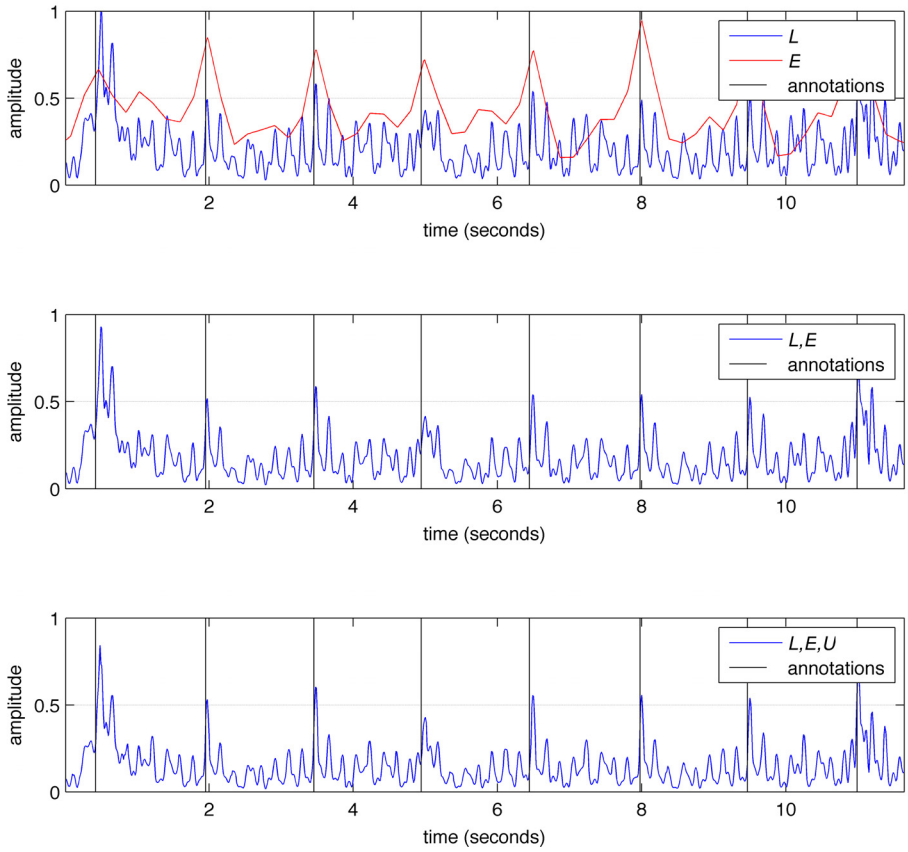

Figure 5.13: Effect of stages in information fusion in Vibes and Wishdokta's *Peakin Through The Window* (1993): (top) L with no scaling, E, and annotations; (middle) L scaled by E, and annotations; (bottom) L scaled by E and U, and annotations.

5.2.5 Evaluation

An evaluation is undertaken to determine the efficacy of the presented downbeat detection method, along with four generalized models, on a dataset solely consisting of HJDB music. This section presents the dataset used, the algorithms under evaluation, the methodology, and results of the evaluation.

5.2.5.1 *HJDB downbeat dataset*

The HJDB dataset is comprised of 236 audio excerpts[48] of between 30 seconds and 2 minutes in duration. Each excerpt was selected from a full-length HJDB track, digitized from its original vinyl format to a 16-bit/44.1 kHz WAV file. The pieces span the first five years (1990–4) of HJDB's development from Hardcore into Jungle and into Drum & Bass.

Well-known, popular HJDB pieces were chosen for inclusion in the dataset. An effort was taken to ensure a wide distribution of artists, styles, and breakbeats used; three professional HJDB DJs were consulted for their opinions. An experienced Drum & Bass musician annotated downbeats using Sonic Visualizer.[49] 30 excerpts were removed from the test dataset to create a separate parameter tuning dataset used to select the kernel and optimize parameters of the SVR algorithm. The remaining 206 excerpts were then used in the evaluation with the other four models.

5.2.5.2 *Methodology and algorithms tested*

For evaluation, a modified version of the continuity-based beat tracking evaluation metrics used by Hainsworth and MacLeod (2004), Klapuri et al. (2006), and Davies and Plumbley (2007) (equations 4.14–9) was used. The principal difference is that downbeats are assessed as the subject of evaluation, rather than beats. Additional modifications included an adjustment of the tolerance window threshold, and an alteration of the possible interpretations of the downbeat to reflect whole beat offsets.

A tolerance window of ±1/16-note is placed around each annotated downbeat in the dataset—a window size equivalent to ±6.25% of the inter-annotation interval. For a candidate downbeat to be correct, it must fulfill three conditions: First, it must be located within the ±6.25% tolerance window around the nearest annotation. Second, the previous candidate downbeat must be located within the ±6.25% tolerance window around the previous annotation. Finally, the difference between the inter-downbeat interval (IDI)—as generated from the present and previous downbeat candidates—and the inter-annotation interval (IAI) must be within

[48] For the track list, see: http://ddmal.music.mcgill.ca/breakscience/dbeat

[49] http://www.sonicvisualiser.org

±6.25% of the IAI. **Figure 5.14** provides an illustration of the three conditions, with black vertical lines representing ground-truth annotations, dashed orange lines representing downbeat candidates, and grey rectangles representing tolerance windows. In the case of the first downbeat candidate on the left, the first condition is not met, as the downbeat candidate is outside of the tolerance window. In the second case, while the first condition is met, the previous candidate lies outside its tolerance window; thus, the second condition is not met. In addition, because the difference between the IDI and the IAI is greater than ±6.25% of the IAI, the third condition is not met either. The third case on the right represents a correctly found downbeat, as all three conditions have been met. The total number of correct downbeats is assessed and a mean accuracy is provided for a given excerpt.

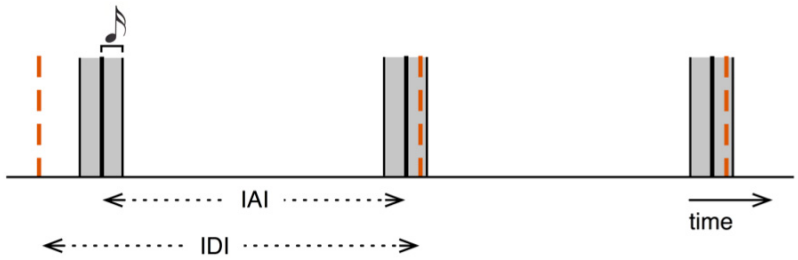

Figure 5.14: An illustration of the three conditions by which a downbeat candidate is confirmed as a correct downbeat. The black vertical lines are ground truth annotations, dashed orange lines are downbeat candidates, and the grey rectangles represent tolerance windows.

Among the various beat offsets allowed by the evaluation measure, the most important is in the 1-metric, which indicates how well the estimated downbeats align with annotations. The 1-metric is the mean accuracy across all excerpts. Additional metrics, the 2-metric, the 3-metric, and the 4-metric, are provided to quantify errors in downbeat estimations that are offset by whole beats. A potential problem for general models is HJDB's fast tempo. Two additional measures, the 1/2a- and 1/2b-metrics, are included to provide error measures for estimated downbeats found at the half-tempo rate. The 1/2a-metric is calculated using the same evaluation method above, with the annotations sub-sampled by a factor of two starting with the first

annotated downbeat. The 1/2b-metric is determined in the same manner as the 1/2a-metric, with the only difference being that it starts at the second annotated downbeat to detect half-tempo downbeats off-phase from the 1/2a-metric.

The evaluation focused on a comparison of the performance of the HJDB-specific method with four generalized methods. The following four methods were compared with the presented method: commercial software #1 (CS1); commercial software #2 (CS2); Klapuri et al. (2006) (KL); and Davies and Plumbley (2006) (MD). The MD and KL methods were both described in Section 4.3.4.2. CS1 and CS2 were commercial products from two separate companies.[50] As access to the algorithms in CS1 and CS2 was not provided, they were treated as black boxes.

5.2.5.3 *Results*

5.2.5.3.1 Parameter-tuning set results

Four possible configurations of the presented method were compared prior to evaluation with the four other methods. This evaluation used the 30-excerpt parameter tuning set to determine the best system to use in the full evaluation (Section 5.2.5.3.2). **Table 5.3** presents results for these configurations using the 1-metric, 2-metric, 3-metric, and 4-metric described above. While two of the configurations did not contain beat-time weighting U, all configurations contained the dynamic programming stage with likely downbeat-level periodicity τ, derived from beats. Evaluation of Beatroot's performance on the HJDB downbeat dataset (beats interpolated from downbeat positions) resulted in an *F*-measure of 83.0%.

The base system (labeled LDF) containing low-frequency detection function L, performed well, which demonstrated the effectiveness of focusing on bass drum frequencies. Adding either emphasis U (LDF, U) at estimated beat times or estimated likely downbeat detection function E (LDF, E) had a similar positive effect. Adding both U and E had a further positive effect, indicating independence between these features. While U increased the chance of finding a downbeat on all beats, E increased the chance of finding the downbeat on or around positions using percussion similarly to breakbeat downbeats (on a secondary strong beat such as beat

[50] One of the commercial products is a beta version at the time of writing

three). This particular result was of importance, as it demonstrates that the fusion of information from all three sources—low-level event detection, beat times, and the rhythmic and timbral characteristics of the percussion—served to improve the accuracy of the downbeat detection.

This result was also reinforced by the results of the error metrics. Errors in the 2-, 3-, and 4-metric in either LDF, U or LDF, E were reduced by the addition of the other features—for example, the 6% error found in LDF, E in the 2-metric was reduced to 3.3%. Similarly, the 2.8% error found in the LDF, U on the 2-metric was reduced to 0.6%. Addition of either or both emphasis U or likely downbeat detection function E resulted in an improvement in accuracy over LDF alone, and a reduction in error rates 2-metric, 3-metric, and 4-metric. As a result of this finding, the configuration incorporating all three sources of information (LDF, U, E) was selected for testing in the full evaluation.

	Evaluation Metric			
Configuration	**1**	**2**	**3**	**4**
LDF	72.8	3.7	3.4	6.4
LDF, E	79.3	0.8	9.6	6.0
LDF, U	79.9	2.8	**2.8**	4.8
LDF, U, E	**83.4**	**0.6**	3.1	**3.3**

Table 5.3: Accuracy measure 1-metric (**1**), and error measures 2-metric (**2**), 3-metric (**3**), and 4-metric (**4**) for four configurations of the presented method using the parameter-tuning dataset. **1** is the mean accuracy across all excerpts; **2**, **3**, and **4** are the mean errors for each beat position (see Section 5.2.5.2 for details). All measures are provided in percentages and bold scores denote highest accuracy in **1** and the lowest error in **2**, **3**, and **4**.

5.2.5.3.2 Comparative results

Performance of the five methods is displayed in **Table 5.4**. The specialized method (HJ)—using the LDF, U, E configuration as found in the parameter-tuning stage—performed best in the 1-metric. In addition, HJ achieved the smallest 2- and 1/2-metric error rates (with a low 4-metric), which when coupled with high 1-metric accuracy, was seen favorably.

For a downbeat detection method to have incorrectly found a downbeat on either beat two or four in this dataset probably demonstrated a preference for high-energy note events such as snares, which are often played on these beats in HJDB music. All models have some degree of error reported in the 3-metric, possibly due to similarities in breakbeat drum patterns starting on beats one and three, which resulted in a confusion of measure boundaries at these positions. Surprisingly, none of the models displayed an affinity for the 1/2-metrics that were assumed to be favourable to the generalized models.

	Evaluation Metric					
Method	**1**	**2**	**3**	**4**	**1/2a**	**1/2b**
CS1	38.5	2.8	**4.0**	4.2	2.8	2.0
CS2	7.4	11.7	9.5	6.7	1.1	1.1
KL	51.3	2.8	9.6	**0.2**	3.0	2.0
MD	29.3	4.7	5.5	3.0	1.2	2.2
HJ	**74.7**	**2.3**	5.8	2.0	**0.0**	**0.0**

Table 5.4: Accuracy measure 1-metric (**1**), and error measures 2-metric (**2**), 3-metric (**3**), 4-metric (**4**), 1/2a-metric (**1/2a**), and 1/2b-metric (**1/2b**) for the five methods under evaluation in the HJDB test dataset. **1** is the mean accuracy across all excerpts; **2**, **3**, and **4** are the mean errors for each beat position; and **1/2a** and **1/2b** are mean error measures provided to identify downbeats found at the half-tempo rate (see Section 5.2.5.2 for details). All measures are provided in percentages and bold scores denote highest accuracy in **1** and the lowest error in **2**, **3**, **4**, **1/2a**, and **1/2b**.

5.2.6 Discussion

Evaluation of the style-specific method with the four generalized downbeat detection methods demonstrated a wide gap in performance. This not only highlights the efficacy of the presented approach in the confines of HJDB, but also provided evidence of the style-specific nature of downbeat detection in niche genres. This latter conclusion is of importance, as without the style-specific training, the presented method is likely to be less effective in music without breakbeats, and in music in which downbeats were conveyed by chord changes.

While the specialized method outperformed the generalized models, results should be examined with the understanding that only this specialized approach had access to the parameter-tuning set used to adjust parameters of the SVR algorithm. While this may have made the comparison somewhat imbalanced, this model was the only algorithm necessitating such parametric tuning, as the other models were generalized approaches. Specific attributes of HJDB music had been incorporated into a model used for its analysis: information about timbre, pitch, and loudness of segments; knowledge of likely patterns; and emphasis on bass drum events and potential downbeat candidates at beat locations.

5.3 Example rhythmic modification analysis

This dissertation has focused on the way in which breakbeats have been appropriated into the genres (Chapter 2) and how they have been modified in the creation of the music (Chapter 3). The present section deals with the problem of measuring the similarity between the drum rhythms in original breakbeats and those in the HJDB tracks that incorporate them. Analysis of rhythmic modification of breakbeats will provide insights into the resequencing practices undertaken by HJDB musicians in individual tracks, which could, for example, be used to assess these practices across an artist's career or across subgenres.

In order for this analysis to be performed, two requirements must first be met: the original breakbeat used in an HJDB track must be determined and relevant measure boundaries—downbeats—in both the original breakbeat and HJDB track must be located. The tools presented in Section 5.1 (breakbeat classification) and

Section 5.2 (downbeat detection)—while independently useful in applications such as DJ playlist recommendation and automated DJ-mixing software, respectively—can be used to fulfill these requirements.

In the remainder of this section, an example of rhythmic modification analysis is provided, which demonstrates the type of information that may be obtained once the original breakbeat is identified and the downbeats are detected. Here, the rhythmic contents of two well-known HJDB tracks are analyzed and compared against the original breakbeat used in both tracks. These examples are included to demonstrate the capability of the presented metrics to display the variation in usage of breakbeats in different tracks, both visually and quantitatively.

5.3.1 Rhythmic segmentation

Breakbeats generally consist of drum types found in the standard drum kit (see Section 2.4 for more detail). In order to determine the degree of resequencing, the drum types typically found in breakbeats (e.g., bass drum, snare drum) must be delineated and their location in time determined. One possible approach could be to compare a sequence of drum type labels (e.g., bass drum, snare drum) found in measure-length segments of an HJDB track to a sequence found within the original breakbeat. Success of percussion detection algorithms for polyphonic drum detection has been limited (Downie 2005a)—potentially due to competing events (e.g., bass sounds competing with bass drums); errors in segment labeling could be propagated into the overall determination of rhythmic manipulation.

An alternative approach undertaken in this example analysis, was to determine the degree of rhythmic modification through a comparison of eighth-note segments of measure-length continuous event activation detection functions. Rhythmic analysis through measure-length continuous event activation detection functions have been utilized in a variety of rhythmic description tasks (Dixon et al. 2004; Davies 2007; Hockman et al. 2008). The advantage of this method in this context is that multiple rhythmic characterizations may be obtained from this comparison. The following example analysis using this approach illustrates the possibility of assessing rhythmic similarity between: (1) a multi-measure HJDB excerpt and individual measures of the original breakbeat, (2) each individual HJDB measure and each

measure of the breakbeat, and (3) eighth-note segments in the HJDB track and similar positions in each measure of the original breakbeat.

Once the original breakbeat is identified through the method presented in Section 5.1, and downbeats in the HJDB track are found through the method in Section 5.2, continuous detection functions for individual drum types—bass drum and snare drum—are created for both the original breakbeat and the HJDB track under evaluation. The bass drum detection functions are created as in Section 5.1.2. The snare drum detection functions are created in a similar fashion, but with a focus on wide-band signal activity between 50 and 500 Hz in the harmonic-suppressed spectrogram. Measure segments of the bass and snare drum detection functions are created for both the HJDB track and the original breakbeat. For comparative purposes, the measure segments are then normalized to amplitude values between 0 and 1, and resampled to a fixed length. While the exact resampling length chosen was not critical, 256 samples was selected as it was the base two number that was closest to the average length of the measure segments (a base two number may be divided evenly into a variety of possible metrical durations, such as quarter notes (64 samples), eighth notes (32 samples), and sixteenth notes (16 samples)). To compare drum type usage between the breakbeat and the HJDB track, an eighth-note grid is applied to each measure-length segment. The eighth-note grid is created by interpolating the downbeat positions. Alternative grids such as a sixteenth-note grid could be also be applied; however, the eighth-note grid was found to minimize the possibility of overlap of event activations in the detection function between two successive segments. **Figure 5.15** depicts the bass and snare drum detection functions for the *Funky Mule* breakbeat used in the example analysis (a transcription of the *Funky Mule* breakbeat was presented in **Figure 5.4**).

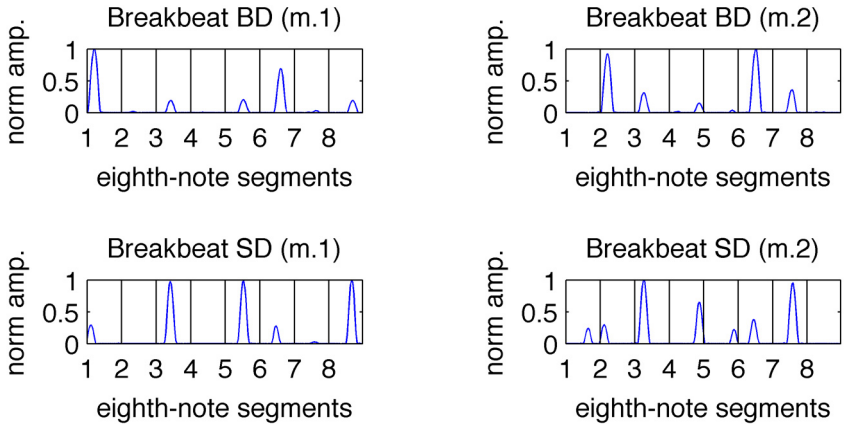

Figure 5.15: Measure-length bass drum (BD) and snare drum (SD) detection function for the two measures (m.1 and m.2) of the *Funky Mule* breakbeat. Each measure is resampled to 256 detection function samples and normalized to values between 0 and 1 before being segmented into eighth notes for comparison.

5.3.2 Comparative analysis

To obtain information about the similarity between bass and snare drum usage in breakbeats and HJDB tracks that use them, comparative analysis is performed using the segmented measure-length detection functions. The eighth-note segments of the HJDB bass and snare drum detection functions are compared to similar eighth-note positions in the detection functions of each measure of the breakbeat using the cosine distance. Offsets in timing may exist between the drum event activations in the original breakbeat and the HJDB track, due to either intra-measure timing variations (e.g., swing) or to minor deviations in the downbeat analysis. To adjust for these potential offsets in the alignment of events between the segments, circular convolution is performed on each eighth-note segment prior to calculation of the cosine distance.

Comparison of drum detection functions for each measure results in the creation of 2 x m matrices where m is the number of measures in the original breakbeat, and the multiplication by two is the result of two drum detection function types (bass drum and snare drum). The bass drums, snare drums, and high-hat

cymbals of an eight-measure segment of Rufige Kru's *Believe* (1992) are transcribed in **Figure 5.16**. **Figure 5.17** displays the four matrices created through a comparison of the eight measures (thus eight rows in each matrix) of *Believe* with two measures of the *Funky Mule* breakbeat. The matrix at the top left displays the cosine distances between the bass drum detection functions from each eighth-note segment in eight measures of *Believe* with the bass drum detection function from the first measure of the *Funky Mule* breakbeat. Values for the cosine distance are bounded between 0 and 1. Darker cells indicate that the HJDB segment has a similar bass drum activity to the breakbeat at this position, while lighter cells indicate a difference between the two. A comparison between the bass drum detection function from *Believe* and the second measure of the *Funky Mule* breakbeat is presented in the top-right matrix. The bottom-left matrix compares snare drum detection functions from each segment in *Believe* with the snare drum detection from the first measure of the *Funky Mule* breakbeat. The bottom-right matrix depicts a similar comparison, but with the snare drum detection function from the second measure of the *Funky Mule* breakbeat.

Visual inspection of the bass drum cosine distances (top two matrices in **Figure 5.17**) demonstrates that the *Believe* pattern is similar to the original breakbeat, as is evident in the alternating rows of dark cells; odd measures follow the pattern of the first measure of the breakbeat, and even measures follow the pattern of the second measure of the breakbeat. A similar scheme is seen in evaluation of the first few segments of the snare drum cosine distances (bottom two matrices in **Figure 5.17**).

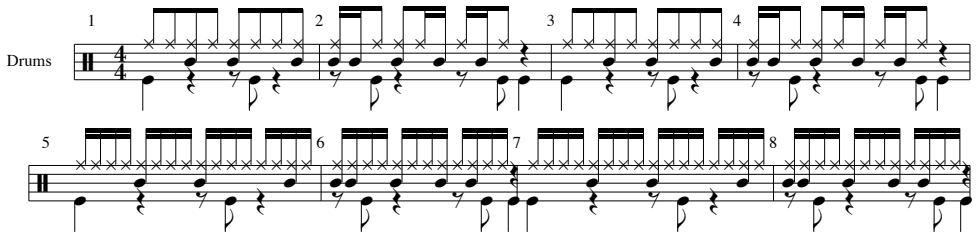

Figure 5.16: Drum transcription of the bass drums (bottom notes), snare drums (middle notes), and high-hat cymbals (top notes) used in the eight-measure segment of Rufige Kru's *Believe* (1992).

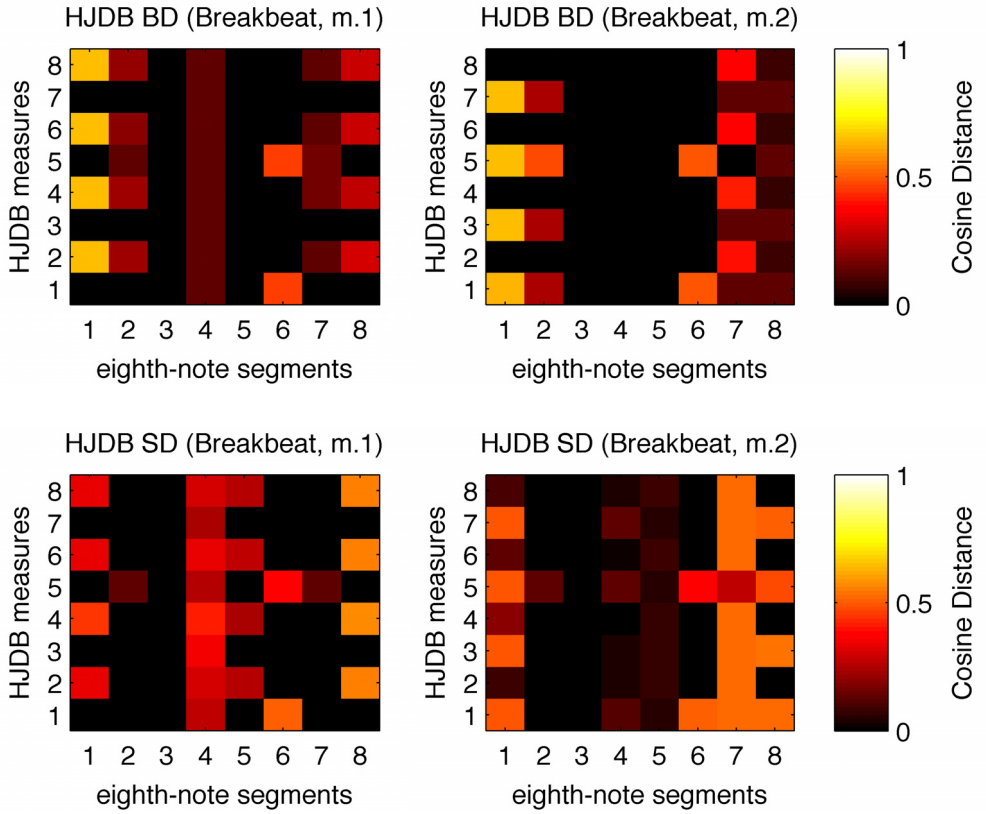

Figure 5.17: Cosine distances between eighth-note segments of bass and snare drum detection functions from eight measures of Rufige Kru's *Believe* (1992) and two measures (m.1 and m.2) of the *Funky Mule* breakbeat. Darker regions denote similarity between detection functions.

To determine which measure of the breakbeat is more similar in combined bass and snare usage, the cosine distances of each drum type (bass and snare) for a given measure can be averaged, resulting in an overall bass drum cosine distance and overall snare drum cosine distance. This equates to the mean of all positions for each of the matrices in **Figure 5.17**. A cumulative combined cosine distance for each breakbeat measure is then created by averaging the bass and snare drum cosine distances for a given breakbeat measure. **Figure 5.18** shows the bass drum cosine distance, snare drum cosine distance and combined cosine distance for *Believe* and the two measures of the *Funky Mule* breakbeat. Since *Believe* follows the two-measure

pattern of the original breakbeat fairly closely, the cosine distances are somewhat similar for breakbeat measures one and two.

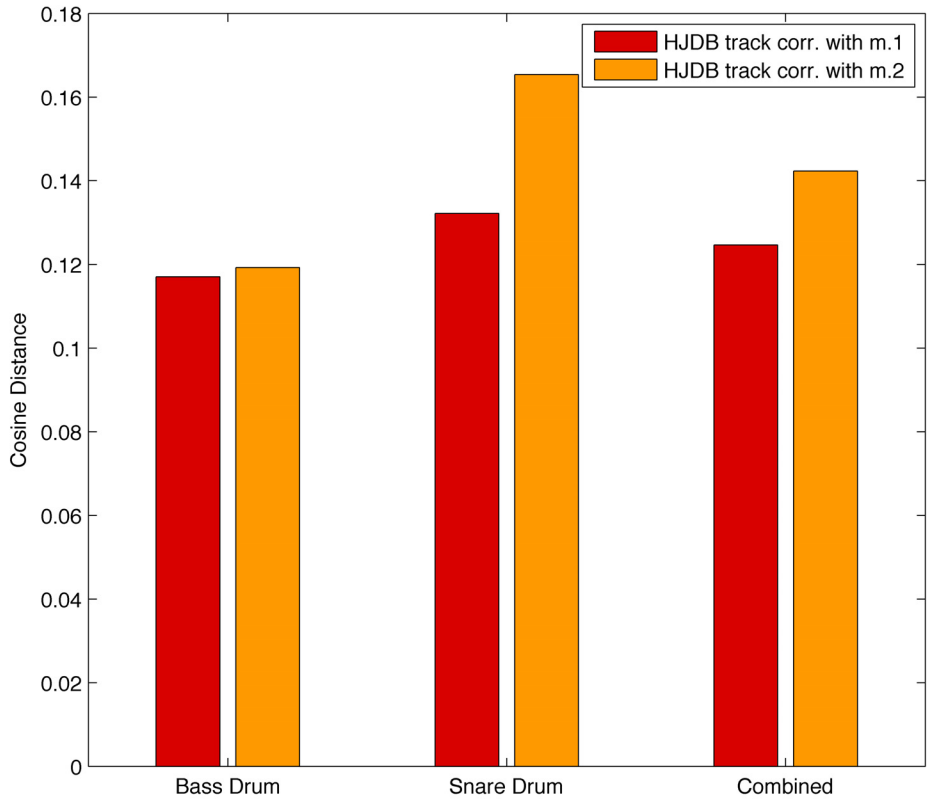

Figure 5.18: Overall cosine distances for bass drum, snare drum, and combined bass and snare drum usage between the HJDB track (*Believe*) segment and the first and second measures (m.1 and m.2, respectively) of the *Funky Mule* breakbeat. The distances are somewhat similar for both measures in all three categories, reflecting the close adherence to the two-measure pattern in the original breakbeat.

A second example of the rhythmic modification analysis shows the usefulness in demonstrating how a different HJDB track has used the *Funky Mule* breakbeat. Unlike the previous example, which uses a two-measure pattern similar to the original breakbeat, this example uses a one-measure bass and snare pattern that is similar to the first measure. The bass drums, snare drums, and high-hat cymbals of an eight-measure segment of Top Buzz's *Livin' In A Dream* (1994) are transcribed in **Figure 5.19**. **Figure 5.20** displays the four matrices created through a comparison of

eight measures of *Livin' In A Dream* with two measures of the *Funky Mule* breakbeat. The matrix at the top left displays the cosine distance between the bass drum detection functions from each eighth-note segment in eight measures of *Livin' In A Dream* with the bass drum detection function from the first measure of the *Funky Mule* breakbeat. A comparison between the bass drum detection function from *Livin' In A Dream* and the second measure of the *Funky Mule* breakbeat is presented in the top-right matrix. The bottom-left matrix compares snare drum detection functions from each segment in *Livin' In A Dream* with the snare drum detection from the first measure of the *Funky Mule* breakbeat. The bottom-right matrix depicts a similar comparison, but with the snare drum detection function from the second measure of the *Funky Mule* breakbeat.

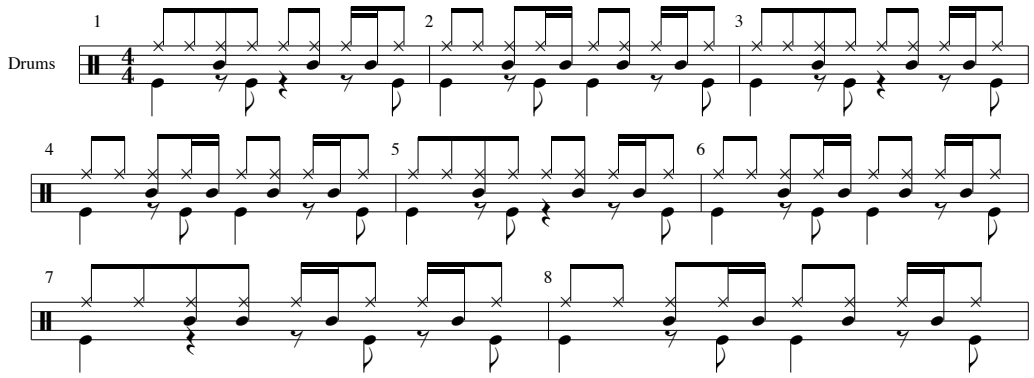

Figure 5.19: Drum transcription of the bass drums (bottom notes), snare drums (middle notes), and high-hat cymbals (top notes) used in the eight-measure segment of Top Buzz's *Livin' In A Dream* (1994).

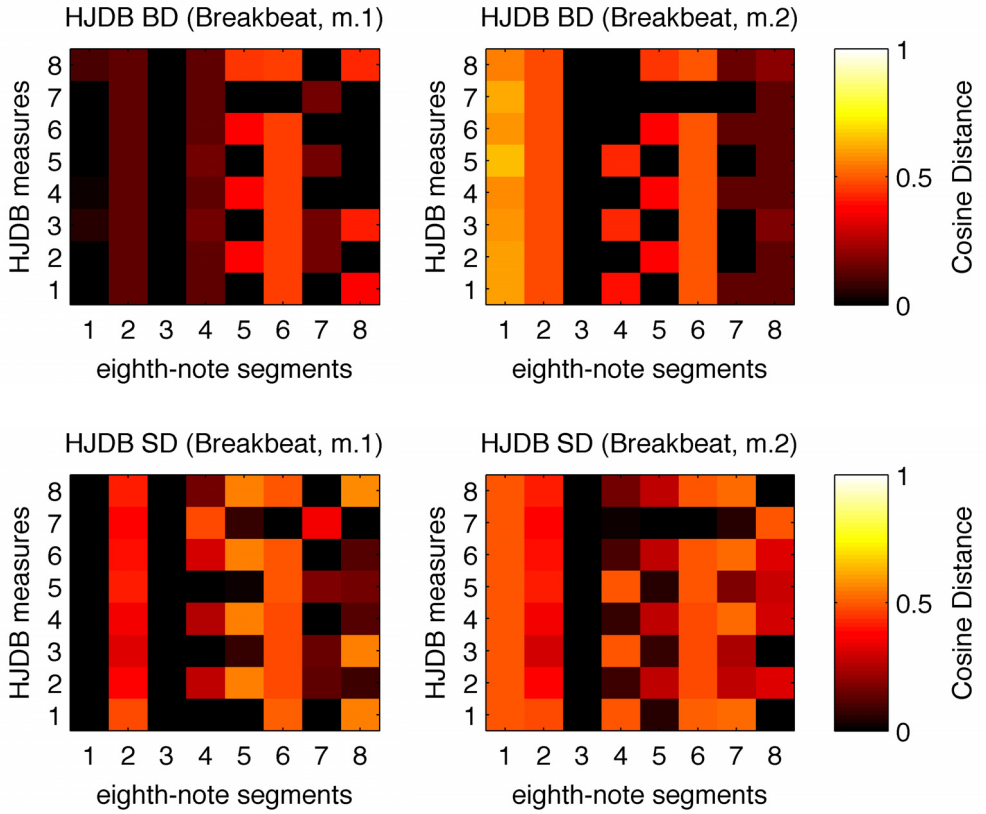

Figure 5.20: Cosine distances between eighth-note segments of bass and snare drum detection functions from eight measures of Top Buzz's *Livin' In A Dream* (1994) and two measures (m.1 and m.2) of the *Funky Mule* breakbeat. Darker regions denote similarity between detection functions.

Overall cosine distances for the example shown in **Figure 5.20** are displayed in **Figure 5.21**. A substantially lower cosine distance is found for bass drum usage in the first measure than the second measure. Snare drum usage is somewhat more similar to the first measure than the second, mainly due to a dissimilarity to segment one in the comparison with the second measure (as can be seen in the bottom-right matrix of **Figure 5.20**). The combined cosine distances also demonstrate that the overall usage is more similar to that of the first measure. This is likely due to the presence of a strong bass and snare drum pattern at the start of each measure of *Livin' In A Dream* that is similar to that found in measure one of the breakbeat. This

is different than the usage in *Believe*, which repeatedly switches between the two measures.

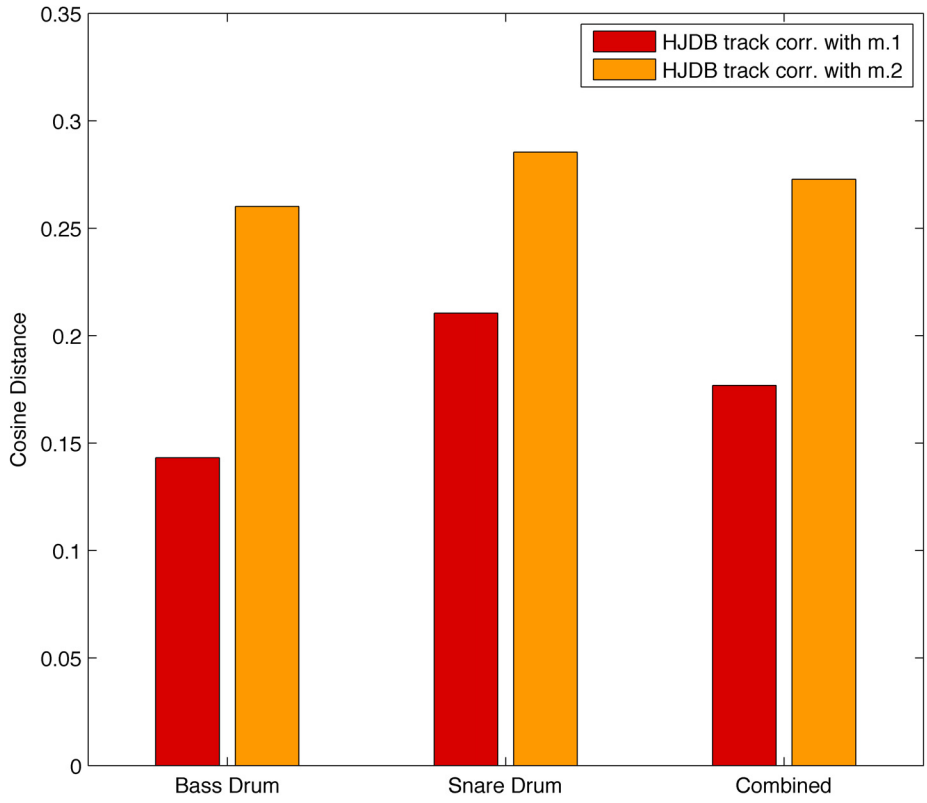

Figure 5.21: Overall cosine distances for bass drum, snare drum, and combined bass and snare drum usage between the HJDB track (*Livin' In A Dream*) segment and the first and second measures (m.1 and m.2, respectively) of the *Funky Mule* breakbeat.

Additional information related to bass and snare drum usage may be obtained from the rhythmic modification analysis. For example, to provide an overall distance metric between each HJDB measure and the breakbeat measure under analysis, the bass and snare drum usage may be assessed for entire measures by averaging the cosine distances for each measure (across columns in each matrix). Alternatively, to provide a distance metric for each eighth-note segment position, each eighth-note segment may be assessed by averaging each column (across rows in each matrix). **Figure 5.22** presents the mean and standard deviation cosine distances of the eighth-note segments in the four matrices in **Figure 5.20**. Here, low mean values indicate

that the given segment is more similar to the original breakbeat for a given measure (m.1 or m.2), and small standard deviations indicate these values do not vary much between measures of the HJDB track. The small bass drum cosine distances (as can be seen in the top-left matrix of **Figure 5.20**) associated with the first measure are seen here, as well as the high bass drum cosine distances associated with the first two segments of the second measure (as can be seen in the top-right matrix of **Figure 5.20**).

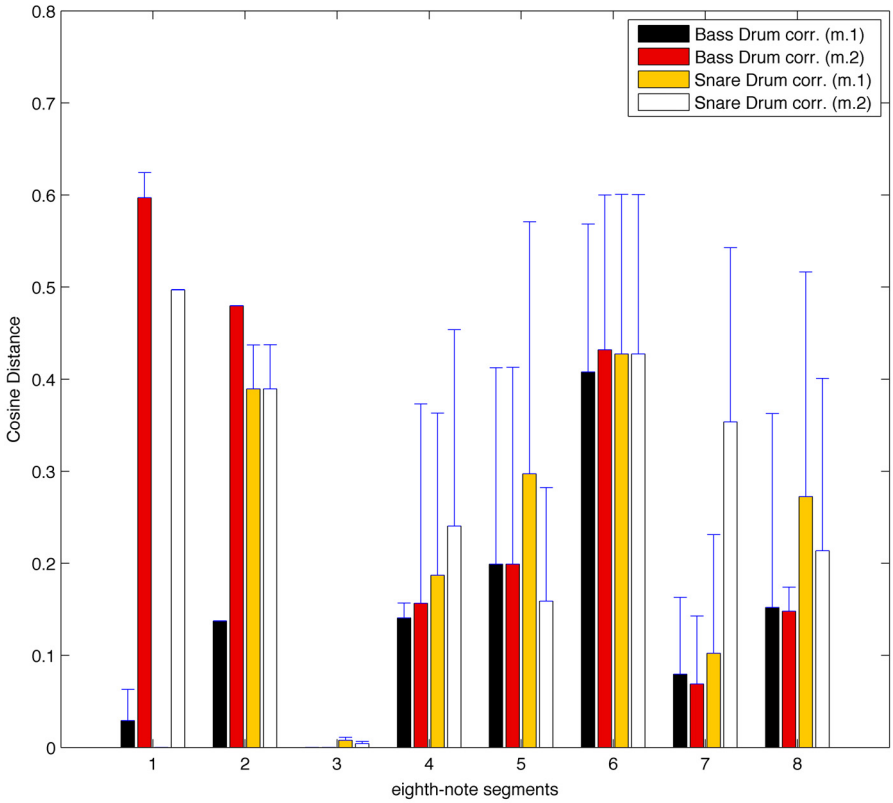

Figure 5.22: Means (bars) and standard deviations (whiskers) of the bass and snare drum cosine distances between *Livin' In A Dream* and the first and second measures of the *Funky Mule* breakbeat. Small means reflect similarity between the usage of a particular drum at the given segment in both the HJDB track and the breakbeat measure. Small standard deviations reflect that these values remain consistent between measures.

5.4 Summary

This chapter has presented novel techniques for the analysis of breakbeats in HJDB tracks. The first technique presented was a classification of the underlying breakbeat used in a HJDB track. The breakbeat classification method relies on the identification and segmentation of bass drums in the audio signal, which are then classified as one of a few candidate breakbeats. Evaluation of this method was assessed in comparison with a generalized music classification method using a dataset of HJDB tracks selected by a online community of DJs and music producers (musicians that have created the tracks). The presented method was shown to outperform the generalized method by a wide margin.

The second technique presented uses the rhythmic and timbral characteristics of breakbeats to help guide a downbeat detection method. An evaluation was undertaken that compared the performance of four pre-existing methods for downbeat detection with the presented method, using over 200 examples of HJDB music from 1990–4. Results of this evaluation demonstrated the superiority of the presented method.

Using these two systems, a rhythm analysis method is proposed that may be used to evaluate the rhythmic modification of breakbeats in HJDB tracks. Example analyses using this approach illustrated the possibility of assessing rhythmic similarity between: (1) a multi-measure HJDB excerpt and individual measures of the original breakbeat, (2) each individual HJDB measure and each measure of the breakbeat, and (3) eighth-note segments in the HJDB track and similar positions in each measure of the original breakbeat.

One disadvantage of the proposed rhythmic modification analysis is that it does not determine if multiple consecutive segments of the breakbeat are used in different positions throughout an HJDB measure (or a grouping of measures). One common characteristic in Jungle is the repetition of segments containing so-called ghost notes (soft quickly repeating drum hits such as stick bounces after a main drum hit) in place of main drum hits with larger amplitudes. A possible improvement therefore, might include the ability to determine such information through the use of additional features capable of identifying this type of attribute.

Chapter 6: Conclusions

6.1 Summary of dissertation

This dissertation has focused on the DJ-oriented electronic music genres of Hardcore, Jungle, and Drum & Bass (HJDB). While the genres have been the subject of previous works, no such works have presented the genres from the perspective of those that have created the music. After a brief introduction to the topic (Chapter 1), this dissertation has traced the development of these genres from this perspective with a specific focus on the integration of breakbeats into the music (Chapter 2). The main source of information for this historical account was in the form of interviews conducted with a variety of musicians and record label owners from throughout the HJDB timeline. Next, this dissertation outlined the technologies and techniques used in the creation of this music (Chapter 3), with a focus on the digital sampler and techniques used to sample and manipulate breakbeats, which provided the rhythmic and timbral basis of this music. As with the previous chapter, interviews with musicians that created this music were used as the main source of information. The focus of this dissertation then shifted to explore the possibility of automated analysis of breakbeat usage within HJDB audio. In order to create automated analysis tools, a review of existing technologies related to rhythmic and percussive analysis was performed (Chapter 4). To evaluate the use of breakbeats in HJDB music, existing technologies were improved (i.e., downbeat detection) and new techniques (i.e., breakbeat classification, rhythmic modification analysis) were developed (Chapter 5). These technologies may be used by researchers in the exploration of a variety of topics related to breakbeat usage within HJDB music.

6.2 Thesis contributions

As noted in Chapter 1, HJDB are genres of DJ-oriented electronic music that are most notable for the usage of fast-paced breakbeats sampled from Funk and Jazz recordings. The aim of this dissertation was to provide a comprehensive view of the genres through an investigation of breakbeats and sampling technology, which are

essential to this music. The four most obvious contributions of this work are the results of this investigation: a written history of the HJDB genres, an explanation of the technology and techniques used, the interviews themselves, and the creation of tools for computational analysis of the genres. The written history—presented from the perspective of musicians and label owners—explains the conditions and influences that brought about the inclusion of breakbeats into UK dance music in the early 1990s, along with the evolution of the genres themselves through several major subgenres.

A detailed account of the development of sampling technology was juxtaposed with a review of techniques developed by musicians for integrating breakbeats into the genres. Interviews performed with musicians suggested that the development of new approaches to tasks such as breakbeat segmentation and resequencing were the result of an evolution of sampling technology itself (e.g., increase in sampling time, new editing features on samplers), along with the competitive spirit among musicians. These new developments led to novel usage of breakbeats, the most common of which is resequencing.

The computational tools were created to simplify the task of analyzing how breakbeats have been used (i.e., resequenced) in audio recordings of music from the HJDB genres. Each of these tools was modeled with design attributes that were specific to the music under analysis (e.g., downbeat detection with machine learning of rhythmic and timbral characteristics of well-known breakbeats) and tuned to the particularities of the music. These tools may subsequently be used to confirm the relationships that have been outlined in the history and the explanation of how the music has been made. In addition, it is hoped that these tools may also reveal additional relationships between the historical, technological, and technical aspects.

6.3 Future research

6.3.1 Creation of larger datasets

The datasets that have been used in the evaluation of algorithms proposed in Chapter 5 have been constructed specifically for this thesis. Currently, the HJDB breakbeat dataset consists of music containing a set number of breakbeats. Increasing both the number of breakbeats represented and the number of tracks for

each breakbeat in the HJDB breakbeat dataset would subsequently allow researchers to determine large-scale trends in HJDB music. A difficulty in this regard is the collection and verification of ground-truth annotations for breakbeats contained in HJDB tracks. Only expert listeners with a high degree of specialization are suitable to make such distinctions, and verification by additional experts is also necessary for the annotations. The social network architecture provides a convenient and transparent environment in which multiple experts can interact to easily confirm or reject candidate annotations. This is straightforward in the case of the breakbeat dataset, which consists of a single annotation per file; however, this methodology is not feasible for datasets requiring multiple annotations, such as tapping data.

Another difficulty in the development of these datasets is that the source audio for many of the candidate tracks exists exclusively on vinyl records, which have the potential for degraded audio quality resulting from repeated vinyl playback. Audio that has been digitized from vinyl records with unspecified components (e.g., cartridge) and parameters—such as the setting of a variable pitch fader that affects tempo—has the potential to drastically skew results for research questions pertaining to the characteristics of these genres, such as tempo statistics. Therefore, audio quality issues (Pras et al. 2009; Pras and Guastavino 2010; Hockman et al. 2011) involved in the playback and recording of these tracks should be addressed during dataset creation.

6.3.2 Improvements to the presented algorithms

While the breakbeat classification method presented in Chapter 5 was able to discern between three classes of breakbeats based solely on the bass drum, there are a number of improvements that could potentially enhance the robustness of the method. At present the method is designed to operate by estimating a breakbeat from among a candidate set of breakbeats. To perform this classification, sufficient training data must be collected from each of the candidate breakbeat classes under assessment. Future work will be to modify the present system to operate in the context of an arbitrary assortment of candidate breakbeats. This will be achieved through the addition of further breakbeat classes and features that target class-specific attributes (e.g., relative distances between spectral centers of drum types) and

characteristic percussion (e.g., *Apache* hand percussion). In addition, the current method only considers percussion from breakbeats, whereas music from the earliest Hardcore and more recent Drum & Bass often utilizes synthetic percussion from drum machines (Bowes 2013; Heinze 2013; Rumney 2013). A future improvement to the breakbeat classification system will therefore be to make it capable of recognizing these timbres as well.

Another area for future study would be to determine if improved results could be achieved for either the breakbeat classification method or downbeat detection method from the inclusion of features from the other method. For example, in downbeat detection, the bass drum detection function method as extracted in Section 5.1.2 might provide a better representation of bass drum activity than the low-frequency onset detection function presented in 5.2.4.2. Also, features targeting the bass drum frequency spectrogram (and wideband snare drum frequencies used to create the snare drum detection function in Section 5.3) might improve results for the downbeat regression.

Ideally, once the breakbeat classification method is capable of assessing a large number of potential breakbeat classes, an interesting future direction would be to determine the presence of certain breakbeats in large corpora of HJDB music. The results of this work—automatically annotated examples of tracks with specific breakbeats—would be directly useful in musicological research on musical influences (N. Collins 2010; Bryan and Wang 2011; N. Collins 2012).

6.3.3 Development of additional modification analysis methods

The automated analysis methods presented in this work are geared towards assessment of breakbeat resequencing. There are a number of other modifications performed in the integration of breakbeats into HJDB music, including pitch modification and distortion, which have as yet not been addressed. In Section 3.2.4 several such modifications were rated and discussed by interviewees.

6.3.4 Additional features for HJDB music

Apart from breakbeat modification analysis, several other elements of HJDB could be studied as well. The purpose of the downbeat detection algorithm (Section 5.2) was to provide breakbeat structural boundaries for comparison between original

breakbeats and HJDB tracks. Downbeat detection was the highest-level metric analysis performed in this work. However, structural segmentation at the hypermeter level would be useful in learning how musicians in the various subgenres have used common techniques such as "breakdowns"—that is, the sections in HJDB tracks when the percussion is removed and only the ambient track components such as sustained synthesizer chords remain.

The role of the bass element in HJDB was touched upon in some of the interviews performed for this work (e.g., Parsons 2013), which are in part presented throughout Chapters 2 and 3. Additional interviews and computational analysis focusing on the bass element could, for example, help to trace the integration of Reggae influences in HJDB bass lines, or to track the evolution in bass presence from the inception of the genres to the present day. Such work would not only be complementary to the analysis of breakbeats, but also useful to provide context for researchers of related genres such as Dubstep or UK Garage.

6.3.5 Application of research to other genres

While the HJDB genres have combined breakbeats—originally from a context of Hip Hop—with elements from other genres including House and Techno, the history of HJDB can be viewed within the context of an extended history of Hip Hop, and its interactions outside of the United States. The interviews performed in this work have confirmed prior work in this area (e.g., Hesmondhalgh and Melville 2002), which has positioned Hip Hop as a major influence in the integration of breakbeats in the UK's dance music culture. The computational analysis methods developed for this project could also be easily adapted for the analysis of breakbeats within Hip Hop. A comparative study of breakbeats in Hip Hop and HJDB could identify similarities and differences of breakbeat usage between the genres.

Appendix

Appendix A: Informed consent form

INFORMED CONSENT FORM – McGILL UNIVERSITY

WHY ARE WE DOING THIS RESEARCH? Our goal is to gather ethnographic information related to Hardcore, Jungle, and Drum & Bass, for the development of both a contextual history in which it was made, as well as tools for the computational analysis of the music.

PRIVACY. All responses to questions that we ask may be used within the context of the current or future research studies related to the analysis/archival/preservation of Hardcore, Jungle, and Drum & Bass and associated settings (e.g., academic conferences, website for display of research findings). In addition, if you choose to participate, you will be identified in reports resulting from this study.

We know that you value your privacy, so if you wish to keep *any* information conveyed to the interviewer *private*, please make this clear in your responses. Any information declared as private will be anonymized and separated from the remainder of the interview. All data collected (including identifiable data, e.g., names and aliases) will be preserved on a secured private server, accessible only by the interviewer and the supervisor.

Participation is voluntary and you are free to withdraw from the project at any time—not just during the interview. If you wish any or all of your data to be removed from the project either during or after the interview, we will dispose of it promptly.

Please note that data conveyed through the internet is subject to interception and that absolute confidentiality of any information submitted in this manner cannot be guaranteed.

DISCUSSION OF RESEARCH IDEAS. We will not be able to discuss our ideas with you during the course of the interview, but we will be happy to talk with you about our research and theories once the interview has concluded.

WHAT WILL HAPPEN DURING THE INTERVIEW? You will be asked a range of questions pertaining to Hardcore, Jungle, and Drum & Bass music and the music community. Questions will be provided one at a time through online means (e.g., email, messenger service). If you do not wish to answer any questions you are free to skip them.

PARTICIPANT'S STATEMENT: "I am 18 years of age or older, I have read the description of the research project and by returning this form from my own email address, I hereby agree to participate. I am aware that the content of this interview will be used for research purposes, and that I may withdraw at any time, if I so wish".

This research is conducted by **Jason Hockman** (**PhD student**) under the supervision of McGill **Professor Ichiro Fujinaga**, Contact jason.hockman@mail.mcgill.ca or ich@music.mcgill.ca for more information.

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Appendix B: HJDB questionnaire

The following questions served as a basis for initial topics discussed in the interviews. Not all interviewees were asked all questions, and successive questions were asked to probe the participants' initial responses further.

Background

(1) *Demographics*

- Tell me about the music scenes you were involved in before Hardcore, Jungle, and Drum & Bass.

(2) *Early instruments, listening habits*

- What genres of music were predominant in your household growing up?
- Did you have any prior musical training beyond your work with technology? If yes, which instruments did you play?

(3) *Family/close friends relationships*

- Did you have any family members or friends that were musicians? How old were you and how old were they?
- If you had early band experience, was it synth/sample related?
- Were there any DJs or producers that served as an influence? Did you have any link to them?

(4) *Parties*

- Tell me about the first parties you went to.
- What kind of music were they playing?
- Describe the crowd.

Early connection with technology

(1) *Musical gear*

- Was there something particular to sampling that drew you into the music?
- Was there something special about synthesizer timbres?
- What year did you purchase your first synthesizers/samplers?

- Which sequencer(s) did you use?

- Has technological development affected your music over the years? Specifically in relation to production techniques.

- Do you have any early photographs of your setup that you would like to share?

(2) *Breakbeats*

- To your knowledge, who were the first producers to use breakbeats in Hardcore? Can you provide a year?

- Tell me about your interest in breakbeats.

- What did you use to manipulate them? What basic techniques did you use? (based on response to this question further more directed questions will follow)

- Please rate on a scale of 1:10 the amount which you used the following:

  • pitch modification
  • distortion
  • resequencing
  • reversing
  • multibreak layering
  • multibreak alternating
  • timestretching or start point manipulation
  • filtering
  • flanging
  • reverbed
  • other:_____

- When you were making these early tunes with breakbeats, were you aware of the influence it would have?

- How many breakbeats do you have in your collection? What are the most popular breakbeats in Hardcore? Jungle? Drum & Bass?

- Do you like certain breakbeats over others?

- Do you mix breakbeats within the same track? Are they generally layered?

- Where did your collection come from? Sampled from vinyl? CDs?

- When you perform the above modifications on the breakbeat, do you attempt to preserve an ordering that emphasizes the beats? Downbeats?

- Please list your favorite 10 breakbeats and at least 1 HJDB tracks that used them.

(3) *Production (if DJ first)*

- What year did you start producing? Did someone teach you production skills? If so, which genre were they in?

Musical Output

(1) *First working partnerships*

- When/where did you meet? How did you guys get on with each other?

- What genre/subgenre were they into?

- What instruments did they play?

- Was there a type of music that stuck with you?

- Can you recall any individual music pieces of music that stuck with you during this time?

(2) *Main DJ working relationships*

- Were you as aware of other genres of music as your own (e.g., Electro)? Any particular tracks? Which elements?

- Did you have any residencies? Radio shows? What year? Where?

(3) *Main production working relationships*

- Could you tell me about how "your big project" happened?

- Do you remember the gear you were using at the time?

- Who were the big DJs when you were coming up?

- How did they get your music?

(4) *Solo work*

- When did you start working alone? (if working in a partnership)

- What drove you to make music? (if DJ first)
- How many tracks did you make before you released them?

(5) *First breakthrough track*

- What year was this?
- Describe how you came up with your first breakthrough track.
- Which breaks did you use? What types of the above break modifications did you use?
- Did this change how you approached making tunes?

(6) *Typical working scenario*

- What gear were you using at this time?
- How did you go about selecting the drums?
- Could you describe a typical session? For example, do you often start with drums?
- Do you often use several hits to comprise a single drum sound?
- Have you found that certain breaks work well with others? Why do you think so?

(7) *Record label (if involved in ownership of record label)*

- Tell me about how you became involved in starting your own label.
- What is the ethos behind your label?
- Is there a particular sound that your label has, and if so, can you describe it?

Genres

(1) *Hardcore, Jungle, and Drum & Bass (HJDB)*

- In what year did you first become aware of: Hardcore? Jungle? Drum & Bass?
- Where was it first heard? How was it received? What changed?
- Can you explain these genres? And how do you see them differing?
- What factors led to the change?
- Did the increase in tempo affect the sound? Timing?
- What do you call the type of music you make?

- There is a lot of futurism in HJDB. Can you comment on the reason why?
- Are there other motives or themes behind the music as a whole? Your music?
- What do you see as the contributions of HJDB to other present/future music?

Appendix C: Interviews

The following interviews were conducted between the period of June 2012 and July 2013, through email correspondence (except for the interview with DJ Krust (Thompson 2013), which was recorded through video conference and transcribed by the author). A list and short biographies of the interview participants is available in Chapter 2.

C.1 Bauer, A. (Alley Cat)

Q: Please tell me about the music scenes you were involved in before Jungle and Drum & Bass. How did you come to be involved in Jungle, then Drum & Bass?

I've always been a music lover and played instruments when I was a kid. I went to my first concert when I was 12 and was an avid show-attender all through high school and beyond. I was into New Wave/Dance clubbing, and went to shows from Punk to Ska to Reggae. I went to my first rave in 1992. I didn't hear any Drum'n'bass; I think back then it was just breakbeat techno.

I was exposed to Jungle/Drum'n'bass (to me they're the same thing) in the mid 90s in San Francisco. I was into all types of electronic music but I seemed to veer toward dnb events. They were very underground and raw and exciting and I loved the tempo and pulse of the music.

Q: Where did you grow up? Which instruments did you play?

Various towns [in] California. I played Clarinet and Saxophone in primary/middle school. In High School I took guitar.

Q: Do you recall the names of any New Wave, Punk, Ska, Reggae artists/groups?

Yes, I still listen to all kinds of music. I used to go see groups like Depeche Mode, New Order, The Cure, Sonic Youth, No Doubt, Seven Seconds, Fugazi, Faith No More, Strictly Roots, etc.

Q: How did you end up going to the rave? How old were you? Do you remember who played?

I went to the rave with some friends, we drove two hours and it was some circus-themed rave and there were guys skateboarding and there were tents with DJs. I have no idea what DJs played. It was a long drive back but I had fun.

Q: Were any of your friends also into Drum & Bass? Were any of them involved in the scene?

Yes, I had a couple friends who played a lot of dnb on their radio show, which was a great inspiration and a friend of mine from England taught me a lot about different sub-genres. I met a lot of people through going out to dnb events and buying records as I was in the local shops in SF all the time.

Q: After your first rave, did you actively seek out other parties? Were raves held frequently? What drew you to rave music vs. the music that you were initially interested in? (what about the music/atmosphere drew you in?)

I started going to more DJ/clubs rather than raves once I turned 21. I'm sure there were raves around but I didn't get more into that until a few years later. I've always been into electronic music (see Depeche Mode, New Order etc.) so to me it seems logical I got into Dance Music more when I was able to get to those type of events.

Q: Are any of your friends still active in the scene? What record shops were you going to? Was the scene in the states well established by this point? (also what year was this?)

Yes, some are still active. I have long since moved to the UK to carry on music here but I know many of my friends from the scene in SF are still doing music. I went to Open Mind Music, Tweakin', Amoeba music. My fave was Open Mind on Divisadero. I'd say by 1997 the scene was thriving.

Q: When did you purchase your turntables? When did you start DJing? What were some of your earliest records?

I started DJing in 1997 and got my turntables earlier in the year and spent many months practicing. At first I only had one and had to mix off of a crappy belt driven turntable on the other channel. I borrowed some equipment or got some stuff from pawn shops. Earliest records were old Ram, Metalheadz, Urban takeover, Good Looking, Renegade Hardware, Reinforced, etc. I was also really into Trip-Hop/ Downtempo stuff like DJ Shadow's 'Entroducing' and underground hip-hop artists like Latyrx.

Q: How did you get into production? Was it before you moved to the UK? What gear did you use? If you purchased this gear, what influenced your purchasing decisions?

I played around a bit in the studio before I moved to the UK but only a little. I produced with other people when I moved to the UK so I used whatever gear they had in the studio. At the time the software we were working off of was Cubase. Mostly we used samples and a midi keyboard. I didn't purchase my own stuff until about 5 years ago. I was recommended FL Studio by Black Sun Empire as a good starting point. I still use it today as their software has advanced a lot and I am happy with what I'm able to create in FL studio and Soundforge.

I have a M-Audio Keyboard, a vintage Casio CTK-611 synth, Yamaha HS-80 monitors, lots of plugins and a good quality laptop. I'm still using a PC and I haven't succumbed to the 'we must use Logic' trend. I prefer to do things my way even if it's a bit less glam and basic. I stick with what works for me. Some things were recommended to me but some I just came across on my own.

Q: What was the first track that you made that was released (was this Iodine and Payload)? Do you recall the gear used and how you made it (e.g., sound sources, sequence, motivation)?

Yes the first record I had out was Payload/Iodine on Skunkrock Productions. We used Cubase, a midi keyboard and some clunky old sampler. It was so long ago I can

hardly remember how we came up with any of it. I wish I could! I know we were under some tight deadlines so it was a bit stressful at the time. It wasn't really as much fun as I hoped it would be.

Q: Who did you make the tune with? Was this done in a pay studio?

I made the tunes with a guy called Tha Countamen. He was also on the label Skunkrock and a bunch of us lived in a house in SE London. We made it there in his home studio.

Q: So what ended up bringing you back to making tunes?

I got more into production eventually as time passed. It's something I've always wanted to learn so finally stopped worrying about it and just started trying. I really enjoy it now.

Q: What would you say was your breakthrough tune? Can you tell me about how you made it and the gear you used?

I'm not sure if I've had a breakthrough tune. I think I'm most proud of my track 'Sweet Spot' on Offshore. I didn't use much. I used:
FL Studio aka fruity loops.
Oxygen 8 Midi Keyboard.
Soundforge.
Waves plugins.
That's about it!

Q: If you could rate on a scale of 1:7 (7 being the most often) the amount which you've used the following on breakbeats (if you can, please use the entire scale):

• pitch modification

• distortion

• resequencing

• reversing

• multibreak layering

• multibreak alternating

• timestretching or start point manipulation

• filtering

• flanging

• reverbed

• other:_____

• pitch modification 2

• distortion 6

• resequencing 7

• reversing 3

• multibreak layering 7

• multibreak alternating 4

• timestretching or start point manipulation 5

• filtering 3

• flanging 1

• reverbed 7

• other:_____ EQ 7

C.2 Bowes, T. (Justice)

Q: Tell me about the music scenes you were involved in before Hardcore, and Jungle. How did you find yourself involved in Hardcore and then Jungle?

During my formative years, about the age of 11, I discovered Electro. I think it was probably Crucial Electro 1. For anyone who doesn't know, these were collections that gathered together early hip hop, electro(nic) and rap cuts and packaged them up for the UK market. It was upon hearing this LP with tracks like Cybotron "Clear" and Tyrone Brunson "The Smurf" as well as other tracks at the time like "Planet Rock" and the "Future Shock" LP by Herbie Hancock that this was the music I had been searching for without my young ears even knowing it. Before this I had always had an interest in sound and capturing it, I used to have a small portable radio/tape player that I would record random conversations in my house or tracks from the radio or TV dialogue, not for any particular reason other than I could and it interested me. So it was that during my teens the music that shaped everything and that was my gateway into all the other musical styles that I discovered was hip hop. It was the music that led me into records, the whole magical experience and [to] appreciate vinyl as not only a conduit for the music but as an actual artifact itself. I think that is part of the reason that vinyl is still revered today within the drum and bass and related bass music scenes, because many of the artists/producers involved are from a similar background and have carried it forward the notion of vinyl in an almost nostalgic way as an antithesis to today's MP3 dominated market. It was through hip hop also that I began to become aware of production, equipment and the techniques used. This primarily focused on in the early productions the synths being used and the kind of electronic sounds and drum machines that dominated these early productions. The warmth of the analogue equipment was something that really pulled me in, but it's only in hindsight when you know your Junos from your Proteus that the magic is slight dispelled. As hip hop progressed it was the sampling that really came to the fore and it was this process and taking something "old" and flipping it into something new that really caught the imagination and added a whole

new dimension to the tracks I was hearing. It was the beats and breaks that I was hearing and the snippets from James Brown and Bobby Byrd tunes that sent me off on a voyage of discovery to go and hunt out these breaks and find out where they came from and who had done them originally.

It was all of this and hearing the likes of Public Enemy for the first time and drawing a line between Todd Terry producing hip hop and then hearing his prototype house productions. That propelled me in the direction and the ultimate destination that I reached. So when I got my first semi-serious decks it was the hip hop that [I] have collected all through my boyhood that I started spinning along with other friends and contemporaries. This also started to become tinged with house, and embryonic hardcore and drum and bass, as these scenes were starting to grow and emerge.

I think our generation were fortunate to experience so many music movements be born, rise up and grow and to have had a hand in the birth of one of them, which subsequently have shaped and formed many other genres and sub genres. So when the time came through a work experience placement I was doing at a local recording studio to have some studio time, it was that all these influences were starting to mix and blend together. We went in to do hip hop, but came out with something hip hop influenced and also a track that was more important to us than I think we could of imagined.

Q: Around what year did you get involved in these genres? What year was the studio work? Were you in school for sound work prior to this?

The year we first went into the studio would be 1990, and it was during this time that we really started to become aware of a movement that was starting to happen. Two doors down from the studio we were using at the time was a dark, dingy, dirty rave club that we had started to go to and this began to shape what we were doing. We were hearing this European house and Detroit techno and tracks that had remnants of breakbeats in [it], plus the rave scene in the UK at the time was still incorporating some hip hop and there was a Balaeric influence as well. I think we knew then that what we had just done in the studio, the rawness and brashness of it would fit in with

the music we were hearing. It felt like I had come full circle in a way, as a youngster so influenced by the art of sampling, I was now rifling my hip hop collection for samples and bonus beats off of the b-sides. This was evident in that first ever studio outing, Blame and myself, used a break from a Young MC track, which had been taken from an Incredible Bongo Band track Apache. This production was what became our first track and first release "Death Row". During this time I was studying at college doing a media studies course, I had an interest in sound and radio, so combining this with film and journalism I embarked on the course. This became instrumental in two ways: one of the modules was modern music technology, and the tutor would bring in his synths, a big Korg one week a Yamaha DX7 the next, so we could play them or play around with them and get sounds out of them, some of which I was only too familiar with. It's always a pleasure to be able to put a sound together with its source or racking the brain for which track has that synth or sound. Also it was through the college that I was able to arrange my work experience in the recording studio. I did I think a week or two and my reward was the free session.

Q: How long did you work in the studio? Was this the first time you played with synths? Do you recall which Korg?

I worked in the studio for my work experience for I think two weeks. I don't remember it being the most exciting, but there were all kinds of weird and wonderful people in the building where the studio was based. It also allowed me to look at and get close to the gear and see what sounds the Proteus could produce, how the sampler could be used to manipulate and record sounds, I think it was a Casio FZ-1 or its rack mount equivalent. The studio time granted to me on the conclusion of my work experience amounted to about 4–5 hours and as I alluded to earlier this session included Blame, myself and two other college cohorts who were moral support. The studio, which was based within our local arts centre, became the studio we used on and off for the next 3–4 years. One of the engineers who we worked with there and at his home studio went on to record as Odyssey for Blame's 720 label.

In regards to prior synth meetings, at high school we had a Yamaha DX-7. Also, this was pre-college, and also an early Yamaha drum machine which I cannot remember the model, but these were my first hands on with "proper" equipment, having used PSR-32's and having a larger PSS something Yamaha keyboard at home. The college Korg must have been a Prophecy, I will try and confirm this.

Q: Regarding the club music in the UK in 1990, were there any DJs or producers that served as an early influence? Did you have any link to them? Were you in contact with others that were creating music that was close to yours? You mentioned your early work with Blame. Had you known him before your school association? Was this your first musical partnership? Who else did you work with in that time, and how did you come to meet?

I suppose the DJs who had a direct influence in the early 90s were the ones that were local and the ones we would be hearing in the club near the studio, The Grid, or on the tapes that were starting to circulate from the big raves. The DJ who was most local was Swan E, who was a fellow Lutonian, and at the time was playing lots of drum break lead material, lots of breaks, hip hop on the wrong speed, early d and b, if you will. I think we got a [test press] to him of "Death Row" or he managed to grab one but either way he was playing it out and supporting it, and we subsequently met. Bukem was also quite local to us and I know he was also playing it as it has turned up on mixes from that era, but at this point I hadn't met him. With regards to producers, N.R.G. was doing lots of stuff and was also from Luton, Rotor were also in the next town along who recorded on Chill and lots of stuff seemed to be happening around us. 2 Bad Mice and Moving Shadow in Stevenage were a stones throw away and it seemed that in all these satellite towns around London—our own included—stuff was happening. "Death Row" came out on Chill Records, which was also Luton-based so I met N.R.G. through this link as he was on the label also and the Rotor guys, a one of whom became Mercy and we would record the "Soothe My Soul" track. One of the other guys did stuff under the Terra Incognita moniker and it was hard not to be influenced by all this music and production that was going on around us.

Myself and Blame met at college and became friends with a shared love of hip hop, once again a bringer together, we were doing different subjects but were introduced and this morphed into our first musical excursion and partnership.

Q: So most of the tunes you did between 1990—[1993] were made at your local arts center? Do you recall what sequencer you were using? Did you start to collect your own gear after this? Do you recall what you liked/disliked about any of it?

You mentioned Death Row…would you say this was your breakthrough track? What year was this that you wrote it? Do you remember how you created the track? What types of sample manipulations did you use?

Did your experience with this tune change how you approached making subsequent tunes? Another big tune that you mentioned was Soothe My Soul. How did this tune come about?

Whilst we did quite a few tunes at the arts centre—we did "Death Row" there, although we did the flip side, "Murderin' MC's" down the road in the studio that was underneath the Grid club that I spoke of earlier. This was really a studio that dealt with a lot of rock bands and the like, it had a huge SSL automated desk and loads of racks of gear and synths, but it wasn't really geared up for us. It didn't really have any proper sampling capabilities and I can say that doing "Death row" was more akin to how I wanted to create. Myself and Blame then dabbled in various peoples home studios on various ideas and productions, these would be a college friend with a rudimentary set up which I can't recall. He did have some sort of sampler and we sketched out something and nothing. Another time we were introduced to a guy who had a sampling keyboard and an outboard sequencer, maybe an Alesis or something. Again, it allowed us to tinker with the sampler and the good thing was we weren't having to spend out, which the studio would require. After this the next few bits I did with Mercy, who had been met through friends of friends and as label mates started to work on a few tracks. I had also sketched out a few ideas with one of the

other Rotor members on as I remember some sampling program on a Commodore Amiga. I reconvened with Mercy and we worked at his home where he had an Ensoniq EPS 16 sampling keyboard with inbuilt sequencer. It was on this modest set up that we wrote "Koncrete Jungle EP" which included "Soothe My Soul", the "Mixed Koncrete EP", some "Fake Lobster" remixes and I wrote the Nitro 44 EP which Mercy engineered for me. This would have been 1992. We would go back to the arts centre to do a few odd productions but most notably the releases we did for Moving Shadow between 93-94. We were sequencing here on an Atari 1040 running Cubase.

I never collected my own gear; I always worked somewhere with an engineer, [and] it wasn't until maybe 1997 that I got an MPC2000 and loved working on it. Just sampling, triggering the pads and get the sequencer going—just the rawness and natural swing was something else. I wrote my whole Hears To The Future LP on it. Death Row was breakthrough in the sense that it was my first release, so special in that sense and it validated my feeling that I knew that this was what I wanted to do. It was written in 1991, this process is really making me check my dates. It was created by bringing a bag on vinyl to the studio and getting what memory would allow into the sampler. We got the break speeded it up, some hip hop [vocals], some scratching, played a bass in and it was truly drum and bass, sparse and gritty. This pretty much set my approach to the studio whereby I would sift through my ever growing vinyl collection, which was starting to encompass jazz, funk, soul, all sorts really. The hunt for vinyl to sample became a quest, and the chosen vinyls would go to the studio to be sampled to see what worked, what went together and what did not. Soothe My Soul came about as a result of hearing these big anthems in the raves I was going to and being influenced by that. I had a record with the synth line hook, another with the vocal, there were two drum breaks I had found, which hadn't been widely used. This was important as I was always wanting some aspect of the tune to be new or previously unused, this was surely the point of digging to find fresh beats and hooks to use. All the bits married together well, really well, this isn't always the way, but sometimes it all clicks and comes together. This was prob[ably] another breakthrough, as it instantly became a big tune on the scene and was received well. I think Death Row has become more of a cult track, an early forerunner for the d and

b scene. Soothe was different it had elements of d and b for sure, but it was more rooted in an era and the scene as it was which was very rave orientated.

Q: Your music has inspired many artists and cultivated labels and subgenres throughout the years. How do you see yourself and your musical output within these genres?

Could you tell me a bit about the club nights that you were part of between 1990–5/6? Were you part of these nights? Also, I've heard a lot about these gatherings—e.g., Music House—did this exist in 1990-5, or was that its own thing?

I think when I did the Glider State tune, "Outside Looking In", that this was a fair description of my involvement with the scene or a scene. When I first started, I guess I had a hip hop viewpoint looking in on the developing rave/hardcore scene and this pretty much continued. This standing back and observing was what I think gave myself and those around who I was working or collaborating with a unique edge. Being able to dip in and out of a scene interested me greatly because I think as I grew in years, confidence and experience that I want to see myself as an artist and not be boxed in, constrained or pigeonholed. It was definitely this approach that helped us to stand apart and be such an influence as we had a pioneering outlook and didn't follow any pack. I personally always felt that I made drum and bass, but was not such a fan of being "in the scene" or being in the clique. I preferred to do things people weren't doing and ploughing my own furrow. I think this has been quite well documented over the years. If I was involved in a group or gang or whatever I liked it to be my own, with fellow like minds around, fellow mavericks or outsiders if you will. The likes of the criminally underrated Endemic Void is a case in point and I think when we worked together we thrived on the outside looking in vibe. It was a random meeting in Paris that threw us together, him doing press and myself DJing, it was often the way things happened. Myself and DJ Pulse met at a Moving Shadow photo shoot for I-D magazine and I think recognised in each other the outsider again, it was like a melee happening in the room that we were observing.

Really I think during my career I have been quite self-indulgent and have done what I like, this was what I chose. It feels great to be cited as someone who kick started scenes and has inspired other producers and derived the start of sub genres. I always felt my music fit into the drum and bass scene, but knew that the likes of Ross Allen, Mixmaster Morris, Laurent Garnier and Patrick Forge were playing it as well, which validated what I was doing and how I was going about it. Later on in my career I became an LP/project artist, which was when I really came into my own and tied together all the strands of what had or was influencing me. It allowed me to do house, techno and hip hop takes on tunes, and I think it was prob around 1997 Viewpoints, and subsequent Hears To The Future that I felt at my most artistic and wasn't really concerned where I fit in, and just knew it would fit in somewhere.

My early foray into DJing, which was a bi-product of producing and these days is the opposite, was at the Grid and a few other dingy warehouse raves in Luton. This quickly moved onto to clubs like Milwaukees, which was legendary for the first ESP nights, and other clubs in and around our locality. My record buying taste had obv[iously] altered and was now encompassing all the latest [white labels] and breaks, techno, rave-with-an-edge related releases. It was something I enjoyed, but was unrelated to the production side, a different aspect, but it wasn't really until around 95-96 that the DJing took off and became an integral part.

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? Why? How many do you have in your collection?

After the electro phase of hip hop, when things were become more sample-centric this was what really started to pique my interest. I wanted to know where the beats and the music in these tracks were being sourced from and what was giving the tracks that old "lived in" feeling, even though they were brand new. This is where the interest started. A lot of the selection process is trial and error, some beats you can hear straight away, because of a sparseness in them or they roll a certain way. A lot of it depended on, in the early years, how the beat reacted to being pitch/speeded up. Some would work, others would just sound too fast or would lose their feeling when

introduced to a faster pitch. But the process was half the fun, sampling a bunch of breaks and seeing what came out. Every time a new technique or new bit of equipment came out that expanded the capabilities of what was possible I would go back to breaks that I hadn't used for to see if they reacted better to being chopped up, or if the new Akai sampler would chop them better or if time permitted the break could be chopped into its component parts, kick, snare, hats etc. I don't think that there was any specific selection program for finding breaks, it was a case of digging a break on vinyl, this is still my preferred option, and sampling it, in much the same way the crate diggers were and are still doing. The breaks I have just on vinyl must run into the 100's, I have DATs full from old sessions and the advent of mp3/wav files have made it even easier to own more and more. As time progressed however I started to revert back to my electro routes and looked to create my own breaks, this is evident on Aquisse, and hark back to the days of using the [Roland TR-]808 and 909 to craft out a different type of beat and to do something fresh in the scene that no-one else was doing.

Q: Please rate on a scale of 1:7 the amount which you used the following (if you can, please use the entire scale):

- **pitch modification**
- **distortion**
- **resequencing**
- **reversing**
- **multibreak layering**
- **multibreak alternating**
- **timestretching or start point manipulation**
- **filtering**
- **flanging**
- **reverbed**
- **other:_____**

• pitch modification-7
• distortion-1
• resequencing-7
• reversing-4
• multibreak layering-7
• multibreak alternating-5
• timestretching or start point manipulation-5
• filtering-6
• flanging-3
• reverbed-5

Q: When you do these manipulations, would you say you try to preserve an ordering that emphasizes the beats? Downbeats?

Yes I think trying to preserve the groove is essential if possible, or using the break that allows its elements to be recreated into the best groove possible. Of course it is not always possible, or it may not work in the way envisaged. But the snare or offbeat/downbeat is always important in its placement to recreate or embellish the groove.

Q: You've mentioned Aquisse. Do you recall what equipment you were using at this point? This was before you were on the MPC, right? Were the sounds sourced from other records, or were any from synthesizers as well?

Aquisse was definitely a magical moment and happened in a quite naturalistic way. It was pre-MPC I believe it was made on an Ensoniq ASR-88 sampling keyboard and Cubase primarily. A few of the sounds were sourced from record, like the main pad riff, and some off a module, which I cannot recall. But it was a point where I started to experiment with constructing breaks from an 808 and 909 kit and to take things in a different direction. The track ultimately took 2 sessions: in session 1 all the patterns and riffs came together and I started to mess around on the Atari muting in and out certain tracks and getting an ad hoc arrangement down to cassette tape. I listened to

the tape on the way home on my car stereo and it just worked, the rough mute in and out mix was just right. So the following session I bought in the tape and recreated the arrangement on Cubase from listening back to the recording, added an ending, mixed it and it was there. It was a record that felt right from start to finish and of all my solo productions probably the most special.

Q: Please list your favorite 10 breakbeats, and if you could, at least 1 Hardcore, Jungle, and Drum & Bass track that has used them.

1. Space Funk - Manzel. This break is featured on Son Of Justice EP- Nitro 44, I really like the timbre and groove of this beat it's somewhere between bongos and a drum kit, it's pretty unique and I turned it up in a second hand store way back when for about 50p.

2. Assembly Line - The Commodores. This break is used by Goldie on the track Saint Angel. This is one of my all time faves, I have never used it because Goldie kind of made it his. I just love the big "Huh" at the start of the bar, and there is a wicked fill and it's a great all round break.

3. Let The Drums Speak - Fatback Band. Used on Outside Looking In - Glider State. A great shuffling break and again has quite a unique sound, which is something I looked for in a break, trying not to use obvious breaks.

4. Funky Drummer - James Brown in Electric Soul – Icons. One of the classic breaks again its the little vocal bits I always loved in this the "huh" and "hah" and James counting off "1-2-3-4", plus the overall groove and its recognisable sound.

5. Marvellous - Mickey Murray and the jungle band-used on 3rd Eye Visions - Icons. I have used this a few times but this was its first outing on Icons LP, a great beat to chop, lovely shuffles, and high hats and nice definition to the snare drum.

6. Bobby Byrd - Hot Pants used in Dialogue by Seeka and Ned Kelly, another classic

break in the funky drummer mould, great roll, crisp shuffling hi hats and pitches up and down a treat in this particular outing on Funk 21.

7. Amen Brother – Winstons. Used on Nemesis by Blame and Justice. We used this break sparingly, as it is the jungle break standard bearer, so it alternates in this tune and is used to emphasise certain sections, a break that is legendary really.

8. Apache - Incredible Bongo Band. Used in Lost In Time [by] Icons prob[ably] the second in line to Amen, again a break we used not a lot, but couldn't resist on this one, but we did our own flip on it and represented it in a more musical fashion.

9. Think - Lyn Collins. Used in Valley Of The Shadows - Origin Unknown. Another break from the [James Brown] camp, Think has various sections that have been used and a wicked tambourine that you can chop and use when reconstituted into a pattern, [which] gives a great roll and really picks the tune up where needed.

10. Humpty Dump - The Vibrettes as used by 2 Bad Mice on Hold It Down. Great timbre. One of those unique, instantly recognisable breaks, but as with most of these popularised through hip hop.

Q: Where did Hardcore, then Jungle, then Drum & Bass come from? Are there social/musical/technological influences or movements that you see as driving the development of the music? Conversely, do you see the influence of Hardcore, Jungle, and Drum & Bass outside of the genres themselves?

From my perspective its was like this—the majority of guys growing up like myself would have been listening to music such as hip hop, rare groove and the like. The first house bits I remember hearing coming over were from Chicago, stuff like Love Can't Turn Around with Darryl Pandy singing on it, Jack Your Body by Steve Hurley and other early JM Silk bits. I guess these were grabbing our ears, certainly mine, because it was different and had that electro(nic) element familiar from the early hip hop/electro stuff. It was also these productions that lead me to Kraftwerk and

Cabaret Voltaire. The house progression continued and I started hearing Todd Terry's stuff which was almost like the link for me between Hip Hop and house, it wasn't what became termed as hip house, it was more an attitude and approach. It was raw and always contained a breakbeat somewhere. Hardcore was born out of all these influences and more. I think hardcore (rave) became a convenient umbrella term to contain many different sub genres. In the early raves I went to you would hear a multitude of tracks—Belgian Techno, US House, Carl Craig, some breakbeat tracks, embryonic D and B, Hip Hop it was all there. And for me the whole scene became a melting pot for all these different influences, which would all feed into other tracks. It was this and also the drugs, the drugs had a big part in all of the music. People wanted to take an E and dance and the breakbeat is perfect for that. The breakbeat started for many to become the backbone and they started to get faster and rougher. And it's around this point that jungle or jungle techno as it was being called started to come into its own. I think socially the rave scene as a whole levelled the social playing field and it didn't really matter everyone was very euphoric, its only now that I sit and think about it but the drugs very much informed most of what was going on, it may sound glib but this was what was happening…Obv[iously] the technology made things easy and it was a happy coincidence that everything seemed to all happen at once. Breaks could be chopped and manipulated, breaks were what we knew about through hip hop, it all seemed an extension of the sounds we loved but was morphing into something else and we were morphing it without quite knowing where it would end up. D and B was the natural progression, the refinement of all the early influences, some taken forward, some left where they were, as we learned the craft of making music the ear became attuned to what we wanted to hear and make. It was breaks lead the upbeat, downbeat but became more sophisticated, I was growing, different music was coming onto my radar more and more. Jazz, fusion, funk it was all ending up in the mix and informing the output.

Q: Can you tell me about the different movements/major changes in the music, and your impression of what caused these changes that you've seen (e.g., 1994 shift away from Ragga Jungle)?

I think what happened with jungle/d n b, is what happens with most genres in their developmental stages. One strand will fragment into another, different things will shape and influence that strand and sub genres will start to develop or people start to create pigeonholes to music into. I don't feel this is always helpful as it leads to a lot of different sub genres springing up which are just essentially drum and bass, but it seems the music media and industry have a need to sub divide. So as a lot of tunes started to come out with ragga samples, although for me reggae always had a strong influence on jungle anyway with its bass lines and vocal samples stretching back to the hardcore days, so it started to become labelled ragga jungle when maybe jungle would have been adequate. Saying this though, there was always a clear distinction, for me anyway, between jungle and drum and bass. The more ragga orientated frenetic jungle styles compared with the more laid back thoughtfulness of drum and bass.

Q: As a label owner, have you ever dealt with problems associated with sample infringement?

I have never had any problems in this area no……that's a v[ery] short answer right!

Q: What did/do you do to differentiate your label from others that had come before? What is the ethos behind the label?

When the label started it's was as an outlet to put out the stuff we were doing, which at the time was really quite different and experimental. We wanted an outlet where we could out the type of music we wanted to put out and the type of stuff we were making. I never set out to sound like anyone else and certainly the stuff we released didn't either, so from the outset we set ourselves apart from the pack. This is the ethos that I still use today, which is to put out good challenging music.

Q: Could you explain the full process in preparing a release?

Firstly you will source a tune or remix from an artist or record a tune yourself or in collaboration. You will compile the release, we release a lot of LP based projects, so it involves quite a bit of juggling tracks and chasing artists. Once we have all the tracks gathered we will send or take it to be mastered, where it can be sorted out sonically and all the tracks can be levelled out volume wise so that the project sits well together. Once this is done a master is produced which will be used to press the disc in question. The artwork will be worked out by Metro and myself and stencils will be cut or hand stamps sourced. We will decide what type of sleeve we will use, we always try and do something different and usually all our packaging is hand made, even down to the actual sleeve as in the case of Modernists 3, the CD sleeve was made by a friend of mine or in the case of Nostalgic Futurisms we hand-folded it ourselves. The CD or record master will then be sent away to be manufactured. We will start spraying or stamping sleeves for a CD and get inserts ready such as stickers etc. When the finished product arrives back we will collate all the component parts together. Alongside this we would have booked a release date with our physical, online and digital distributor and initiated some sort of internet/press coverage and send promos of the tracks to DJs. The finished product is sent to the distributor and goes on sale.

Q: In the music's heyday, roughly how much revenue was generated by a release? How much would a release cost to make?

This could vary but let's say that roughly you would press a record in a first run of 1000 copies and this would roughly cost with mastering £1000. The distributor would pay between £2.50 to £3.00 per copy so you would look to nearly triple your initial outlay. But you have to take into account maybe a few went out [as] promos, etc.

Q: When I started making music, I would take a breakbeat, then make a copy of it, and cut off the first note of the copy. Then I would copy this copy, and cut off the first note of the copied copy. I'd continue with this until the end, and this way I could access any point of the break and connect and parts of

the break (by adjusting the release time of the held note and triggering a different note) while preserving the original feel of the break. Later on, I started to use recycle, which outputs individual slices and a midi file.

How did you go about this? Why? Were there constraints due to the gear? Did you change techniques at some point?

When I first started to produce or dabble in production I don't really think chopping as we know it hadn't really started or taken off. It was really based around finding a break that we liked and work well when pitched up, this would be the primary concern. A lot of the time I would then work on layering another break over the top or a bongo pattern or some other beat or percussion type sample. As time went on I would start to play with the triggering of the break, maybe a double trigger on the start of the break to obtain a double kick at the beginning of the bar. After this rudimentary experimentation we started to realise that we could chop certain bits out that we wanted so would chop the kick, snare, hi-hat and any other slice and position them across the keyboard so they could be triggered in a new pattern. Other times Cubase would be used on the grid screen and the hits could be drawn in, this allowed for control of velocity also, which is prevalent in the work Blame and I did for Moving Shadow, where we would do snare rolls that we could control the volume and velocity of via Cubase and the drawing tool. Working with Endemic Void, he was an exponent of drawing the break on the grid screen to great effect and rarely used the keyboard spread technique, maybe only to drop an odd hit in, by this time Recycle had become prevalent and had taken the boredom and long windedness out of the chopping process.

Q: Can you tell me about how [Soothe My Soul] was made? [note: this question was asked after Andrew Wright (The Moog) had provided an answer, and the author of this dissertation and Wright agreed it would be interesting to pose share the answer with Bowes]

It was definitely a clash of production styles, I was more sample based and although Andrew had used samples in the past it was mainly a break and then the majority of the track was synth based in his productions. So I think when I turned up with my bag of vinyl and got stuck into the samples it was a shock for Andrew. But I had this track by Collapse with this anthemic breakdown in it that I could hear in a breakbeat tune. Once we had sampled that along with breaks, a vocal sample and various other bits Andrew was getting into the swing of sampling and we knew we had a tune on our hands. It was probably one of the first things we had done together and I think the marriage of my digging and Andrew's engineering, on what was a very limited set up, came out particularly well. It is a tune that resonates to this day and one people still mention or want a copy of. As Andrew alludes to, it did just fall into place and I think the whole Koncrete Jungle EP is a great testament to the work we did together and also a snapshot of the scene and the era that we wrote it in. I think at the time it was probably the best tune either of us has done and certainly helped propel us forward in the scene. I remember hearing at numerous do's like AWOL, ESP and Camden Palace where it would make even the sweatiest ravers put their hands in the air and it would go off, it's a great feeling.

C.3 Chatzilias, J. (0=0)

Q: Tell me about the music scenes you were involved in before Hardcore, Jungle, and Drum & Bass.

I wasn't really participating in any music scenes at the time as I discovered breakbeat hardcore just as it was coming out of the woodwork in 1991 at the tender age of 11 years old. I had older siblings that would expose me to music. The music I loved most before then was hip hop and synthpop. I really responded to anything in the 80s that featured vocal sampling. I was just amazed that you could re-trigger vocal samples as one-shots and pitch them around. Other music I enjoyed a lot would be The Smiths and The Sugarcubes. I later got into playing instruments. I played guitar and bass in a few funk and jazz bands. I'm what you would call a rhythm player. My style is most suitable to latin jazz (bossanova etc). But this was a side thing from working with computers and electronics on my own to make music.

I think community (see: University) radio in Toronto and the city itself being the perfect climate to be such a huge adopter of the rave scene had the biggest influence on my early exposure to this music.

Q: How long did you play the guitar? the bass? Do you still play?

Years. Ages 8 to 18? No I don't play. I don't even own a guitar or bass anymore.

Q: Were there any particular hip hop artists you were into?

Hip Hop started to explode when I was 5, so I was into whatever was represented by that explosion. Young MC, NWA (probably my most listened too), Rob Base and Easy Roc, Biz Markie, Stetsasonic, Public Enemy, Beastie Boys, I really like Jazzy Jeff and Cash Money as DJs.

In the late 80s early 90s I definitely gravitated towards the east coast…delicious vinyl specifically, and the boot camp. I just loved all the phrase

sampling gritty beats with tricky lyrics. Specifically stuff with low-passed samples that just leave the bass and have knocking beats running. Black Moon, Black Sheep, Digable Planets, Leaders of The New School, etc.

Q: When did you first play with synths/samplers?

I had a cheesy Casio keyboard when I was 7 (mt60)? I messed around with that ad nauseam. A friend of the family had the Casio sampling keyboard (sk1? maybe the sk5?) and that was my first instance with a sampler. He made a sample of his voice making a gunshot sound "pssh" followed by a scream "ahhh" and we started hacking away at the keys. We recorded it onto a tape called "Synthesizer War".

My dad conducts the church choir. They had to record something in this very famous studio in Toronto. I tagged along and was placed in a room with a Roland JX-10. I began programming and sequencing with it right away. I was 9. I've always found synthesizer interfaces to be very intuitive.

I then made music on my computer using a dos tracker and my adlib FM synthesizing soundcard. My parents got me a consumer grade Yamaha PSR keyboard with midi. I started experimenting sequencing with a score based composing program called Midisoft Studio. I later stole a copy of Cakewalk 3.0 from my school. My first piece with it was called Chemical Warfare (war seems to be a theme in a lot of music?) and it was in 10/8 time. I still have a tape of it. I also played around with retriggering WAV files manually using Windows built-in sound software. I even configured different error [messages] to be different sounds and would create beats by performing these errors. There was usually a lag, so I had to try and account for that in my triggering of them to have a semblance of rhythmic cohesion.

Q: Were there any DJs or producers that served as an early influence? Did you have any link to them?

As a child I always believed that DJing was exclusively a hip hop thing. I loved Cash Money and Jazzy Jeff. I also loved beat boxing. When I discovered rave music…I

didn't really realize it was just records being mixed together. I thought it was performed exclusively with drum machines, sequencers and samplers (the perceived performance aspect of the music really added to the appeal for me). I believe also seeing videos of Altern8 and The Prodigy on Much Music really added to that image for me. I later realized it was just DJing on a lot of the sets I had. I didn't really value "DJing two records together just to mix them" very highly. Although I did have favorites. There was a DJ in Toronto, Ruffneck, that played the best music (very obscure, manic and heavy early jungle). I like him so much I even named my cat after him!

He played at my first rave (one of the most important evenings of my life). The set can be found here: http://torontojungletapes.blogspot.com /2011/09/ruffneck-sykosis-unity-1993.html. James St Bass was also integral to my musical development. But we are well into the jungle/hardcore years here…and I know you are looking for things before that.

My eldest brother loves classic rock and art rock. He introduced me to King Crimson and he would love to talk about weird technical things about that music to show how knowledgeable he is…things like: fripptronics and chapman sticks and mellotrons. So I definitely consider that as an influence as it definitely sparked my imagination towards more technical and experimental things. My favourite King Crimson song is called "Indiscipline" and it's in 10/8 time too. It was recorded on August 19th 1980…which was the day I was born.

Q: Tell me more about the first parties you went to. What year was it? what kind of music were they playing?

The first party I went to was a recoup event "Unity" by a company in Toronto called Sykosis. It was 1993. It was predominantly jungle hardcore of the deeper and darker variety (as was the fashion at that time-specifically in Toronto). I got there early…and in the beginning of the night when no one was there they just let this compilation play. http://www.discogs.com/Various-Hard-Leaders-III-Enter-The-Darkside/release/326077.

I had never heard music with so much bass before. All my previous experiences with this music were limited to listening from tape or off of the radio (tapes I had recorded off the radio) with a really small "boom" box or very bad headphones.

The music was dark and sophisticated. It was all the really obscure white label offerings of the time—stuff off Brain Records, Formation, Boogie Beat, Face Records, Kniteforce, Basement, Awesome, Kickin, Rugged Vinyl, etc. It was a point in the scene's evolution when darker sounds were starting to get accepted by the community so much so that people gravitated towards events that featured them exclusively. A trend that continued forward to make Toronto have one of the biggest Jungle scenes in the world.

The tracks had many different shifts, bridges and breakdowns that were common in hardcore…but even more exaggerated and allowed for even more breath. The focus was more on juxtaposing different influences and soundscapes to create atmosphere instead of just inducing mania at the same time the beat programming was far more manic and involved. You would hear a dystopic vocal sample from some sci-fi moving with a beautiful pad playing a minor 9th chord on a bed of huge subbass with mashed up breakbeats sprinkled on top…then it would breakdown into some dub-reggae sample with the same break pitched-down to half tempo in a hip hop style (but still programmed with a jungle ethos). It was everything I loved about hardcore but even MORE OF IT AND FASTER!!!!

I was hooked after that. I went to loads of events. Some featured all kinds of music but had sections jungle played by some of those DJs from Sykosis. Others were jungle only events. The scene really came into it's own when Syrous had Kenny Ken come play (1994). The DJs affiliated with Syrous (Mystical Influence, Sniper) started taking over more slots and they were playing much less interesting (but still good) stuff then those original DJs (Dr No, Ruffneck, Jungle PHD, etc).

When the jump up/hip hop influence started trickling in…the beat programming became less interesting and the musical influences less diverse. Rave culture was huge at this point and I was disenfranchised with this gravitation towards the lowest common denominator so I gradually stopped going to events. This was

1995—I was 15 years old. Once again, my musical uptake was limited to my own personal enjoyment of it. My community was reverted back to university radio and occasionally going to get records from downtown. That lasted for a long time…but I satisfied myself with all the atmospheric drum and bass (GLR [Good Looking Records]), riot beat (digital hardcore), and idm (warp) that was coming out at the time. I feel as an artist that I'm somewhere in between all those things.

Q: What year did you purchase your first synthesizers/samplers? Which sequencer(s) did you use? Has technological development affected your music over the years? Specifically in relation to production techniques.

Ok I'm gonna do this chronologically to my musical development.

My first device was a cheesy Casio home keyboard with mini keys (probably the mt) messed around with that a lot when I was 7. Also used to program bleeping music things on the pc speaker on my dos computer using GW Basic. So that was probably my first sequencer.

Adlib tracker in dos. To control the yamaha opl fm chip in my adlib soundcard…so you can use the software to sequence and also modify the sounds.

Midisoft midistudio. A score based sequencer…basic looping capabilities and funny timing. I was really comfortable with reading music scores so I got a long with it. Was fun to make music in different time-sigs—Belgian techno in 6/8 etc.

King mod—from the sierra bbs. A tracker with a staff view. Kinda like mario paint. First use of samples. Did funny remixes of prodigy songs.

Cakewalk 3.0 for windows. I stole(borrowed?) this from school. First time using a piano roll. Really tight and quick sequencer. had this great feature to delay tracks microscopically…really fast copy and paste. Also was able to play one audio sound linked to a time event (as in mins/seconds…not in musical tempo based time) would never hit accurately ha. I stayed with cakewalk for a long time. especially when it turned into "Pro Audio"

Hardware 95-96. Eventually got a hardware sampler. A Roland DJ70. It had a funny sequencer…and a funny "turntable" that would scroll through samples like a manual timestretch-sounded awful though. Also had a yamaha cs1x. I worked very

hard to get that. Wrote a lot of material…experimented a lot with generating rhythmic patterns using the arpeggiator and custom drum maps. Hardware stolen at one point…so I was forced to use only computers…this happened to be at the exact time soft synths were coming out. This was the most critical time of my learning how to make music with technology. I had cakewalk 3…and cakewalk 4 pro audio (later 5) and Seer Systems "Reality" (which was really really good!). So I would sequence "Reality with cakewalk 3.0 (because it had faster and tighter midi than 4…as it wasn't dealing with audio). Render parts out…and load them into audio in cakewalk 4…and arrange everything.

I would also use Goldwave…to edit samples…later it was Cool Edit…and Soundforge (I still use both to this day).

I eventually got really focused on the ripping apart of audio in a DAW. Before I really understood what a DAW was. It was never in real time…I would always have to edit…and play back…it felt like weaving a drum track. I experimented with making what I would call "rhythmic fractals". I would conceptualize a process…and follow through with the execution of that process…and have further iterations get deeper within what the expression would be.

I was also remixing everything I could think of…really stupid juvenile stuff (being a goofy teenager and all). Video game music…80's television theme songs. Anything I could find in the lowest quality on the internet that I could download on my dialup internet connection.

My friend Joel (deadmau5)…introduced to me to a program called Orion, which had a more virtual studio environment. It had built-in synths, samplers, mixers etc. Each instrument had it's own pattern sequencer (with a piano roll) attached to it that could loop endlessly. I ended up working with the developers of this software as a tester. The workflow was incredibly fast. And afforded me to express myself musically. Rendering audio out…to be put in cakewalk to be turned into songs.

As I got more comfortable…I started being able to express myself emotionally. This led to making my first record completely on a 486dx2 66MHz with 8 megs of ram? Using as many different pieces of software as someone would use hardware in a traditional studio.

I was loyal to the old version (Cakewalk 9) for a long time…but I felt limited having to go to different programs (Orion) to use VSTi's and have that sort of loopy satisfaction. I experimented with many different daws. Then reaper came out…so now I use that. I'm also interested in Renoise and experimenting with different sequencers. I've even built some sequencers in Reaktor…but that's for entirely different approaches to music.

I live in a trichotomy now, between my established view of how a song should be made (instrumental parts somehow written…to be introduced to a daw and everything weaved together), use of hardware (fun experimentation…and interesting sound design but cumbersome to integrate), and my proprietary Reaktor live performance enhancing approaches to beat "programming."

Q: Tell me about your interest in breakbeats.

I've been interested in breakbeats since I first heard them…since long before I had a grasp on what they actually were. I just love the explosive energy around them. Jungle represents the pinnacle of Breakbeat usage. Breakbeats are initially analog…but get manipulated digitally. The organic transformed to the synthetic. Something about that will always seem special and futuristic to me. Someone hit those drums in room and sound hit a mic and also bounced off a room and hit the mic. That mic hit a preamp…that preamp hit a tape…hitting a compressor and eq…hitting a needle which then carved into acetate to be stamped into records. These captured moments are then trapped there for a long time before they get utilized. That's a lot of energy to have happen before someone like me can start tearing these things apart.

I also like that people (both crowds and producers) also become very familiar with breakbeats. So part of the expression becomes the deviations of those breaks as platforms through your own programming and engineering. They are so characteristic. And it's those characteristics that dictate their uses and usefulness. So many harmonics to play with that can respond to different FX and techniques. I've always been a fan of confrontational and challenging music and those properties of breakbeats really lend themselves to that. I can take a breakbeat and I can do this

with it. It's like how comic book author's use super heroes. People are familiar with the characters and their back-stories, so there is a huge mythology to grab from and be creative with but at the same time respected.

Also within the sound itself there is musical information that can provide inspiration as well. There is a flow you can use (or not use at all if you decide!). Drum machines don't have that. They just are sound boxes with sequencers and you program them and I find it boring and stifling. In fact the best thing a person could do with a drum machine is try to emulate a breakbeat and then resample it and use it as such.

Q: What did you use to manipulate them? What basic techniques did you use?

First stage of manipulation always comes with sampling. I'm a firm believer in the colouring that gets imparted by the Analog-Digital Conversion process. Also gain-staging at the conversion level can really make for aggressiveness in your breakbeat while using it (if that's something you are going for). Lower bit-rate samplers seem to have this masking effect on background/room noise possibly from how the dynamic data gets omitted. Sample-interpolation can also have a great exciter effect making the break stick out more and providing more definition to high hats and cymbals. Typically after I have my break sample. I would do some kind of dynamic and equalization processing to bring sonic characteristics out of the break…but also give it more of a pleasant usability (filtering out incoherent frequencies etc.). Trying to get it to sound better on it's own before putting it into context. This can also bring a lot of your own personal flair to the drum sound-people have made signatures at this stage. It's something I haven't been careful with in the past and I've since learned that over-processing can make breaks (and the drum tracks made with them) really difficult to deal with in the mix-down stage.

Special attention is paid to chopping up the break. This is always done manually. Chopping in general gives you a sense of intimacy with your samples. Sometimes musical ideas about arranging them can jump out at you in this stage.

Then comes beat programming. This is a bit like weaving. Intricate edits at very small resolutions. Resampling bigger effected passages and then further chopping those up. Sometimes I just operate directly on the audio. Other times I use MIDI sequencing to trigger a sampler (software or hardware). Both have their pros and cons. Manipulating audio within a DAW is a very comfortable way for me to work but also very linear as you are always aware of the song structure (which could be an encouraging thing). Using MIDI sequencing gives you tactile abilities to program and edit but then you have to deal with different components. There definitely isn't just one perfect tool for every job.

No matter what you are using Jungle is really all about the drop. Not just the initially drop that happens after an intro/buildup…but having continued instances of significant impact. It's really spatial and textural music. So all these techniques used are to manipulate the textures and bring the contrast out that only serve to emphasize drops. *Even the language used to describe the music is usually descriptive terms about space and scale. "Big Tune" "Inside the ride" etc.*

Q: Please rate on a scale of 1:7 the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion.
• resequencing
• reverse reordering
• multibreak layering
• multibreak alternation (question answer)
• other: _____

• pitch modification 5
• distortion. 3
• resequencing 7
• reverse reordering 2
• multibreak layering 1

• multibreak alternation (question answer) 6
• other: timestretching or start point manipulation 6
• other: filtering 4
• other: flanging 4
• other: triggered or resampled reverb. 2

Q: To your knowledge, who were the first producers to use breakbeats in Hardcore? Can you provide a year?

There was no hardcore without breakbeats. They are just that integral to the music. So you name an early hardcore producer you have your answer. Breakbeats really started getting used in 'rave' music with Hip-House. A lot of early UK proto-jungle hardcore stuff used similar breaks. Stuff like Lost "Baz de Conga" from 1990. A lot of the HJDB stalwarts got their start in 1991.

It is my opinion that this discussion can't even happen without mentioning Zero-G's inclusion of breakbeats on their sample CDs in an Akai-ready format.

Q: When you were making your early tunes with breakbeats were you aware of the influence it would have?

I feel that I'm always wearing my influences on my sleeve. But there is a certain spirit in which I do things that I feel is more than just the combination of my influences. While I'm making music there are times this is very obvious to me as I get a profound emotional response to my music as it's being made while thinking about the context of how it will get disseminated into the public sphere. In fact a driving factor of my making music is too have influence and to inspire. I'm consciously trying to contribute to the cannon.

Q: How many breakbeats do you have in your collection?

Well over 1000 unique. I collect a lot of records. I also have many iterations of the same breaks. I almost always make a unique version of a break every time I decide to use it in a song; a version of that break unique to that song.

Q: What are the most popular breakbeats in Hardcore? in Jungle? in Drum & Bass?

Hardcore had quite a few Kool N The Gang breaks ("Give it Up", "Chocolate Buttermilk". Most of the breaks in old hardcore came off those Zero-G sample CDs. If the producer wanted to dig they would more likely use an old hip hop track and get the break off that ("Runs House", "Bust a move, "Raw", "Fools Gold", "CB4" etc.). So more breaks were not necessarily from their original sources. Partly because in a way hardcore was just sped up hip hop (from the drum perspective).

Jungle definitely had more attention paid to the individual components of the breaks. So that gave different concerns like having longer breaks to start with. I would say a lot of those came from the Ultimate Breaks and Beats compilations.

Lynn Collins Think *
Original soulpride*
Sesame street*
Apache
Funky drummer
Amen brother
Funky mule
Life could (hardstep staple)
Cold sweat*
Hotpants (raw variant)

*used often as intro breaks on many well known amen tunes

These breaks were used in all subgenres at all points. Ragga, metalheadz, photek, glr, reinforced.

Lesser used but still repped:

Sweet Pea

NT

Tighten up

Assembly line

Soul drums

New day

God made me funky

Etc.

Q: Please list your favorite 10 breakbeats and at least 1 HJDB track that uses them:

• "Funky Mule"

The Committee - Profound Love

• "Think (About it)"

The Sentinel feat Coco - Toulepleu

• "Humpty Dump"

Senses - Her Smile

• "Soulpride"

Squarepusher - Beepstreet

• "fuz and the bog"

D'cruze - Lonely

• "Sesame street"

Armand Van Helden - Ain't Armand

• "Apache"

Goldie - Jah The Seventh Seal

• "Too Doggone Funky"

Plug - Delicious

• "Amen Brother"

Equinox - Stagger

• "all the kool and the gang breaks"
Smokey Joy - Gimme My Gun (Desired State remix)

Q: Do you prefer certain breakbeats over others?

Definitely. There are some breakbeats that really lend themselves to all the torture that they get put through with this music. Others are very rigid and only sound good at certain tempos and within certain pitches.

There are some breaks that I usually hate, partly because [of] how they've been used before and what that represents to me. But maybe it's also just something about how they sound.

I also really don't like bongos in my breaks. I find they clutter things. I'm just not a huge bongo fan. There is something cheapening I find about them. I would have to really be in the mood.

Lately I've been choosing breaks based on my perception of a certain "3D" quality they have. My feeling is that if they have a lot of definition between the transients I won't have to do as much work to them. I don't feel very confident in my EQing etc. so I'm really trying to stick to this whole "garbage in -> garbage out" idea especially when it comes to drums.

I also like finding breaks that have never been used before that sound a bit like classic overused breaks.

Q: Do you mix breakbeats within the same track? Are they generally layered?

I have and I've liked that results…but I generally don't layer that often. It depends on how the track is. Mixing breaks can give you a rugged almost synthetic sound and that's really good for certain kinds of tracks. Other tracks call for more natural sounding breaks. It really depends.

There is also break-switching (alternating breaks) which I enjoy a lot. Break switching can really give you sense of space because your brain makes comparisons as a listener. That can also propel fun programming like you are digitally cut-mixing breakbeats or beat-juggling but with compositional processes.

Q: When you perform the above modifications on the breakbeats, do you attempt to preserve an ordering that emphasizes the beats? the downbeats?

Sometimes I want a natural order…as in something a drummer could play. It's a fun game to really deviate from the way the drummer played it but still have it sound organic and performed. Sometimes I try to not have downbeats and really emphasize the non-linearity afforded to me with digital sampling and manipulation. This type of programming seems to really only exist in jungle. I like very long phrases or passages. I would go so far as to say that I'm attempting a lyrical style of drum programming.

Q: Have you found that certain breaks work well with others? Why do you think so?

Well to answer that question I think it's important to discuss why certain breakbeats work in that jungle context in the first place (especially the ones that have achieved their iconic status). A big part of that is their distinctiveness…the special combinations of frequencies and the nature of their transients that give them the character that makes them instantly identifiable to the listener. It's also that certain breaks maintain their distinctiveness after they have been pitched up etc. Other breaks (more dry punchy varieties) end up sounding more generic when they've been used in a jungle fashion.

So given that there is so much variation where everything "sits" with these drum sounds…they can fill sonic "holes". So if you are layering them as a "unison" approach for sound design you can get a really full drum sound that occupies a very complete spectrum. You can have the "air" of one break handling the top end and a fuller tighter bass drum from the other break—mixing and matching characters together.

Now if you are layering breaks with different rhythmic programming you get this manic rolling urgency and it's beneficial if the breaks don't interfere with each

other sonically (their distinctiveness helps for that). I don't really do much of this programming…as I find it a bit dated. I do like old records with this sound a lot.

Q: Did you learn music production from anyone?

I taught myself production. If anything I gleaned a bit from looking at MOD files in the demo scene when I was experimenting with trackers. I find it really interesting now that the way of sharing and listening to the music you were also given completely transparent access to the sequencing and samples. So a small file would have all these things. And then people would write out information about themselves…their crews…the song and their shout outs in the instrument section. There will always be something elegant about trackers.

Around the time I was 17 I met Joel Zimmerman (Deadmau5) and we used to work together on music. I would visit him in Niagra Falls and we wouldn't work on specific projects but just have a creative space to experiment on techniques. He turned me on to some software that was really important for my musical development.

Q: What was your first breakthrough tune? What year? What gear were you using at this time?

I would say my breakthrough tune was both sides of my self-released and first record "Running/Reflux". I had made those songs probably in 1999-2001?…they came out on August 18th 2002. They were made completely on a computer…it was the 486 dx2 66MHz with a $15 generic soundblaster knockoff…the same computer that my dad used for word processing.

Q: Do you remember how you came up with the idea for it?

My friend Vanya and I used to hang out at his place after raves and we would often discuss what the big party tunes were in all genres…not just jungle. One of the tunes was an Armand Van Heldon remix of Nuyorican Soul featuring India

"Runaway". I've always really loved the way jungle tunes can take diva soul vocals and put them into a really dark and moody emotive context. So a few years later I always remembered that song…one day I recorded the acapella into my computer and timestretched in Cool Edit to fit into that bpm (I think it took a really long time with my crappy processor). Wrote the synth melodies and the tune came together. I used to make a lot of commentary with my music about this idea of "nuschool dnb". So I always used to try and make rolling "2-step" intros that would build up to really huge drops to provide contrast with my style of mashed up beat programming. I was really fueled by how against the grain I felt my music was at the time. I really felt that my vision was something true to the DNA of jungle/dnb…the formula of bass/aggressively chopped up drums/female vocals/atmospheric synths. I remember sending the song to Pete Parsons and he gave me really good feedback that I ultimately didn't use but appreciated. The record sold out pretty fast. I think that had to do with how different it sounded to everything else at the time…and that its sophistication and rawness fit in with jungle/breakcore/idm all at the same time. I still function within all those genres with my music and that's been very beneficial to my career.

The flipside Reflux came from reading about the synthesis of 2c-b and the use of a Reflux flask. I got the sample "Erased From Existence" from Back to the Future…it seemed like some extreme thing to fit in the dark "hallucinogenic" vibe…especially when timestretched. I had given some test presses to the Inperspective Records crew…and breakage played one of them at a Bassbin Records Night in Dublin Ireland…there was a big rewind when the bass kicked in…and Chris Inperspective grabbed the mic and yelled "I told you we're bringing the sounds of the future…the sounds of 0=0…watch out for that boy". I later sampled that line and made a track that became the opening tune when I played at Technicality…my first ever London UK gig.

Q: If you used breaks, which did you use? What types of the previously mentioned modifications did you use?

At that time I had most of my breaks downloaded off websites…or from a few sample CDs…Zero-G's Jungle Warfare and a bootleg of Planet of the Breaks. Most of my Amens were all modified versions of the one provided on Jungle Warfare.

Q: Could you describe a typical session? Like, do you often start with drums?

Usually I start with a sound…that forms a really early melodic or groove element. Then I put looping drums to put it into some sort of context…and then I make a bassline. The song isn't really anything until I make a bassline. I then add more detail and layers to the music side of things…I work on drum programming and track structure (which are the same thing in my world) last. The melodic elements are very important in the initial stages as they describe the emotion of the song. I often get lost in that side of things and that prevents me from finishing music.

Q: Can you tell me about how Synaptic Plastic started? What is the ethos behind your label? Is there a particular sound of your label, and if so, can you describe it?

The label is a bit out of service now. It started after getting involved with that community of Inperspective Records and Subvert Central…there was a lot of good music being made so I wanted to support it. The records really came out after my partner, Magda really pushed me to get them out. I had purchased a lot of music directly from the artists (buying the rights at a flat rate)…so I've amassed a good catalogue…unfortunately I wasn't able to follow through the releases.

The way I like to describe the Synaptic Plastic catalogue would be that the tracks sound the most like what I imagine the artist who made them would like to sound like…at the time they made them. So it's all very distinct. I might be biased because I know the artists personally and knew their personalities at the time…but maybe that qualifies me even more to presumptuously assess what the artists "sound like at their core". Some of the songs I've signed have since been bought out from

me and released on other labels. I would like to think I'm pretty good at A & R…and I help a lot of people in that capacity.

Q: Do you still use older hardware samplers? If so, for what?

My biggest use of hardware samplers is to treat drums. I have a few samplers that I would consider to be character-imparting devices. My E-mu Emax is a 12-bit sampler with analog filters. You can run samples pretty hot into the preamp, which gives a nice saturation/clipping. The low bit rate seems to reduce the dynamic range in a way that gets rid of unwanted room sounds and some of the hiss in breakbeats and makes the drums punchier. There is little to no interpolation when changing pitches so you get some heavy aliasing noises that enhance and define high frequencies. The analog filters do a great job of smoothing out that aliasing…or enhancing it with the resonance. I also have a Zoom ST-224 that also delivers similar pitch artifacts but acts on stereo material (where the Emax is just Mono). This gives me a certain sound I can't achieve exactly in software (although theoretically it should be possible and some people have made great strides in this field, such as David Yeh and Native Instruments).

Samplers generally lend themselves to making really nice ambient sounds. You can sample really complicated dense harmonic sounds and pitch them around/ filter them and create very powerful atmospheres. Like looping long reverb trails to make extra breathy "spectrum" pads. The artifacts and behaviors from doing that in hardware makes things even more fun.

The interfaces and operating systems themselves can inform (or dis-inform) creative choices. Cutting up samples on devices that doesn't display waveforms forces you to focus on the audio of the transients more closely than if you can see a representation of the sound on a screen. Consequently, I also have a Yamaha A4000 that not only shows the waveform, but also has a built in slice and map function that is pretty useful sometimes.

This might be completely obvious but its worth saying that using a hardware sampler can lend a certain authenticity to sample-based music. If you have 1000's of records that were made on an Akai S950 or E-mu SP-1200…there is probably a part of you that is trying to get to that sonic territory at times. So using those devices will

get you there pretty quickly. There is a moment of recognition when you have sampled something into that gear and it's impacted its crunchiness into the sound that makes you say. "Ya…this is it." It takes a bit of effort to doctor things in software to you get to the same place.

Another possible benefit to the hardware is having a completely discrete signal path…it can potentially give you more texture just from the summing alone.

I also like collecting sample CDs. I consider myself a bit of a historian. Its fun to see where people have gotten their sounds from…and I've created a huge library on the *gasp* 9GB internal SCSI drive on my Yamaha sampler.

There also times when I'm just messing around with different devices and I need to capture something…it could be an idea for a riff…or a very nice spontaneous moment of sound design…for some strange reason it is convenient to use one of my samplers (most likely the Yamaha as it has the most ram and is the most transparent) for this purpose.

C.4 Clements, J. (ASC)

Q: Please tell me about the music scenes you were involved in before Hardcore, Jungle, and Drum & Bass. How did you find yourself involved in these genres? How did you come to be involved in Hardcore, then Jungle, then Drum & Bass?

I grew up on a diet of Motown and Soul, thanks to my Mum. I think my earliest memories of music in our house growing up were listening to Marvin Gaye, Teddy Pendergrass, Smokey Robinson etc. My Mum was really big into that sound and collected vinyl from an early age too. I remember hearing 808 State and Art Of Noise around about 1991 and I was blown away. I'd never heard music like this before. It was instrumental electronic music and I was hooked. The tune that really got to me was Olympic by 808 State, which was on the b-side of the Cubik single. I'd bought the 7" single after hearing Cubik on the radio and I recall sticking the b-side on and listening to it over and over again for hours. Not too long after this, around about the summer of 1992, rave/hardcore had taken over the UK, and was even invading the top 40 charts. Acts like Smart E's, Bizarre Inc, Urban Hype, SL2 and of course, The Prodigy, were all being played on TV and the radio, and it was an unbelievable time for that music. So as a young teenager during this time, I wanted more of it. A group of us at school were all into it and started listening to local pirate radio stations and making tapes of the DJs. We'd then dub tapes from each other and swap our collections. Back then, me and my friend Chris took it a step further and decided we were gonna start buying vinyl and learn how to DJ, which led to us both becoming minor celebrities in our school when we landed a show on one of the pirate radio stations we listened to. Every weekend we'd head into Leeds, Bradford, Huddersfield and the local cities where we grew up, to visit the specialist record stores and spend whatever money we had on expanding our collections, then every Thursday, we'd get the bus down to Reality FM's studio, which wasn't exactly hidden well—it was in the bedroom of the guy who ran it!

By means of wanting to keep DJing, I followed the music through until it changed from Hardcore into Jungle and then into Drum & Bass. The pirate stations all started getting raided by the DTI and eventually, Reality shut down for good after numerous raids on its links. By this time, me and Chris had been learning how to produce on our ST & Amiga's in around 1995-1996. I was already hooked on this music and new I had to do something and be involved right there and then.

Q: Just for reference, how old were you in 1991? How did you and Chris learn to DJ?

We were both 14. Chris is 2 weeks younger than me and we pretty much did everything together back then. We'd analyse tapes of DJs from pirate radio and any bootleg tapes we could find of recordings from big raves. I can't say mixing really clicked for us straight away, as we both had this idea that fading out from one tune into another was mixing! Haha! It was only when we started messing around making music that we started to become more aware of structures and time signatures. For some reason, listening to music from a non-production point of view seemed so innocent back then. It was like listening for the first time to something you had no grasp over but were just drawn to, like a moth to light or something. After this, I realised what it was all about. It definitely clicked.

Q: What style of music were you making in 1995/6? I assume you were using a tracker? How did you choose this instead of other software? How did you learn it? Were you using any hardware in conjunction with it?

I'd say we actually both started messing about earlier than 1995, if I recall, as the first stuff we were making with out Amiga/ST trackers, were remixes of rave/hardcore tunes that we both loved at the time, and since the Jungle boom didn't happen until mid 1994-ish, that makes sense. I don't think we started to take things seriously until about 1996, and when I say serious, I just mean spending more time on it and trying to write our own music from scratch. The writing still wasn't serious, I mean, it couldn't really be with a 16-bit sampler cartridge and an Atari 1040STE, but it was a

great start and introduction for me. I was using Noisetracker at the time, and Chris was using Protracker on his Amiga 500. I then got a cheap midi keyboard and decided that I was gonna learn a program called Trax, which was a simplified Cubase-like sequencer for the ST. Eventually I moved onto Cubase 3.0 for the ST. Still, I wasn't making anything serious until I switched to the PC.

Q: Is your friend Chris still DJing/producing?

Chris went to the famous Manchester Midi School and learnt a lot, but never stuck with it sadly. I'd have loved to see him get somewhere, as his passion for music was infectious. He introduced me to a lot of early rave music and it was a reason why we still are such good friends. I know a while ago he invested in a new Mac setup to try and get back into it, but I think his IT career had been taking up all of his time. There's still time though and I hold out hope that I'll get a new tune from him in my inbox sometime soon!

Q: When/why did you switch to a PC? What style of music were you making? At this point what were you using (software/hardware)?

I got heavily into trackers, and the way of writing music on them on the ST and Amiga. Trouble was, the software and sound quality was very limiting. The one I was using, Noisetracker, had only 4 channels, a few command line effects, and not much else. It was great for a while, but I had come to a decision—either buy an Akai Sampler to use in conjunction with Cubase on the ST, or buy a PC and start using more powerful tracker software. Turns out the PC route was a hell of a lot cheaper and more appealing to me at the time, so I went with that. At this time, I had started to work with another friend of mine, Michael, who went by the name Future Link. He worked with me on music that was on Covert Operations (COV001 - Serenity) and Inperspective (INP002 - Surface Tension). We'd started out working on his PC before I got mine, making stuff primarily with samples and FastTracker 2. He was a long time friend who was a few years younger than me and Chris, and he got hooked on the music after I'd introduced him to it.

Our first setup, if you can call it that, was simply a PC, and his Sony hi-fi. Nothing more, nothing less. It was simply about making do with what we had and letting the software do the rest. I've told this story a fair few times, but we were starting to pool resources to invest in some professional equipment to really make a go of things, about 1996-1997, and we'd returned home from Leeds with an Iomega Zip Drive to back up our music. We were hit with a stroke of bad luck, and upon firing up the computer, the hard drive just died on us. All the work from the last few years was gone. We'd dubbed a handful of cassettes, complete with printed cover of a demo album we'd put together. This has the original version of Windchime on it, which wasn't an amen tune then. It had a the same chord arrangement that I'd programmed though, and that was the basis for the tune that came out, which I had recalled from memory, since neither of us could find the tapes we'd recorded or remember who had the ones we gave out.

It was after this disaster that Michael decided he didn't have time anymore, as he was pursuing a career as a mechanic with Audi, so I decided to invest in my own PC and my first batch of outboard gear. I recall my own first studio setup was a PC, Alesis Monitor 1's, a Pioneer amp to run them, a Behringer Dualfex Pro, a Samson Mixpad 9 (which I still have, for nostalgic reasons!), a Sony DAT recorder and a Yamaha CS1X. It was the perfect little setup to learn on and get me up and running on my own. I was still using FastTracker at this point too.

Q: You mentioned Chris went to MMS, but did you learn production of any sort anywhere (would you say musically you are self taught)? Were there other producers you were in contact with during this time?

I couldn't afford it to go to Manchester Midi School sadly, and to be honest, my parents were really pushing me to pursue my career in graphic design. I stayed on at school and finished qualifications, then went to art school for further qualifications, then dropped out of my first year in university, where I was studying for a degree in creative imaging. I knew by then that it wasn't what I wanted to do and I had to leave and follow my dreams, much to my parents dismay. I was fortunate enough to go to a high school that encouraged music as part of the curriculum, so we were

taught basic music theory in our teens and encouraged to learn a music instrument. I learnt the french horn and the piano for a few years. All this came in handy when all my productions started to mature to a releasable standard in about 1999. As I mentioned, the only other producer I was in contact with then, was Michael. Out of all my friends, only me, Chris and Michael ever got bitten by the production bug. There was quite a number of us all into the music and our crew of friends and people we hung out with at school were all into it and some even started to buy vinyl and DJ also, but I this meant so much more to all three of us, especially myself.

Q: Were there DJs/producers that served as an early influence for you in making your first, more serious tracks? Did you have any link to them?

I was quite isolated from any specific scene and producers. We were all still quite young when this happened, so we couldn't get in to any of the raves yet, although we tried a few times, so no, there was no direct contact with anyone. I remember me and Chris realising there were telephone outlets in some of the study rooms at our school, so we brought a spare phone from home, plugged it in and called up the numbers on the back of record sleeves we were buying! I remember calling up Moving Shadow and Rob Playford answered. I asked him for a back catalogue, and he said, 'you mean a discography?' I said yeah, one of those! So a few days later, I got a printed discography from him and some Moving Shadow stickers in the post, which made my year! The reason I bring that up though, is Omni Trio was one of my biggest early influences. The first piece of vinyl I bought of his was Rollin' Heights Vol.4 and I was hooked. It was exactly what I was searching for and to this day, it's one of my most treasured pieces of vinyl I own. We'd often dissect the tunes we loved, doing terrible remixes of them, sampling phrases—basically anything went back then. It was all a learning process and all about having fun.

Q: What would you say was you first breakthrough track? Do you recall how you made it (e.g., motivation, gear, samples used)?

Probably Windchime I'd say. It came about at a time when the amen was still a very relevant part of drum & bass culture and the atmospheric side of things was still going strong with Bukem and Good Looking at the forefront. I'm not even sure if he played it or not, but it was probably the first tune I made where I had a LOT of serious feedback from DJs and producers who I'd looked up to back then. As I said earlier, Windchime started off as a non-amen tune. It was a very disjointed stuttering kind of break that we used. I'd had this chord progression in my head, and that was the only thing that made it into the version that everyone came to know and love. I wrote that on the setup I listed earlier. In all fairness, it's a rather simple tune. The main key's are sampled from Air's 'Kelly Watch The Stars' intro and heavily reverbed. The intro pad was from Autechre 'Autriche', from their Incunabula LP, and the FX were sampled from the film Snatch—the scene where Brad Pitt knocks the other boxer out in the very last fight. The amen was just chopped and programmed into FastTracker 2, then I'd make a ton of little loops, then I'd have to take them into GoldWave in Windows 95, since FastTracker2 was a DOS based program, and then run them through filters and FX that I didn't have access to in FastTracker. It was all a weird process when I think back, but it worked, and that was the main thing.

Q: I remember reading about your preference for trackers over larger production environments. Did you have any link to the game or demo scene? Theres the famous cover of Amiga Format…were trackers used by a lot of people to make hardcore and jungle? Which trackers have been relevant to you?

I had no link to any scenes really. I was isolated by my location and I didn't have any interest in the internet until the late 90's. I do recall that Amiga Format did a feature on Urban Shakedown and they talked about how they were using OctaMED to create Some Justice, which they had a hit with in the UK charts, so of course, for a tune to get into the charts, created in a non-typical fashion, on software that any person could get hold of, there was a big thing made of it. I've tried a plethora of trackers over the years, as well as the usual suspects like Cubase, Logic, Reason, etc.,

but I'd have to say the relevant ones for me would be Noisetracker, as that was the first one I tried in the early 90's on the Atari ST, then switching to PC and using FastTracker was a big step, as most of my early releases were created in that, and of course, Renoise, which is my program of choice to this very day, and I can't see me changing to anything else any time soon.

Q: Were hardware samplers ever relevant to your production?

No. I had access to a friend's Akai and another's Roland, but I never felt the need to get my own because of how the tracker worked. It made more sense for me to put my money towards other gear.

Q: So while you had the heavily edited style of atmospheric tunes found on Inperspective, you were also forging another style under the Intex Systems alias. Can you describe this project? Which track would you say is "the one" for the Intex tunes? Do you recall how you made it?

I only went heavy on the edits when it was an amen break. There's something about the way that break sits normally that just made me want to slice it up and experiment with it. A lot of my other stuff around that time was pretty straight forward, in drum & bass terms, like the things on Good Looking, 720, Covert Operations etc. The Intex Systems thing came about from me creating a wealth of material, which were really just experiments on the side. I was fascinated by FSOL, Autechre and late 90's 'IDM' in general and really wanted to write music like that—music that didn't really conform to anything. At first it was all non dnb stuff, like the Research & Development LP, but then when I started working with Offshore, a lot of that similar vibe was creeping into my drum & bass productions around that time, and Brett at Offshore was really keen on merging the two identities and wanted to use the Intex name as part of the growing Offshore identity at the time. From then on, it was kinda put on the backburner for a while, until I started using the name for dubstep production. I didn't do much with it, but had moderate success on labels like Hotflush and my wife's eponymous short- lived label, Vaccine.

As far as the production methods went, it was all very loose in a creative sense. It was kinda throw stuff at the wall, see what sticks, or at least that's what it felt like in hindsight. I always loved experimentation and this was it for me. It encouraged me to think outside the walls that drum & bass create for producers, try new tricks, learn new techniques, and be happy with a 'try anything' mentality. I think a lot of the habits I picked up from those days stuck with me and allowed me to create the music I do now, which to me, is very similar to the vibe I was hearing in the late 90's on labels like Warp, but just with a modern approach, and of course, a different tempo.

It's hard for me to pick any one track, but I think the Research & Development LP was the defining moment for the now defunct Intex Systems moniker.

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? why? How many do you have in your collection?

Well these days, I don't use breaks at all, as they don't fit into the type of music I want to create, so this is all kinda null and void really. Back in the day, I liked the amen, apache and funky mule the best. Each of them had a really unique sound to them and were fun to use when writing more traditional drum & bass stuff.

Q: Please rate on a scale of 1:7 (7 being the highest) the amount which you used the following (if you can, please use the entire scale):

- **pitch modification**
- **distortion**
- **resequencing**
- **reversing**
- **multibreak layering**
- **multibreak alternating**
- **timestretching or start point manipulation**

• filtering

• flanging

• reverbed

• other:_____

• pitch modification 1

• distortion 1

• resequencing 5

• reversing 3

• multibreak layering 3

• multibreak alternating 2

• timestretching or start point manipulation 6

• filtering 5

• flanging 2

• reverbed 1

• other:_____

Q: I suppose an interesting follow-up might be to ask why you've chosen to not use breaks any more. What do they contribute timbrally and/or rhythmically that you'd rather avoid?

It represents a form of music that I feel is better left untouched now. By the whole, I really don't like or enjoy modern drum & bass at all, so I try and steer clear from it in all aspects of my music. Drum & Bass peaked in the late 90's and has been getting steadily worse every year since. It's a sad state of affairs when you have all this student pop music with its big 250hz snares masquerading as Drum & Bass. Fair play to those that try and keep the vibe going from the golden era, but I'd rather leave it untouched and just listen to that era when I want to reminisce. I can't help but be reminded of Drum & Bass when I hear a breakbeat. No other form of music comes to mind, no matter what break it is.

Q: You mentioned amen, apache, and funky mule...could you list 10 breakbeats (or as many as you'd care to—it could be 0), and provide a Hardcore, Jungle, and Drum & Bass track that has used them? if you'd like, please explain what you dig about these tracks.

I used to also like the Assembly Line break, the Soul Pride and the Boymerang. Dom's hybrid Tramen break also gets a nod too, just for how influential it was. Here's a few of my faves:

• Apache: Wax Doctor – Heat

• Amen: Splash - Babylon (DJ Trace VIP Remix), DJ Crystl - Warpdrive, Source Direct – Exit 9 / The Crane

• Funky Mule: Source Direct - Call & Response

Q: While you're no longer using breakbeats, there must be certain elements of your music creation process that are directly related to techniques that you picked up from making drum & bass, no?

Not really. I've well and truly moved on from it in all aspects.

Q: In a related question: Do you see the influence of Hardcore, Jungle, and Drum & Bass outside of the genres themselves (i.e., technologically and culturally)?

Hmm, again, difficult to answer. I think if I was more into it I'd probably see more ties to it, but I honestly can't think of anything influenced by it these days.

Q: Can you tell me about the different movements/major changes in the music, and your impression of what caused these changes that you've seen (e.g., 1994 shift away from Ragga Jungle)?

It's hard to say what caused them from an outsider's perspective back then. For instance, the move away from the whole Ragga thing as you mentioned, I can only

imagine that the people producing back then saw Jungle get into the charts with the likes of M-Beat & General Levy's 'Incredible', and thought this wasn't the direction the scene should be going in. Back then, it was a very insular small scene dictated by the top dogs in a few cities, namely London and Bristol. I didn't question it much back then, as I think I was wrapped up in the music and discovering as much as I could, so my tastes and the styles I bought were varied. As I became more involved in the scene and started producing, DJing, promoting, running labels etc., you tend to realise that everything goes in cycles. There are some trends that die out altogether, and some that get reincarnated into the latest flavour of the month. For example, the whole minimal thing that happened at the end of 2009 and early 2010 was nothing new. You had labels like Partisan doing very similar things back then that most people just called leftfield. It's all relevant in one way or another.

Q: What did you do to differentiate Covert Operations and then Auxiliary from other labels that had come before? What was the ethos behind each?

The main thing for me was to learn from the mistakes I made with Covert and make sure I didn't make them with Auxiliary. The ethos behind Auxiliary was to create a small group of talented artists that would work almost exclusively with the label and with a few other like-minded labels too, where as Covert was more of a 'sign whatever is good' type of mentality. There's nothing wrong with either I suppose, but I just felt that I wanted to concentrate on a specific vibe and sound that only a handful of artists were ideal for.

Q: Could you explain the full process in preparing a release?

I'll make a list of what I usually do:
Agree terms and conditions with artist
Acquire pre-master wave files
Submit release info and metadata to my distributor
Choose mastering house
Wait for test pressings and then approve/reject depending on quality

Get release date from distributor
Promote a few weeks before the release and then also after release date

Q: In Drum and Bass' heyday, roughly how much revenue was generated by a release? How much would a release cost to make?

From going on the prices I've become used to, a hell of a lot more revenue was generated by releases back in the day! These days, the majority of sales are digital and vinyl is really seen as an advert for the digital sales in some way. I mean, every sale is important today and most labels that still press vinyl are happy if they break even and/or make a slight bit of profit. Back in the day, some of the biggest tunes were shifting tens of thousands of units AND getting repressed. For those labels who had a legit distributor behind them, there was probably decent money to be made from even just an average 12" that got a bit of exposure.

Q: Can you tell me about your interest in ambient music (when you started to listen, who brought you to it, which artists, etc.)?

I think the first ambient thing I took notice of was a track on an EP that Moby did back in 1993. It was called 'The Rain Falls and The Sky Shudders'. It was a six-minute piece with tinkering pianos, rainstorms and other pleasant noises. I hadn't heard anything like it up until that moment and even though it's not a brilliant track or even a timeless example of ambient music, it was enough to peak my interest. Almost immediately, I started to veer off that path and more towards more abstract ambient stuff with percussive elements, like FSOL, Autechre, a lot of labels like Warp, Morr Music, City Centre Offices etc. As cliche as it sounds, I think it was when I heard 76:14 by Global Communication that I really developed a love for ambient music. I say cliche, as a lot of people name-drop this album a lot when talking about ambient music from the 90's, but it really was THE gateway LP for me to truly get into ambient music. After that, I started to look back at what had come before and got heavily into Brian Eno. To this day, he's still a massive influence on my music in general. Truly a pioneer.

Q: At what point in the music creation process would you say that your interest in Ambient music began taking shape in your drum and bass? How did it come to fruition?

Probably about the early 2000's. I was experimenting a lot with atmospheric, soundscapes, long evolving pads, that kinda thing, and it was getting more and more prevalent in my music. For a while, I discarded it and went off on a tangent, but I eventually came back to it. When I got involved with the autonomic thing, I think out of the main guys involved (dBridge, Instra:mental, Consequence and myself) I was probably the most ambient of the bunch. I think in general, it's always been there in my productions, even if it's only a slight nod to it in some cases. When I think back, I once analysed how I wrote my music from the ground up and I realised that I was always building around the ambiance of pads and beds rather than writing beats and then on top of those.

Q: I seem to recall reading an interview you did once, where you were describing your process for pads, and it was always a multilayered approach. Is this something you still do today? Where do you get the sources for these (feel free to talk historically if you'd prefer not to divulge your current techniques, or ignore the question altogether)?

Yeah, that's right. I think that was for UK publication, Computer Music, a fair few years back now. My approach has changed a fair bit these days, as back then I was limited by what equipment I had at my disposal. My PC wasn't very powerful, so there were only a number of plugins I could run, so I was using a few of those, rendering to sample, and then layering with other samples. I'd sample from the most obscure places, like indie records, classical, TV commercials, all sorts really. After I had a bunch of stuff I liked, then I'd start to blend them together and time-stretch to get a texture and key I wanted. These days my techniques are a lot different, as I have quite a bit of hardware now and a really good PC that can handle anything in multiple instances.

Q: What sonic characteristics differ between the recent Drum & Bass (referring more to your Autonomic/170 style) and Ambient music that you make?

The main thing is not fighting with the frequency range! When I'm writing 170 stuff (I don't like to call it drum & bass, as to me it isn't), I'm constantly aware of keeping things in their 'right' place. When I'm writing ambient, I can disregard these rules slightly and start letting the pads and soundscapes drift into the low end that I usually reserve for bass, kick drums, etc. When there's no beats to worry about in the mix, then you can really fill things out with soundscapes.

Q: So you tend to fill things out differently when you're making Ambient music.

Yes, totally. As I said, there's more to fill up when you're not focusing on how the beats are sitting in the mix and what frequency range they are taking up. In general, I tend to look at like Photoshop. I have a graphic design background as it's what I went to school for, so I see a lot of similarities between designing and making music. With the ambient stuff, especially so, as I'm often filling up lots of space with sounds then chipping away at the layers, almost like a sculpture.

Q: Do you find that the phrase length is different in the ambient music you write? I suppose this leads to another line of questioning...how does organization change when you remove the beats? Are you still structuring in terms of 4/4, and the basic conception of 4, 8, 16, 32? Or do you expand out of this? Or does this not even apply to the 170 music?

I usually leave it the standard 4/4 when I'm writing ambient. When it comes to 170 though, I've been all over the grid—3/4, 4/4, 5/4, 7/8. I love the challenge of making something at that tempo fit into a non-standard time signature in terms of DJing. The Out Of Sync LP project I did for Samurai last year had a few tracks like

this. Stay True was 3/4, as was Nightmute from the Lost Sync EP's that followed, and Open Source was a mixture of 3/4, 4/4 and 5/4 in parts. A real nightmare to mix!

C.5 Collins, C.

Q: Please tell me about the music scenes you were involved in before Hardcore, Jungle, and Drum & Bass. How did you find yourself involved in these genres? How did you come to be involved in Hardcore, then Jungle, then Drum & Bass?

Whilst in Secondary school, I started to write for a music magazine "Blues & Soul". This was mainly club reviews and live gigs, this started when I was sixteen. I would save my lunch money to buy tickets for live shows. The first show that changed my life was Light of the World at Hammersmith Odean, 31st July 1982. Light Of The World is widely acknowledged in the UK as true innovators of Jazz-Funk (Nu-Soul/Funk & Jazz). Their unique sound is a branded combination of gutsy soulful vocals, tight jazz horn melodies, essential rhythms and fat gritty bass lines. From then on, fat gritty bass lines became my destiny. Jazz-Funk was very influenced by the US Soul/Jazz Fusion scene that dictated the sounds of that era. By the beginning of the early 80s UK artists had developed their production sound and were beginning to establish their own style. It paralleled the developing Rap movement of 77 coming out of NY, with its signature style and fashion. Fashion tended to be casual along with compulsory white socks and whilst not as outlandish as the Nu Romatic Goth scene and the Punks of Susie Banshees and The Cure of that era who were making prominent waves at that time.

The Clubs were found mainly in backs of pubs, small clubs and then taking over the more commercial clubs. As a rule the commercial clubs demanded suits and ties as part of their strict door policy. The large groups of males especially the Tribes as they became know i.e., large groups of enthusiasts that dressed alike and danced alike and their trademark large formation dances that were culled from the American dance shows, such as Soul Train. With a group of friends I would travel the south of England, in search of the ultimate beats. This was a very cool scene, very underground and self contained. Clubbing in the UK even in the early 80s was a very

serious business, operating away from the bright lights of the commercial scene indulging in the likes of national radio pop fodder of the day.

The 80s underground scene was rapidly changing due to the decline of the previous decade's Disco era and brash commercialisation that came with it. The brashness of the late 70s Punk attitude had pervaded the new decade. Being based in London and the home counties, the thing to do was miss school and go and watch the punks in the Kings Road in search of the latest Jazz slippers and Hot 12" import. London had a vibrant Friday afternoon party called Crackers [and its DJ,] DJ George Power had created a loyal mixed gay straight multi-cultured scene with exceptional dancers gravitating to the small compact dancefloor. The Soulboy & Soulgirl were suburbia's extensions of the 60s Mods, not so focused on the fashion aspect of pseudo-cool and the beatnik persona galvanized by the Silver screen chic of the emerging youth culture of that era. The eighties dance generation could express themselves freely as their parents who had witnessed the birth of The Beatles, The Stones, Led Zep, and the swinging sixties counter culture. This era was [musically experimental] as it was diverse in its taste for the beats. Music from the US was prominent in terms of [the] guiding taste. European production was emerging in all forms of Funk and Jazz, Disco was still being produced. The 70s Soul Fusion was still sought after, [and] the Japanese import emerged as new markets expanded. Expensive high quality 180 gram pressings made for the Japanese marketplace were turning up on the shelves of Record Shops. Music was in abundance due to the burgeoning British Pirate radio scene no longer based in international waters. The radio waves of suburbia were being transform[ed] by urban based transmitters high over London and inner cities broadcasting. Music not dictated by playlists but DJs' sense of taste and dance floor worthiness or lyrical content depicted emotions all could relate to in some way or form. Alongside the pirate radio, some legal stations had started to broadcast. By 1980, Mike Shaft in Manchester, along with Robbie Vincent and Greg Edwards in London, were regarded as the most influential Soul show presenter in the UK, playing a superior selection of Soul, Funk, Disco and Jazz-Funk, whilst making regular appearances on the All-Dayer scene (parties starting at lunchtime finishing after a minimum of 12 hours) on Bank Holidays.

The industry of dance music was fueled by a rapid growth in the eighties, specialist music tastes were developing like a out of control virus. The fan base was large consumed major amounts of alcohol and relatively narcotic-free. The early eighties dance clubs were fueled by cigarettes, amphetamines, speed, the rigor of the day, and sweet smell of Marijuana.

Peoples desire in the UK in the early 80s was fueled by the love of the old (Rare Groove) and the latest imported US 12" vinyl. Musically-broadminded youth listened to music from the past and future, the Rare Groove scene as it became was a catalyst brought around by the US Hip Hop movement and its desire to create records from breaks in previously released material; usually old 7" singles and album tracks, i.e., breaks, the funkiest bits of over music. The late Rap of the 70s and early 80s from the likes of Sugar Hill label early rap pioneers Curtis Blow and the social [consciousness] of Grandmaster Flash's The Message. The plush orchestration of Philly, the windy city and Miami's Disco sounds were searched out and enjoyed graciously lapped up on the dancefloors. The early to mid-eighties consumed music with a ferocious appetite. Commercial Pop artists turned to the remix, the art of combing the latest hip underground sounds of club culture with commercial pop releases. The original DJ Superstar was Larry Levan from NY's Paradise Garage. The mixing DJ was born creating a continuous BPM-oriented flow of music (labels now printed BPMs on the labels). UK major record labels now started to fund Dance music labels, licensing 12" vinyl for domestic release at a cheaper price than the imported vinyl. US vinyl would cost on average 4.99 pounds and Domestic vinyl 2.99 pounds, [and] releases would not be immediately purchased until a buzz was created through specialist record shops. […] Record shops run by mums and dads, who once specialised in Pop and Punk, now stocked the latest US import 12". Cool record stores started to appear everywhere known as indie.

By the mid 80s, the dance floor was taking a new direction. The lack of social media meant the movements had time to develop at a more organic speed through the tried and tested word and mouth; this was the era of the fanzine and black & white news letter. The flyer had come into its own. The majority of this club scene grew and multiplied through membership cards that allowed promoters to run their events as private clubs, avoiding stress from the Police. by the mid-eighties,

promoters were taking over empty warehouse spaces creating there own club world with larger sound systems and all-night dancing polices and two or three rooms of different music. The desire to move away from the clubs and pubs was creating a desire that would fuel the music festival agenda and the quintessential British Weekender[—]a long established right of passage created in the later party of the 70s, when an out [of] season Holiday resort with Carvans and chalets would be taken over from Friday afternoon to Sunday, with [an] emphasis on dancing and drinking and making merry. This happened twice a year in [and] out of season. These events had their own radio station and in later years internal TV broadcast to guide, inform and hilariously entertain the captive audience (myself included). Occasionally I would work at the concession stands at these events selling merchandise or vinyl. All-Nighters and All-Dayers were established in the 60s, in the UK.

Underground dance music was fueled by its overriding desire to shirk the restrictions of the mainstream club, seen basically [as] a venue that had not really moved on since the 60s. As the popularity of the alternative venue grew so did the Police awareness. The UK in the 80s was redesigned with the new era. The economic boom and bust created the beginning of the super clubber with money to spend on music clubbing and […] designer label [clothes] were seen on the dancefloor as dancefloor fashion was the rage on the catwalk, by the late 80s.

Seismic shifts were a foot, the tectonic plates of the dance music scene were changing. The catalyst for the change was the US, the purveyor of the sound track to the UK's dancefloor, [which] had shifted with the growth of electronic dance music. The early 80s Electro fueled the changes. Body Popping had started taking over the UKs younger generation, and Beat Street with it locking and popping was battling with Jazz dancers who were bebop diehards expressing their spirit on the dancefloor. The new music was taking over, the mid-eighties saw the decline of US mainstream black music as the fuel for the UK dancefloor. Grand Master Flash had inspired the scratch DJ and the rapper was emerging. Hip Hop and the success of Afrika Bambaataa, LL Cool Jay, Eric B, Beastie Boys was changing things. Public Enemy arrived with vim and vigour, and the US sound was changing; lyrical content became defamatory. Middle England did not relate to the ghetto poetry of the late eighties, The Last Poets and Charles Wright & The Watts 103rd Street Rhythm Band 1970's

"Express Yourself" ((#3 R&B, #12 Pop), a song that has been sampled by rap group N.W.A., which included Wright's nephew Eazy-E, amongst others). The US House sound laid the firm foundation of the dance floor culture, later to be defined as Rave. Soon the music magazines were writing about Ibiza'87 as the starting point, completely negating what went before. The Jewel in the Mediterranean Ibiza crown changed the way UK listened to music and danced, globalization of the dancefloor was taking place. Free spirited DJs started to change their sets combing home grown beats and European dance and the Saturday night fever era was over, The US explosion was going a new direction from the mid-eighties. House from Chicago, Detroit, and NY was consumed in large quantities, making producers household names. After being introduced to the magic of the recording studio whilst at school, my first venture in the studio was a remix of OG Edwards "Its Only You" for Danceyard Records, who I began working for in 1987. I became label/studio manger of the pioneering UK House, label Warriors Dance. Overseeing the releases of No Smoke "Korro Korro" and Addis Posse "Let The Warriors Dance", plus working with the well established Bang the Party, culminating in the release of "Bang Bang You're Mine" and further 20 releases. Before moving to new pastures with the major financed Desire Records, working with Double Trouble and Rebel MC who went on to set up the cult label Congo Natty, and the beginning of the Ragga Jungle explosion. Whilst at Desire, I worked on a remix album project for The Cure, who were the main artists on the parent label, Fiction. At the time [Fiction was] owned by Chris Parry and financed by Polydor Records. As part of the promotion, I set up a pirate radio station for the release of this album project with Robert Smith on the decks filmed by MTV Europe.

After a year I was asked to leave, due to lack of commercial chart success. I was soon approached by the late Don Taylor, the man behind the careers of Bob Marley and many other US artist. At the time Don was the international manger of UK act Soul II Soul, who had secured the number 1 single, "Back to life", in both the UK and US Charts. I was asked to join the backroom team in 1990 that was working on a label project with Motown Records and UK artists Soul II Soul. I had previously meet Jazzie B whilst working at Warriors Dance. The appointment was to be a short lived experience, [as] the label released [only] 1 single and album in the

first year. I decided to branch out, independently working on various marketing projects within the dance market, setting up my own label Shine Records and putting on warehouse parties with a fashion company Sun & Sand.

My first taste of the Hardcore had begun at the time I was working with Warriors Dance, artists like Shut Up & Dance and Acen were developing and changing the scene. The Akai S900 sampler, along with the [Roland TR-]909 drum [machine], had created a crunchy sound [that was] the hallmark for beats at the time [and is] now a vintage piece of equipment […] still highly regarded in today's dance music production. By the early 90s, the roots of Hardcore were developing. In 1992, a friend was running a club in Central London—it had a notorious Sunday Morning session. The Club was called Fish, it was a venue close to my heart, as it was the old Crackers club I graced in my soul boy days in London's retail flagship area, Oxford street. The Sunday session was for the Hardcore clubbers, who spent the night dancing there faces off at The Trip in London's Charring Cross Road, a little bit more than a 10-min. walk away. The late eighties and early nineties saw a rapid change in the tempo of electronic music and the increase of the ravers desire for partying be it in vast outdoor arenas or clubs. From Rave came Hardcore and Jungle, with it fast beats and immense bass lines. The popular Hip Hop break from The Winstons' "Amen Brother" became the influential default break of the [era] alongside the sampling of vocals from older Reggae releases. The sound of Ragga developed and the hard edge of the Hardcore Techno sounds rapidly mov[ed] away from the earlier Detroit Techno sound to the minimal, harder German Techno sound. The Hardcore scene with heavy pirate radio play soon mutated into Jungle music and then the era of Drum & Bass. I found myself in 1994, working with UK label Kickin Records, set up by the late Peter Harris. We had actually met in the early eighties when I was a sales rep for the music magazine Blues & Soul. Kickin Records will always be synonymous with The Scientist – "The Bee", and the track from same artist, "The Exorcist"; early Hardcore hits of national chart proportions. Peter asked me look after the Drum & Bass label he had just started, Hardleaders—this was his original Hardcore compilation series. I was charged with recreating the identity of the label and developing an artist roster, releasing a wide array of Jungle, Jump Up, [and] Drum & Bass alongside downbeat releases. The label featured releases from

Lemon D (aka Souljah), Dillinja (aka Capone), Decoder (aka Darren Beale), one half of Tech Itch (aka Mark Caro), Justice, Total Science, Peshay, Digital, Manifest, DJ Ruffstuff featuring MC Fun and MC Stamina. My last official release with the label was the Tudor Rose remix by Shimon in 2003. In 2000 I moved to Toronto, Canada, still working with my great friend Peter Harris until his untimely death from cancer in 2008. Still involved in the electronic music culture, with my last venture being a party promoter and record shop partner with Black Market record shop creator Rene Gelston in downtown Toronto, hosting parties with such electronic music luminaries such as Larry Heard, Robert Owens, Derrick May, Jeff Mills, Francois Kevorkian, DJ Hype, Dillinja, Lemon D, Total Science, Peshay, Shimon, DJ Ruffstuff, Bryan G, Jumping Jack Frost, Groove Rider, Digital, Mickey Finn, Darren Jay, Digital, Marcus Intalex and Calibre amongst many others.

Q: Can you tell me about the different movements/major changes in the music, and your impression of what caused these changes that you've seen (e.g., 1994 shift away from Ragga Jungle)?

The shift that occurred creating the emergence of Drum & Bass against the well established Jungle scene was a correlation of a few different factors. The first and foremost foundation that facilitated the change was [that] the major record labels and their subsidiaries determined that they could buy into the talented underground scene that was developing under there noses. 1994 was a flagship year; tunes from the underground were dominating the national charts. […] In particular, M-Beat featuring General Levy - "Incredible" charted at #7 nationally. The General was quoted in the style magazine, The Face, as stating that he ran the Jungle scene. This created a backlash amongst the supporters of the scene. The radio support from pirate radio Kool FM—London's leading pirate station—stopped overnight, and the leading DJs stopped playing the tune. The General apologised [and] the label tried to blame it all on a misquote. The label Renk Records was the most successful at this time with Jungle crossover chart success. The rot had set in, the scene was upset and its guard was up. The debate was in place, Jungle or Drum & Bass, what was the title of this scene. Whilst General Levy aggravated the underground, Shy FX and UK

Apache dominated dance floors, this Jungle anthem could do now wrong. UK Apache & Shy FX on SOUR had chart success with the release of Original Nuttah in 94, being placed at 34 in the national charts. Shy FX developed into one of the scene's finest producers and alongside creative partner T-Power, went on to achieve chart success with "Shake Your Body" in 2003. The backlash against M-Beat was not the catalyst for the demise of Jungle, but a mere footnote in the power of street music and its many different influences and how they come to shape things. Renk Records was an independent label, SOUR records was an underground label. The major labels tend to monitor independent labels as they always need finance to acquire and develop talent. The majors focused on investing in talented Drum & Bass producers over the next 2 years. Jungle was still being produced but the impact in terms of the national charts was diminishing. UK Garage was picking up the slack left after the jungle and ragga era. The jungle scene was still strong in terms of events. Specialist big parties devoted to Jungle still occurred, Jungle Mania being the biggest event.

Artists were being offered lucrative deals, large advances, this was unheard of in Jungle. The press at the time took on the mantle of Drum & Bass after flirting with the terms atmospheric Drum & Bass and intelligent Drum & Bass for a while. In the latter part of 94, the intelligent jungle scene was created. The chattering classes had developed a taste for a less-Jamaican influenced Ragga sound…The bad bwoy bravado of the Versace-wearing Jungalist was in decline, Gucci and Prada were moving towards the speed Garage scene.

LTJ Bukem had created a sound of suburbia than hit home with House people…Mellow Drum n Bass was wafting from the bass bins at 4 am after the main room vibe was chilling. By the nature of underground music, the new tunes were being broken on pirate radio and in the clubs and tended to be dub plates that had shelf life of from a year to 6 months ahead of actual release date. The art of creating a demand was now seeing a more musical vibe share space with the hard urban beats of the day. The biggest impact in the switch away from Jungle to Drum & Bass was Goldie [and] his Metalheadz label, alongside Roni Size and his Bristol based battalion of producers [that] reached out in a new direction. Impact was still important to the beats, but now vocals became polished again. Not Since Elizabeth Troy set the

standards as the first lady of Drum & Bass with her incredible "Greater Love" produced by Soundman & Don Lloydie. Quality vocals were now the standard, less voice sampling. Songs were being created, producers were receiving acknowledgement for their production kudos.

The nature of the creative music and the ebb and flow of creativity, [is that] music moves on. The transition away from the Ragga sound was gradual. The sound had been around for sometime and became ridiculed to a degree as it became a default setting. The era started with Tom & Jerry with excellent production values and the harder Congo Natty party pieces. In the UK, the divide [that] was slowly setting in was due to the change in the mindset of the people following the music and the taste maker DJs getting into a more serious mindset with beats [and] the way they were playing simply moved on. The change had taken hold, the music press had a new moniker for the music, it was now Drum & Bass DnB for short. Mainstream dance press had now reviewed Drum & Bass alongside House music, DnB [musicians] now started to create artist albums…Jacob's Optical Stairway on R&S was the new era of Drum & Bass albums with its homage to Detroit and its lush strings. Goldie was the first artist marketed as a Pop star with the power of FFRR a then subsidiary of Polygram the label run by Pete Tong, long-respected supporter of all electronic beats. Goldie created the opus "Inner City Life", [and] Drum & Bass had its icon. Goldie went on to become a media celebrity, with film roles in James Bond and Snatch amongst others. In 1995, Drum & Bass never looked so glamorous. Between 1994 & 95 the metamorphosis was complete, DnB was created as the all encompassing platform to carry the music onwards. There has been a renaissance [and] Jungle has seen its classic tracks remixed by the latest batch of producers. The old school party vibe is still very much [that] of the UK DnB party scene. This allows the music to move forward and respects the past glories.

C.6 Davies, D. (DJ Trax)

Q: Please tell me about the music scenes you were involved in before Hardcore and Jungle. How did you find yourself involved in the genres?

Pre-hardcore days…From an early age I was really into music and particularly drums and percussion. I started playing drums when I was 7 but had to stop a few years later due to neighbours! Luckily when I was ten, I had a new passion, which was electro/old school hip hop. I was totally drawn into all aspects of the scene. I was part of a B-Boy crew called the Electro Breakers (including Nucleus as well as others). I got my first turntable at 11 (with built in amp, radio and cassette) and tried to replicate scratches by DJs like Whizz Kid, Marley Marl, Grandmaster Flash and many others.

I also made mix tapes on my hi-tech double tape deck which included looped breaks (using [the] record and pause buttons).

At around 13, I started to put on hip hop events and invited crews and DJs down from London. By this time I had my first set of 12s [Technics 1200 series turnables] and my teachers were now the likes of Jazzy Jeff, Cash Money, Too Tuff and Luke Skywalker. My cuts progressed as the level of DJs improved. Around this time I got my first taste of early house with records like the original Can U Feel It, T-coy - Carino and Nitro Deluxe.

In the early 90s as well as being influenced by hip hop DJs, I respected hardcore and rave DJs like Fabio, Randall, Kenny Ken and Darren J amongst many others.

I was also influenced by producers like Mr. Fingers, Carl Craig, Rhythm Section, Real 2 Real, The Future Sound Of London, Frankie Knuckles, Shades Of Rhythm, Depth Charge, Quartz, LFO, Nightmares On Wax, Adonis, The Scientist, A Guy Called Gerald, Unique 3, Phuture, 808 State, Lenny D-Ice, Leo Anibaldi, Epitome Of Hype and many more. I did not have much of a personal link with most

of the above, [as] I first heard about them by performing with a few of them in the following years.

I also had […] work experience with Plastic Jam. On my first day at work Bug Kann and the Plastic Jam were recording Made in Two Minutes! That tune was huge (it went top twenty) and I scratched along side them at some early events.

Myself and Dev also recorded our first track in a pro-studio with Plastic Jam early in 1991. Although it was almost signed to a large underground label, we had a manager at the time and unfortunately that got in the way.

The music industry was totally different then. Producers and DJs tended to know a small amount similar artists within their circle. Unlike now, where the Internet has made everyone so accessible. I believe this to be a double-edged sword. It is great that everyone can get in touch with each other more directly and that studio secrets are shared, but on the other hand, I believe its the reason that there was more variation in production styles back then, which is part of the reason why labels tended to have more of an individual unique sound. I first met Dev as I was seeing his sister. One day I went to meet her and she said her brother wanted to meet me by the lake! I walked down there and there was this guy with a big hightop and Nike Jordans. At first we did not really get on. I use to go round to see his sister and he would have his bedroom door shut and I'd hear him rapping over hip hop beats.

One day he called me and said that he had heard one of my mixtapes and wanted to come round. He came round for a jam and we just clicked. Soon after I met Leke (who now runs Aerosoul) and we formed the group Mixrace (called so because of our varies origins). We were originally a hip hop crew. I wrote the beats and performed the cuts, Dev (known as the Brown Assassin) and Leke wrote the lyrics and rapped.

I was writing beats using MED on the Amiga and I taught Dev to do the same (he still has my Amiga haha). We wrote hip hop but were heavily influenced by the British crews like Gunshot, Hijack, Monsoon 2, Hardnoise and Demon Boyz. So gradually our hip hop tracks started to get faster and more hype!

When Dev and I went in to record with Plastic Jam, we pushed the BPM up to 140 (very fast for those days). That was kind of the birth of us making hardcore/rave as it was known then.

The demo tape we sent off to Rob Playford had the Plastic Jam track plus 3 or 4 other hip hop tracks and a couple of instrumentals. The Future Is Before Your Eyes was on the tape and was originally 180bpm with Too Bad for Ya at 188 BPM! Rob wanted to sign them and we had a debate about the speeds. Hardcore was around 130 at the time so the speeds (although the future was before your eyes ;)) were a bit too mad! We agreed that [The Future Is Before Your Eyes] would be 160 and 2 Bad for Ya [would be] 180.

Q: When you were working on the MED did you use any additional gear? I read somewhere that at some point, you guys started to use Rob's studio. What kind of gear was he using? Did that change the why in which you created music? Along those lines, do you think technological development has affected your music over the years? What about in relation to production techniques?

We started off using MED and didn't have the sampler for the Amiga (called Techno Sound Turbo). So we had to borrow samples and were forced to get very creative with the limitations we had (few samples and very little sample memory). After a while, I bought the sampler (£30 or £40 if I remember right). It was 8 bit and due to the sample time we had to sample albums on 45 [RPM] and then slow them down. The sample time was such a big issue but its limitations were what I believe created the need to chop up breaks in those early days. If you had a vocal sample then you would make the most out of it but using bits reversed for example.

In 89 I started working at Plastic Jams' studio (when I was 16). It was an amazing studio with a reel to reel [tape recorder], a 64-track [mixing] desk, plenty of synths and outboard [gear]. I learned a hell of a lot whilst working there. I also sampled a hell of a lot, and brought 8-bit samples home from the 16-bit gear! It was so exciting to have piano, strings, and bass sounds from the M1, Juno and other synths even if they did sound crusty (in fact that was part of the charm ;)).

At a later date (around 93) I bought a Yamaha SY85. We then had 16-bit samples and more sampling time. This was shortly followed by an Akai S01 sampler. From this point the studio grew quite quickly. From 91–93 Dev and I also recorded at Moving Shadow. It was a small front bedroom in Rob's house in Stevenage. I use to drive my mum to work so I would have the car and then myself Dev and a couple of mates would go to Shadow. As soon as my mum left the car we would blast the tunes and weed. ;)

Tuesday was always Mixrace day when we both went to record. Thursdays I went to record the Trax material. We always wrote the bones of the tunes at home and then tried to recreate them in the studio with Rob. As [his] studio had MUCH better equipment, we were […] reliant on Rob to engineer the tracks. Sometimes it was hard for Rob to program things that we had found quite easy to program on MED (due to its step time sequencer). The studio at Shadow consisted of an Atari running Cubase, NS10s, and some alternative monitors, a Korg M1, Juno 106, two other keyboards that I cant remember at this time, a Roland R8, various bits of outboard including Vintage Keys rack (I loved that!), various FX, and some TC Electronics bits.

I really think many people back in the days benefited from having less equipment and being forced to be as creative as possible with what they had. These limitations meant that producers would find ways around these limits and whilst experimenting and would often create things that they would have never thought of otherwise.

It also meant that when you did get your next bit of studio gear you really appreciated it and got to know it inside out. Sure it's nice to have a bigger studio these days (both software and hardware) but I think there is a lot to be said for having limits. I scaled down my studio for this reason and returned to a lot of the hardware that I neglected for a few years.

There is some amazing software out there (I am a big fan of the UAD stuff in particular) but personally I love combining the old with the new, the hardware with the software…

Q: What happened next (after 1993)? You were making tunes at home and at Rob's place. When did you stop working there?

As well as recording at Moving Shadow, Dev and I worked on many tunes at home. As the Moving Shadow roster [got larger] there were larger gaps between releases and so we begun working more at home. In the meantime I brought a Yamaha SY85 and an Akai S01 sampler meaning that we now had 16-bit sample quality (although time was limited) and some lovely quality synth sounds. We got more into creating our own pads and bass sounds. :)

In 1994 myself, Dev and two friends started Stronghold and Mobhanded Records and released over a dozen 12"s between us on those labels. Soon afterwards we set up Offset Records and Nautilus (mainly to release my downbeat output). I continued to release under DJ Trax and Parallel Worlds. Myself and Dev recorded under Brown and Dangerman and Broken Silence. Dev also released his first Paradox and Alaska 12"s.

Q: What was your working relationship with Dev and Leke at this point? When did you meet Nucleus? Were there others that you were working with around then?

My working relationship with Dev was great at this point as we had four labels to regularly release on and began working with other labels and producers. We released two 12"s with Hyper On Experience (under Pro Ton Isospace). One was on Stronghold and one on Timeless. They are two of my favorite 12"s and were recorded in two amazing weekends in a shed at the bottom of Alex's (half on Hyper On/EZ Rollers) garden. :)

I have never written a tune with Leke. He was an original member of Mixrace but that was in our pre-recording days. Both Dev and Leke were the rappers and I was the scratch DJ.

I met Dave Nucleus when I was about 12. We were all from the same town. There was a really good hip hop scene when I was growing up and myself and Dave were both member of a B-Boy crew called The Electro Breakers. :) We went from

place to place battling other crews. :) Myself and Dave also played at a lot of the same hip hop jams in the mid to late 80's.

Q: Were dubplates a big deal for you guys? Did you have a meeting place where you would hang out and share new records (e.g., BM Soho, Music House)?

Dubplates—nope never used them. I played out and used a portable DAT along with turntables a few times. :) So we didn't hang out at Music House or anything, but more in record shops. I used to go and see Danny Donnelly and Winston (Runtings) at Boogie Times a lot. I also shopped a lot in Black Market where people like Ray Keith would often be in the shop. Unity was another great shop. Nookie worked in there. As there was no internet back in those days (as we know it anyway) record shops, clubs, record companies and [distribution companies] were great places to chat to other artists and DJs.

Q: What influences were you pulling into the music in this era? What big club nights were the focus in 1993?

No influences were pulling me in as such in 1993 as I was well and truly sucked in by that point. Every weekend we went raving from nights like Pirate Club, Elevation and Desire at the Roller Express to AWOL and lots of one off events like Dance 93 in Brighton, Orange, Pressure, Equinox, World Dance at Lydd airport and many more. Soon after we started going to Blue Note and Speed, every Thursday and Sunday religiously! We would often stop at Turnmills on the way home to give out TPs and DATs to DJs.

Also the first things I went too were Sunrise (a legendary 89 rave), Total Confusion, Rage (Fabio and Groovrider's legendary event), World Party (I scratched for Bug Kann and the Plastic Jam at world party alongside, Prodigy, Altern8, Qudrophenia and more). Vision was a HUGE 100,000 people event I went to in 1992! I was involved I a car pile up approaching the event! Other events I attended were Biology, Fantasia, Milwaukee's (in Basildon), Dreamscape. At a later date along

with Speed at the Mars Bar, Metalheadz at Blue Note, we also regularly went to Innovation at the Lazer Drome in Peckam. And of course Logical Progression at Ministry (from around 94).

One of the first hardcore things myself and Nucleus played at (we had played at a lot of hip hop events previous) was at Mico Music studios in Roydon (5 mins from my home town). It was in the studios where I use to work. On the weekends (in 89) they ran a series of illegal acid house parties. Myself and Nucleus played amongst others. We didn't have that much breaky stuff at that tempo so we often mixed in instrumental hip hop on 45 [RPM]. The studios were a series of rehearsal rooms. A couple with DJs [played] in them, and the smaller ones [had] Acid casualties all over the floor. At 16 years old, it was an eye opener for sure!

I also use to play on various pirate stations in Cambridge and played on others in London including Touchdown FM.

Q: What was the process of starting a label? How did you guys go about it?

Starting a label was quite straightforward for myself and Dev as we ran the promotional and creative side of it and the other two guys put the money in and ran the administrative side.

Q: How do you select [breakbeats]?

That totally depends on how I start writing the track. If I begin with the drums then it is usually because I have found a break that I cant wait to use! If I have started by writing the pads or laying down some samples then it's a different process.

Whilst writing the basis for the track, I would usually start imagining the drum pattern. As I imagine the pattern I can hear the drum sounds that would work with that pattern and with the basis of the track.

I will then start to go through breaks from my library (usually already sampled and put into many folders) over the track to see which fits. I often have a few different options and will program a few alternatives. Some get used and others never see the light…

Q: Are they most often from sourced from vinyl? Do you prefer certain breakbeats over others? why? How many do you have in your collection?

They have more often than not been sampled from records or CDs I have bought. I have mass sampling sessions and have been building up my library over the years. I have literally thousands of breaks.

There are obvious breaks that most producers return to—Amen, Think, Hot Pants, Cold Sweat, Apache, etc.—they are so versatile and distinct. The crowds also really react to those breaks. Even if they don't know the names as such or even understand that they 'know' them, the fact that they are familiar with them gives them a nostalgic quality.

Q: Please rate on a scale of 1:7 (7 being the most often) the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reversing
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

• pitch modification 3
• distortion 2
• resequencing 7
• reversing 2

• multibreak layering 6
• multibreak alternating 6
• timestretching or start point manipulation 3
• filtering 3
• flanging 1
• reverbed 7
• EQ'd 7
• compressed 7

I have been through many different methods of chopping break up over the years. I went from chopping up visually in MED (on the Amiga) to chopping by ear on Akais and the Yamaha A3000 to using Recycle, which I use to love but have grown to dislike. These days I chop up my breaks in my DAW (Reaper). Its a bit of a longer process but I feel the quality is better than rex2 and I can quickly make more adjustments or change the start/end points as I work.

[Additional comments:]

A good friend of mine was another scratch DJ from the same town DJ Raw. He got asked to play at an acid house event and that's where he met Bizzy B. He brought me up to meet Bizzy and Blakeski. We played Bizzy some tunes we had been working on. One I remember was called "Yes." We discovered that if you slowed a sample down to half speed it would fit of the normal speed sample (but other double the bars). Likewise if you doubled the speed that also worked. I remember the night we discovered this (in 1990/91) it really felt like a eureka moment. Although we used the same trick on our EP released on Brain, Kaotic Chemistry beat us to the release!

We recorded two tracks in Bizzy's basement studio. He had a crazy pitbull called Rizla! That dog scared the sh#t out of us. I remember working and every now and then seeing that it had crept down to the basement and was staring at us! (the weed didn't help!)

The RawTrax 12" was my first release. By the time it had been released, myself and Dev had already been in talks with Optimism and Suburban Base. We were

being managed by the guy who managed Bug Kann and the Plastic Jam. The group were friends who were also from the same town…BKTPJ went on to have chart success with Made in Two Minutes and headlined many of the early raves along with groups like Prodigy, Quadraphenia, Adamski, Bizzare Inc, and NJoy. Myself and Nucleus both scratched for them at a few events, which were our first experiences playing at very large events. Myself and Neil (DJ Raw) also recorded some tracks with Mark Rider at Strictly Underground that were never released and probably exist on a DAT somewhere…

Also myself and Raw used the same technique Bizzy used of using two Amigas so that we could use 8 tracks (early OctoMED was limited to four tracks). There was no way to sync the computers so you just had to bang the space bars at the same time!

C.7 Fieber, C. (Fracture)

Q: Tell me about the music scenes you were involved in before Jungle and Drum & Bass. How did you find yourself involved in Jungle and then Drum & Bass?

I got into Jungle and Drum & Bass in the same way most men from my generation and area did. I grew up in East London in the late 80s/early 90s. I was about 12 years old in 1992 and had some older friends that listened to pirate radio stations such as Pulse FM, Chillin' FM and Rush FM. I had some even older friends that were actually going to the raves and buying records and stuff. When you're that age, guys that are a few years older are the coolest thing you can think of, so you follow their trends.

Not only was I getting into Jungle and Drum & Bass, but I was also getting into playing and recording guitar. My father is a guitarist and music enthusiast so that was another logical progression. When I was about 15, in about 1995, I began looping up parts from people's tracks on my Mum's computer on a basic audio editing software called Sound Recorder. I then got one called Goldwave and went absolutely nuts. It had reverb and shit on it.

I had a friend who had a bedroom studio and did a few tracks there. I was already so immersed in the music and musicianship that I didn't even consider getting my own stuff—it was automatic. In 1997, I met Nelson and he shared a similar background and love for the music so we went in on some gear and the rest is history. We spent a year perfecting and then sent some music out. A producer called Danny Breaks picked up on one of the tracks and signed it to his label, Droppin' Science. We pinched ourselves and then wrote a b-side.

Q: Did any of these older friends of yours also get into production or DJing?

No, none of them went on to have careers in production or DJing.

Q: Do you remember the name of your friend (w/the bedroom studio) or the style of music he was making? Did he influence your style in any way or did you already have an idea of what you wanted to create? Who were your main influences when you started producing?

Yes, his name is Nick Lynch. He was making experimental Jungle. He played keys so it was very musical. I think everyone that you work with influences your creativity and style. He had an E-mu sampler which I went on to buy, so I guess he influenced me that way. At that time, I was listening to loads and had started raving. I was listening to all sorts. From jump up to laid back stuff. I loved it all. I'd say my main influences when I started producing properly were guys that were using breaks and saturated bass sounds: The Bristol crew—Die, Krust, Roni Size—and Metalheadz artists. But as I said, I was totally immersed; there wasn't much that didn't influence me.

I should also mention Matt Qualifide. We went to secondary school together. He had a similar bedroom set up and started putting out his own records in about 98.

Q: How did you meet Nelson? What gear did you purchase, and how did you decide on it?

Nelson and I met at 6th from college. We started hanging out because my other friend, Daniel, told him I had decks at home. After a while we bought an G3 and an E-mu esi4000. Then we bought a Mackie desk and some outboard stuff. It was just what you had back then. Sampler, desk, effects rack. Pretty simple decisions really.

Q: Did synthesizers factor into your music making? or not until later?

Synthesizers yes indeed. That's jogged my memory a little. Right back at the beginning I used to use an early virtual synth on my Mum's computer called Vaz Emulator. It had a couple of oscillators, filter and step sequencer. You could export to WAV. I remember then a massive break through when I found some WAVs of jungle breaks online and worked out the maths to control the bpm by pitching them.

Then I could layer the breaks and Vaz Emulator exports seamlessly. Very crude, with a single undo available. But in fact I worked fast and the ideas I had were still some of the best I've ever had. I remember the computer used to crash after I made about 90 seconds worth.

Q: What sequencer were you using with the G3?

First of all we used an early Cubase VST but we just used it for MIDI. Later we changed to Logic 4.7 after I used it elsewhere and the audio capabilities blew my mind.

Q: What would you describe as your breakthrough track? Is it the Deadlands/Discharge release? How did you make it? That is, where did you get the ideas from, sounds sourced, etc.? What type of sample manipulations did you use?

I guess our breakthrough track was Discharge as that got picked up first. It was on a CD of 5 tracks that we first sent out. Also on that CD I believe was The Ice Planet and Normality Complex. These later got reworked and given better mixdowns. But Discharge remained the same, I guess we just caught a good vibe on that one. All our early stuff contained samples from vinyl and then some stuff from CD. We were into mixing Philip Glass samples with Steve Miller samples over breakbeats. In terms of manipulation, there were some decent synthesis capabilities in the Emu esi4000, nothing like the e6400, which we later upgraded to, but enough to take a string sample from a classical record and layer and filter it so it became a pad.

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? why? How many do you have in your collection?

Having got into the music, and Hip Hop for that matter, in its early form, breakbeats have always been an interest of mine. They formed the character of many early tracks

which then went on to be the blueprint for years to come. I love how individual they are. Some are chilled, some have raw energy. Some sound silly, some serious. I would always choose a breakbeat for its character, or because no one else had used it. I got heavily in to digging for that reason. I've built up a massive library by now. Lots on vinyl and lots digitally, I've no idea how many.

Q: Please rate on a scale of 1:7 (7 being the highest) the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reverse reordering
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

Resequencing, Pitch Mod, Distortion = 7
Filtering, Reverb = 6
Multi break layering = 5
Reversing = 4
Alternating = 3
Time stretching = 2

Q: When you perform these manipulations, would you say you try to preserve an ordering that emphasizes the beats? the downbeats? (for example, do you keep the ordering somewhat similar to the original break around the downbeats?)

I always play with rhythms. Sometimes I'll [have] pre-conceived ideas about how to totally flip a break and have the emphasis on different beats of the bar. That's not just breaks, but melodic loops too. New grooves and melodies appear when moving the emphasis of any loop. Saying that, I mostly just jam and do what ever feels good.

Q: Please (if you would) list your favorite 10 breakbeats, and at least 1 Hardcore, Jungle, or Drum & Bass track that has used them.

If we're talking about jungle breaks there are the obvious ones: amen, think, apache. Those are all faves but they turn up in every list. So…

1. Latee - This Cut's Got Flavour. A second gen[eration] break. Sounds like it's got a Think break in there somewhere. Used in phantom force by digital and spirit to excellent effect.

2. Jimmy Hammond Smith - Soul Talk '70. I searched for this break for years. I first heard it in Acen's Trip II The Moon pt. 2 and loved it straight away. A very cheeky groove. DJ Die also killed this one in Footsteps.

3. The Vibrettes - Humpty Dump. The original track is a fave of mine, a real party track. The break was most famously used in Ray Keith's remix of Moby's Something I Feel, which was dubbed 'yes yes' so the break was known as the 'yes yes' break.

4. Run DMC - Run's House. This is James Brown's Funky Drummer break with added hats, an 808 boom and massive snare explosion. Its sounds amazing pitched up as Blame found out in Music Takes You on Moving Shadow.

5. Orange Krush - Action. [A] fat disco break. Huge snare and kick, which sound like they're backed up with a drum machine. Whether they are or not, I don't know, but they sound huge. Used to devastating effect by Optical in To Shape The Future VIP.

5. Lou Donaldson - Ode To Billy Joe. Very crusty and snappy. Very usable too, cuts up really nice and has some lovely snare rolls. It was used a lot, but most famously in Adam F's Metropolis.

6. Blowfly - Sesame St. Most famously known for being used in Deep Blue's Helicopter tune. This was a huge tune for me. Its one of those breaks that sounds amazing pitched up because it has nuances from the recording, like a little background vocal, that become very apparent and characterful.

7. James Brown - Cold Sweat. If anything other than the vocal sample can take the credit for being the hook in Sub Nation's - Scottie, then it's this break. So much so that this break is commonly known as the Scottie break. Another break that really comes to life when pitched up.

8. Eddie Bo & Inez Cheatham - Lover & A Friend. Very crusty and metallic sounding. Used by Origin Unknown's remix of 'Johnny'. Anyone reading should dig out the original Eddie Bo & Inez Cheatham track, it's a killer.

9. Kid 'n Play - Do This My Way. Another Think break version. Has some added percussion that really makes it swing. It was a real catchy element to an early favourite of mine, Sweet Vibrations by DMS & The Boneman X

10. Kool & The Gang - NT. Another genre defining break when speaking about jungle/drum and bass. At normal pitch it sounds like a funk break. Pitched up it becomes something else entirely. It becomes Jungle. Doc Scott murdered this on Drumz 95.

Q: Has your studio undergone many changes since the original setup you mentioned with the e6400? Has technology changed how you approach sample editing/modification and/or track creation?

Technology has changed how I use samples but not necessarily track creation. Essentially I'm just doing the same stuff, it's just become a little less labour intensive with programs such as Ableton. I guess in a way you are more free to experiment because you don't have to invest a day into just getting a break or sample on to a key group in a hardware sampler any more. But at the same time that limitation meant that you had to be more concise and simple with your ideas.

C.8 Hansen, W. (Escher)

Q: Please tell me about the music scenes you were involved in before Jungle and Drum & Bass. How did you find yourself involved in the genres?

Before drum and bass I was into hardcore. This was when I was at school. Just getting tapes, Slipmatt and Dougal come to mind. There was a big trend for the rave scene, all the tape packs, bomber jackets, record bags (with no records haha). It was trendy, there were lots of record shops in Brighton town selling mix tapes (cassettes), Buzz Bass I think one was called. They had a big rack of them all with photocopied sleeves, with graff pictures of ravers smoking spliffs on the front.

Moving into drum and bass was a natural progression from enjoying that sampled repetitive sound, although it took me a while as I was always more into the uplifting vibes from hardcore and thought jungle/early drum and bass was too dark, minus a few of the classics. In fact I remember having a recording on vhs of Goldie, I think it was because I was into graffiti at the time, and there as a shot of him playing Pulp Fiction on some turntables in some flat looking out of the window. I remember loving that, having to repeatedly rewind the vhs to keep playing it because I didn't know what it was.

Before that I was mainly into rock and grunge I think, Led Zeppelin, Nirvana, Therapy, [and] Pearl Jam. I used to skate at the time, so a lot of music I found off skating videos. 'Plan B' video, early 411 [videos] mainly a mixture of rock hip hop and some folky classics.

Q: When was this (into hardcore)? How old were you? Did you have friends that were into Hardcore as well? Were you or your friends DJs or producers then?

This was at school, so I must have been about 14/15, I think. Maybe around 93-95. [A] few of my friends liked hardcore, we used to swap tapes. No one was a DJ or producer at that point but I got some decks a bit later on, maybe after a year or two.

Remember buying a load of old hardcore records off a friend I met around 96 who just got into dnb, cant remember what they were now, some Hectic Records is all I remember. I was a little behind. So I suppose listening to the tunes he was buying at the time got me into drum and bass too. Early no smoking records, I remember Funkula being one. Innercity Life 12" Dom and Roland 'Quiet Before The Storm' maybe.

He used to go to under 18 raves up in Milton Keynes. Probably why he was getting into jungle/dnb, because he could actually hear the bass in tunes, where as I was listening to it all on dodgy headphones and hi-fi's. The bass didn't exist on those setups.

Q: Did any of your friends from this era get into DJing or production? When did you start getting into raves? When did you start producing? What were you using? Did you learn from anyone?

A few of my friends got into DJing after I did, we used to spend a lot of time mixing round each others houses. I don't think anyone got into production at that point.

I went to a college near me called 'Northbrook College' straight after school and did a National Diploma course in music technology where I got my first look into production. Using Cubase very basic version. At around the same time I got a copy of Cubase for my very shit PC, midi keyboard and a E-mu 4000 sampler which I used to make some very basic tunes/loops, but it was frustrating having no outboard fx or eq, it was literally just going into an amp as I remember, but with that and college I learnt how it all worked, basically.

I used that setup while I was at college, which was two years and then sold it all around the time I finished, I didn't have the patience at the time, and it was frustrating not having options—fx, channels eq etc. So that must have been when I was about 16–18ish I think. So that stopped my production efforts for a while.

I think I was more into the ding side of things at that point and manage to get some gigs in Brighton and a residency at a club night in Sheffield (200 miles from where I live) called Coalition, through a friend, so was going up there to play every month or two, which was great for me. Other residents there were TC1, who now

runs dispatch recordings, and two guys called M.I.6, one of which went on to be MRK1 from the garage/dubstep scene.

Before that, while I was at college was when I started going out to parties. I remember going to a 'Essential Festival' first, I must have been 15 (1996), in a park near Brighton, I went into see Kemistry and Storm, but I didn't get it, it was too dark for me at the time, I just remember it being boring (very much doubt I would have said that now haha).

Then shortly after that I started going to some dnb nights in Brighton, the first time I remember was seeing hype and Peshay at a club called The Concorde at a night called 'Legends of the Dark Black'. I remember them playing warhead and brand new funk, must have been 97. I must have enjoyed that and then started trying to go to various dnb nights around Brighton.

Q: What happened next then that got you back into production? When you did get back, what did you use? Did you work with anyone?

After that I didn't do any production for years. Lots of DJing though. I was just doing dead end jobs and getting fed up so I decided to move to London in 2003 and do a degree in music tech at Thames Valley University. This lead to me buying a Macbook and copy of Logic at the start of the final year of the course 2006.

At this point, I was more patient and inspired with all the stuff I had been learning and started to get some ideas going. I was making tracks with some people from college, but mostly doing it alone. [To be honest] nothing was finished for ages, just getting loops going, I never bother finishing things if I am not fully into them at the time. I think 'Subtleties' and another track called 'Snap Dub' were the first tracks I did properly. Then a couple more 'Boomka Boomka' and 'Hi-Tek' Must have been about year after getting the computer. [Ben Scope] from subvert central hit me up after hearing my myspace and asked if I wanted to give him 'Boomka Boomka' and 'Hi-Tek' for their net label.

After I finished the course I came back to Brighton. I made a few tunes, Slice, Austere, Little Terror and sent them out to people. Future Thinkin Records really liked them and wanted to do a few records, so I was hyped. I had also sent the tunes

to Jem1 who was doing a collab with Blocks at the time. Blocks heard them and we hook up on aim and shared some tracks. Both sharing similar tastes so did some collabs, which were 'Shadowplay' and 'Miller' first. This must have been 2007/8.

Q: So your production now is all software?

Now my productions are mainly software, I have an E-mu 64 and a Juno 106, a MOTU traveler soundcard and a small spirit folio desk and some Behringer truth monitors. I only really use the emu for putting my breaks into a smashing them with gain. Pretty limited use but it does wonders. And obviously use the Juno for lush pads and bass from time to time. But yes, mainly software. Blocks has a virus synth so you will hear that popping up a lot in our collabs.

Q: What would you say your breakthrough track is? Could you walk me through the creation of this track (e.g., motivation, sample sourcing, synths)?

I think the breakthrough track was Shadowplay, lots of people were hyped about that at the time and it got signed pretty quickly to Digital Soundboy, although didn't end up coming out until 2011, 3/4 years later.

I made the basic beat and percussion in logic and sent to blocks some wav loops, he added the intro pads and intro bass (Virus [synthesizer]), then we bounced ideas and started adding fills and structuring it out. I can't remember where the samples came from in the tune. There wasn't really any certain concept or anything, it was just our take on the darker Metalheadz sound that we both love.

Q: Regarding the e64, is this a final mix thing? or is this something you do before you use a software sampler? are you still using logic?

I make breaks in logic using the EXS then normally I will bounce them down as loops, the put theses loops into the emu and distort and maybe timestretch, then load back to the computer and save again, normally a few different versions with varying gain or stretching etc. It gives a crunch that I love and take off the clinical

edge slightly, not sure if similar effect is possible in software, but [to be honest] this works so well and is easy to do.

Q: So what is it about the Metalheadz sound that you like? What is it that you try to instill in your tracks that is from this era? Are there particular tracks that you see as influential in your sound?

Its the rudeness of the tunes, the b-boy flavour to them break-switching, nods to hardcore. That badboy sort of attitude, not overly aggressive (normally) but rude. Lots of contrast, Stuff […that] tells stories. That resonated with me so strongly, along with photek, prototype recordings, 31 records.

As for tunes, Doc Scott - Prototyped really made me think about tracks, I couldn't understand how it was so good but nothing was even going on. Rather than things coming in on the drop, everything disappears. Incredible. Also Photek['s] Still Life remix, that underground anthem feel to it, epic, not angry but still rude as fuck. Also Dillinja Threshold and silver blade, the bleakness of threshold, sort of tune you can lose yourself in, eyes closed, screw face, it gives me so much strength listening to that, its mad. A lot of the really bleak and reflective stuff is like that for me.

Q: Which breakbeats are used in Shadowplay? how are they manipulated from their original form?

I can't remember the break used in shadowplay, amen I thinks used, couple of classics for the fills. Main break is layered with claps. I am really bad at knowing names of beats. [To be honest] I normally try not to use breaks just as they are in most of my tunes, I always preferred to build my own breaks up out of a few different ones and then use that as a sample. This helps because you can spend time doing that then process (emu) and save, then when you come to use it again you can whack it straight in, in audio, cut up as you wish, quick as fuck and get the tune moving. This helps the ideas flow better but also give you that new school character in the weight of the beats.

Q: It seems that you've found a good middle ground between hardware and software. Are there pros/cons for each?

I was concerned how production technique overtook ideas and arrangements in newer dnb and the music really suffered because of that, and I was thinking a lot about how to get the quick ideas going when you are also trying deal with lots of time consuming layering and eqing, so this resampling method keeps the focus on the ideas for me, and also get some mad new ideas when the beat has been reused and processed a few times. Its like doing a big painting and then just cutting into it, 3d. Layers. Also the limitation of not having all the separate parts on different channels also creates some interesting ideas, much like it did when people where use stereo WAVs of funk breaks.

Software is convenient, but it lacks something for me. I don't like really shiny pumping tunes, so its all down to taste, but putting things through real wires, distorting things through hardware just gives a certain character, a certain dullness or grit. I remember hearing stories of Goldie resampling breaks again and again to get them as crusty as possible. That was the style, like digital punk. Now everyone is trying to sound as pop/RNB as possible, trends lol.

But I could never get the precise breaks done just in the emu, so software is essential for a certain tightness I think, you just have to colour the sound afterwards to get rid of the shine and add some grit.

I suppose the tools create the trends, whatever is easy to do becomes the current style, like everyone is on computers with ridiculous soundcards and studio monitors now so everything is shiny and 'perfect'. Where as Photek, Optical and Dillinja sound just came from fucking around with Mackie desks and emus (that crunch) and Jonny L's from some sort of groovebox?? Its funny how I try and recreate that 90s sound, not sure why, don't think I am alone though. I seem to remember a lot of producers sounds go to shit instantly when they swapped to computers.

Q: Can you explain a bit more what you mean when you say you make breaks in logic?

When I say make breaks I mean layering. A lot of the time I will hear a break with great snares and just snip them out, use another kick with them, maybe layer some synthetic layers over for weight (without ruining the original texture too much!) use separate hats, envelope them to shuffles, just lots of layers, maybe some big reverb layers/percussion on top to give some character.

Really its just trying to get a balance between organic and synthetic, to add some new style weight to the old textures, so it doesn't just sound like another James Brown break looped.

I don't record my own sounds, [I] just use samples and sometimes synthesised drums.

I do this all in EXS sampler, which give me quick control over pitch, envelopes, modulation and filtering.

Then things are bounced as a wav, put in emu and reused as an audio file.

Q: How do you select breakbeats? Do you prefer certain breakbeats over others? why? Roughly how many do you have in your collection?

Selecting breakbeats is normally down to textures and not so much patterns as everything's resequenced, not always but mostly. Like I said above hear a interesting snare and go with that. It's the drums that sound like they have character, which I like. I have always loved the rimshot style of breaks, tight little hits. They give you lots of space, and also lots of room for contrasting with big bashy fills. Little bursts of energy always seem to work better than constant. Although there is a time and place for everything.

Q: Please rate on a scale of 1:7 (7 being the most often) the amount to which you use the following on breakbeats (if you can, please use the entire scale):

- **pitch modification**
- **distortion**
- **resequencing**

• reverse reordering

• multibreak layering

• multibreak alternating

• timestretching or start point manipulation

• filtering

• flanging

• reverbed

• other:_____

• pitch modification 6

• distortion 7 (overdrive)

• resequencing 6

• reversing 4

• multibreak layering 5

• multibreak alternating 4

• timestretching or start point manipulation 3

• filtering 4

• flanging 2

• reverbed 7

• other: Envelopes (tightening) 6

• other: Filter envelopes are something that I do quite often too. 5

Q: What are your [favorite] breakbeats? Can you list them and name a track that has used it?

• 'The Worm' is a favourite break, used in lots of Photek and ed rush optical.

• Sesame Street beat - Helicopter Tune

• the beat used in the intro of Dilinja's Silver Blade (can't remember the name of it)[—the] light pingy beat

• Model 500 beat, no sure of exact name (Doc Scott - Shadowboxing beat)

• Funky Mule - Ike Turner (Inner City Life, I think?)

• Lightnin Rod - Sport break

• the break used in [Digital's]Gateman??
• Lyn Collins - Think

So many [to be honest], these just came to my head now.

Q: Regarding the breakbeats you use, do you attempt to preserve an ordering that's related to the original breakbeat order? Do you attempt to preserve the feeling of the original around the downbeats?

I don't consciously try and preserve the order of the break, just use them however works, I'm open to trying whatever patterns, although saying that a lot of time things don't need to be changed.

Q: What do you think makes a breakbeat easier or harder to use? Does this play into why you choose them? Is this related to the patterning? timbre?

I think tighter breaks are easier to use. When you have lots of crashy cymbals and big hits they get harder to chop and EQ. One break that I have never been able to use properly (even though it not bashy at all) is apache, I really like that beat but it always sound shit when use it.

Its much harder to get a balanced sound using big bashy breaks, which is might have something to do with current trends of beats in dnb.

Clinical synthetic beats, Kick only tunes etc., because it's easier to do these beats with the current equipment, than more dusty sounding ones (done well).

Q: Can you tell me about your sequencing procedure? Do you have a lot of sections? How do they differ?

Well most tune start from a loop so once a decent loops going you can build on it, its nice to have switch sections, but [to be honest] it varies so much from tune to tune.

[To be honest] most of the time I spend on my tunes is on the sequencing, from the details in the rhythms to the overall arrangement. I really try and avoid

boring sequences, like most of my tune[s] don't have intro [leading into] breakdowns and most of them try and develop into something later on. Not always though, haha.

The thing we always tried to do was to make music that can be listened to from start to finish.

I think peoples attention spans seem shorter now (might be a wild claim?), people are involved with music in a different way, not many people listen to LPs they are on YouTube instead picking all the best bits. I am not sure people listen to mixes all that much in reality, probably just skip through them to hear the fresh tunes. So making tunes for mixing with long intro and outros seems a little redundant, not to mention the people that do mix now normally use newer tools which allow faster mixing techniques/mashups (I am still not one of them hah).

Most people out now are more than happy to hear all different styles of electronic music in clubs and mixing seems like less of an issue to most, so you sort of want things to work when played in full. But I suppose that way of thinking could be taken even further and you could say you only need a good 32 bar loop because people will want to hear the next tune by then anyway hah.

The sequence I am most proud of is Sagan, [it] is a real mission, and not the sort of tune you can get into on first listen. It's layered so you notice/and imagine the things which will come later and resolves in a really satisfying way (to me anyway) at the end. It feels like a sci-fi story.

Q: Maybe you could tell me more about how you made [Sagan] (sonic elements, sources) and what parts are layered?

I spend a lot of time making beats and bouncing them like I mentioned before. Sagan came together after I found the main sample in the […] soundtrack. [I] got a load of the breaks I had made and started building them over the sample. I then sent to Blocks and just said go mad, do whatever. He made a load of random synth sounds on the [Access] Virus and sent them back and I roughly sequenced them in. Building up into the middle section with [it] is sort of the main part where all the sounds/breaks come together. After that I stripped the first part of the track down

so you get tastes of all the sounds but not the whole parts. To give more impact to the main part when it comes in and also to remove any obvious bits.

I didn't want it to just end on the madness and thought it should have some release. A third part. So we stripped back the last part with some strings and twisted up vocals and went minimal. A resolution to the madness going on before hand. This balanced the track for me, gave it another dimension. It felt like it was in three parts then. A story.

The sequencing took forever with this tune [to be honest], I was doing it for weeks, militantly, and every time I changed something everything else had to be changed. Do you get that? One edit fucks up the rest so you have to redo loads, haha. There are samples from [a hip hop artist and sci-fi films] cant remember the exact tune the vocals were from, some harsh pop tune though, hah.

C.9 Heinze, M. (Martsman)

Q: Please tell me about the music scenes you were involved in before Hardcore, Jungle, and/or Drum & Bass. How did you find yourself involved in the genres?

I wasn't involved in any music scene before Drum & Bass. When I started to listen to it (around 98/99), most of the excitement of the early days (of any genre) already had gone and Drum & Bass was pretty much an institution already. Obviously, I had heard about Hardcore and Jungle and—once interested in the genre—crawled my way back through the 90s. However, it was early 2000s Techstep that attracted me the most and obviously had a major influence on me.

When I started writing music myself, which was around 2003, Drum & Bass already had split up into a variety of subgenres, one of which was called "Drumfunk". That was the one I was mostly associated with, when my first few releases came out. My first involvement with any scene was basically when I joined the Subvert Central board. There were lots of likeminded people—Paradox, Fanu, Fracture & Neptune, Breakage, Ben UFO, Macc, etc.—in one place who all shared the love for a rather abstract and drums oriented approach to Drum & Bass and/or music in general.

Q: When you started writing music, did you start with anyone else, or did anyone show you how to do it? What initial hardware or software did you start with? Were you DJing at the time?

I started writing music alone and basically have been writing on my own ever since with only a few exceptions throughout the years. Actually, I didn't make face-to-face contact with too many producers before moving to Berlin in 2006. There was no one in particular to teach me how to produce, but boards and various other sites on the net helped a lot in the early days. I started and still am writing music with a freeware tracker program called Buzz. There was no hardware at all involved in the beginning.

Now there are two very basic midi-controller units standing on the desk in front of me, which I use every now and then, but frankly, 90% is done with a laptop and a mouse.

I bought turntables and started practicing with them around 2003/2004 after finishing the first bunch of tunes; so, writing and production came before DJing for me.

Q: How did you find out about [Buzz]? What made you want to use [Buzz]?

Pretty simple—I was looking out for free music software and all-in-one-solutions and stumbled upon Buzz pretty quickly. I think what appealed to me was that it worked quite differently than other music software solutions I've been using before (vertical vs. horizontal, graphic vs. hex code). The raw look and feel made writing music appear a bit like writing software. I find that idea quite easy to identify with when it comes to electronic music. Also, even if it may sound strange, I found and still find the instability and bugginess of the software quite appealing—not being able to get rid of all the glitches makes you work around them, play with them etc.

Q: Do you use [Buzz] in conjunction with other software?

Hardly. Obviously, I use VSTs but I guess that doesn't count.

Q: Where were you before Berlin? You were in school, yes? What were you studying? Do you see a link behind your musical process and your scholastic endeavors?

I was studying Art and Media Theory at the Karlsruhe University for Arts and Design. They also had a sound department where I got in touch with artists who worked with tools like Max/MSP, SuperCollider etc. The Art Theory part of my studies hardly had an impact on my music I reckon. However, the whole surroundings of the University definitely had. It shares premises with one of the most influential institutions for Media Arts in Europe, the ZKM (Center for Art and

Media) and over the years there were uncountable events, exhibitions, performances etc. who inspired me deeply.

Q: What was your breakthrough tune? Could you walk us through how you constructed it (i.e., motivations, sample finding, sample prep, arrangement, and so forth)?

I don't know if there was one breakthrough tune, I'm not even sure I ever had a breakthrough. There were several tunes that attracted the attention of certain people at certain times. My remix of Hi-Lar's "Sunstate" track attracted the attention of Thomas Cycom, which ended up me releasing on and doing A&R for Plainaudio. "Ago" attracted the attention of Brett Offshore, ending up with me putting out my first ever record in 2005. "Worst Case Scenario" attracted the attention of Hospital Records, "Reclaim Your Resonance" that of Goldie (who eventually didn't put it out) and so on.

As for motivations, sample-finding, etc., even if there's (hopefully enough) variation in my music, there are certain patterns I follow. I hardly use common breakbeats but prefer one-shot samples I often bring together from various drum machine sample packs. Most of the sample preparation is done on the fly and I hardly save sounds and samples for later use. I prefer Buzz-native machines for bassline synthesis over VSTi [plugins]. As far as motivation is concerned: There's a poster on the wall in front of me saying "A copy is never as good as the original", reminding me not to plagiarize. This poster has been on walls in front of me since 2005.

Q: So what would you say you learned from your experiences at ZKM that you were able to apply directly in your music? Can you think of any specific influences or moments where you said to yourself, I need to bring this feature, "X", into my production?

The majority of artists and students I've attended concerts of or worked with at that time seemed to concentrate on the technical and theoretical side of things.

Most of the time the results were something the majority of people wouldn't easily consider listenable music. I guess I developed an obsession with software-transformed sound in general—glitches, digital feedback loops, the high frequency spectrum, micro rhythms and micro melodies that suddenly came out of mere noise by just tweaking a few knobs here and there, and try to integrate them into a somewhat more dance music like vocabulary.

There were countless moments of inspiration at that time. I used to write and scribble down a lot of ideas and specific sound phenomena I found interesting in a small sketchbook. I usually failed at making sense of what all that cryptic stuff on all these pages was about weeks later, but everything I wrote down made it somehow into a track at least.

Q: Somewhat related, I have a question about […] "track economy". Basically, each sound in a production has a particular temporal and frequency space, and during the playback of each sound, other sounds are prevented from being as present as these due to the limited space that is available within the dynamic bandwidth and length of a measure (or 2)…thus each producer's sound is defined by their conception of track economy, or their usage of sound objects in the time/frequency planes. It seems you are very aware of the track economy within your productions. Could you reflect upon the process behind the development of these techniques?

That's probably right. At some point in time I was obsessed with literally filling every gap between single elements in my productions, a little high hat-figure here, a bunch of bleeps here until there wasn't room left for anything else and everything sort of corresponded with each other. I found that even when you stick to a certain two-step pattern in Drum & Bass, there's so much more space between the main elements (kicks, snares) to fit in yet another little rhythmic something to tell a whole different story.

I see this all a bit different today and am currently more attracted to very simple and sparse rhythmic structures and repetition but a few years back, my take on track economy was basically: put-in-as-much-as-you-can.

Q: Which tracks are you referring to regarding the filling of gaps until there wasn't anything left?

One example is Trueschool Drumkit Wonder, released on Med School in 2008. Another one is Antique Antic, released on Offkey in 2009. I still see me searching for yet another rhythmic gap to close on these two. As I said, it was pretty obsessive.

Q: Can you walk me through Antifunk's creation and various elements? What production techniques did you employ on this one? What were you attempting to convey (or learn, etc.)? Samples?

The main idea I had in mind when writing Antifunk was to strip the drum break I used of all breakbeat funkiness and squeeze it into a quite un-funky, stiff and rigid pattern.

There's this high hat/ghost snare sample that is somewhat of the grounding of the whole rhythmic structure. On top of that all kick and snare drum samples are placed on only the even beats of each bar avoiding classic Drum & Bass drum patterns and more or less referencing to 4/4 music genres instead. Initially, I think I wanted to scatter all the kick and snare drum samples more or less randomly throughout the whole piece so that the listener would never know when one of them came next (but at least could expect them to be on the even beats). However, I gave up on this idea in favor of a more predictable pattern as you can hear. The percussive voice samples serve more or less as a rhythmic point of reference for the piece. The layered Photek break(s) are somewhat in between—both emphasizing the existing drum patterns and filling in on the gaps.

The triplet-based bassline is meant to be a rhythmic counterpart to the rigid drum pattern both because it doesn't emphasize even beats and the notes are somewhat lazily pitch-bending thus quite inaccurate compared to the drums.

Q: Throughout your career, what music inspires you both within the genres, and outside the genres?

Obviously, that changes over time. As for within the genres: I felt deeply inspired by various obscure Reinforced B-sides from the late 90s. I still love that rough take on Drum & Bass that labels like Fuze Recordings or Renegade Hardware shaped between 97 and 99. Obviously, the whole Drumfunk movement around 2003 was quite formative and I was excited about Dubstep and all its new and prosperous sub genres as well in 2005 and the following years. Right now, I'd say I am more "interested in" than "inspired by" music within the genres—that is in technical terms, say, a drum pattern I haven't thought of before or an intelligent way to deal with certain elements etc.

Outside of the bass music genres, there have been various other genres I've been following for a while: Drones, Harsh Noise, early Dub Techno, experimental Electronica (whatever that is exactly). Composers like Lucier or Cage have been important for me at some point in time. That changes a lot, though.

Q: So do you write out the variations you need first? Or is it all experimentation in the sequencer?

It's both really—with a tendency to the latter. I often take out elements of early stages of a tune when other elements introduced later on in the process make the earlier ones obsolete sound wise—trial and error to some extent. This way, a rhythmic loop can change thoroughly throughout writing a tune entirely covering up the initial idea I started with.

Q: Regarding breakbeats and funkiness, what makes a breakbeat funky to begin with?

Regarding funkiness—for me everything funky happens between the two main elements of a drumset, kick drum and snare. All kinds of more top-end-based percussive elements like high hats, shakers, etc. are quite handy to create a certain kind of "off-ness" that equals funkiness for me.

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? Why? How many do you have in your collection?

Generally, I lost interest in (sampling) breakbeats a long time ago, probably because I didn't 'feel' the competition of who could dig out yet another unused breakbeat and build yet another crazy drum track around it. What really began to interest me was rather how to use single one-shot samples from different sources and make them sound homogeneous.

Nonetheless, there were certain breaks that I used here and there. These are either really clean sounding (e.g., the Boymerang break) or quite the opposite—muddy, reverbed, compressed, noisy (e.g., the Gandalf break) and I used them mostly for layering. As for numbers—checking now, there are about 1GB of sampled breaks in my folder. However, I cannot say how many different breakbeats there are exactly. I never really bothered to organize them.

Q: Please rate on a scale of 1:7 (7 being the max) the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reversing
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

• pitch modification: 3
• distortion: 5
• resequencing: 4
• reversing: 2
• multibreak layering: 1
• multibreak alternating: 1
• timestretching or start point manipulation: 4
• filtering: 7
• flanging: 5
• reverbed: 6
• ring modulation: 3

Q: Could you explain what you mean by break digging, and the significance of rare breaks, and a drum track?

Break digging means you're actively trying to find and sample drum breaks that haven't been used in (electronic) music so far. Especially when writing Drumfunk there has always been a certain challenge to find and work with new and untouched breaks. There was only a certain extent to which you could use well known breaks (e.g., the Apache break) to sound different or still interesting to the break lovers ear, so there was the need to come up with 'new material'.

C.10 Kane, J. (Bay B Kane)

Q: Please tell me about the music scenes you were involved in before Hardcore, Jungle, and/or Drum & Bass. How did you find yourself involved in the genres?

Before I got into hardcore I was an mc & very much into hip hop. From around 1986 myself & my then DJ MrE were making tracks and would generally play at most local parties and stuff & were looking for a break to get some backing from a label so we could progress. We were basically chasing a dream even though we knew that to make anything happen as a UK based hip hop duo was nothing short of mission impossible!

But towards the end of 86 we got introduced to a fella named Des Parks who along with his partner & wife Bess Parks owned a small independent label called T.U.F (The Underground Family). This was the real starting point for me in a sense & although they only had limited finances they were very passionate about music in general & very supportive. Over the course of the following year we started to build up a small studio we were also in and out of professional studios gaining experience while recording our first single.

Through the label TUF we also got to work with a few respected artists well I say we but in fact as a duo we only got to work with Double Trouble but I got to work with Central Line who were a pretty well known jazz funk group from London & I also worked with Sylvia Tella who is a very well known Lovers Rock singer. But we also had our own contacts & a crew we knew from way back called us up and I went and jammed with them at the Basement club & as it turned out they had some beef with one of the members of their crew and had kicked him out and were looking for an mc who not only had proper bars but also had the balls to perform in front of a very large crowd…At this point I had no real idea just what they had lined up & this crew was from West London & I'm from East but true we had mutual respect amongst us but it was still pretty unheard of back then. To cut this story a little shorter I found out 3 days later that they would be one of the warm up acts at

the Brixton Academy for the biggest hip hop event of those times the mighty Public Enemy in concert!!! The one and only time they ever played live in London possibly the UK…Needless to say I smashed it!!! :) And so that was the highest point of the part of my musical career which began in hip hop.

At the end of 87 TUF released our 12" single which was called "Reality" with "Sucka" on the flipside and under the name of The Eastside Chapter. Sadly it sold around 300 copies which I thought was pretty good considering there was zero promotion as well as being a home grown hip hop tune. By the time we reached spring 88 we parted company with TUF as artists but remained friends. During the year that followed we tirelessly searched for a sound…a sound which we couldn't quite describe yet we knew what it was. Pressures of life were getting heavier for me as my girlfriend fell pregnant & so we had a baby on the way. But I had a dream and was not about to give that up and take some dead end job & end up dead inside by the time I reached 25! No way…So I would be out on road every night selling drugs to make money not only to put food on the table & pay the bills but also to get enough together to start our own label and press up our first release & do it all ourselves how we want it & turn it all around & make a real success. Most days like within a 24-hour period I would sleep maybe 3 to 4 hours other than that was constantly on the go by now though I was still into hip hop I was also heavily into the sound of Techno as we continued to search for that sound we knew we had to find and believed beyond any doubt that we would.

January 1989 got a call from Des Parks he told me he was DJing at the Palmtree club in Clapton East London and said he put us down on his guest list…So we went along and it was that night I heard a track called Depth Charge by Han Do Jin & it blew me away!!! It changed everything for me coz it was the closest thing I had ever heard to the sound that was in my head all this time. The very next day we got down to business & started to fuse Techno sounds & basslines with raw hip hop breaks and that's where Break The Limits was born.

During the next couple of months myself & MrE worked on our sound as often as we could and by now I had saved enough to provide my half of what we needed to get a 6 track EP mastered & 1,000 copies pressed…MrE made the ultimate sacrifice to provide his half of the necessary funds by selling his prized

possession his Technics SL-MK II decks in custom built flight cases…I must admit I did feel very bad about him having to do this & yet he did not hesitate & I remember thinking to myself whatever may happen in the future I will always respect this brother for making this sacrifice to hold up his end of the deal!

We were finally almost there…I thought to myself as we brought home 1,000 copies of Break The Limits Part 1 six track EP. We got a distribution deal & sold out of the first 1,000 copies in 3 days!!!! BTL Part1 went on to sell 7,500 copies all together over a period of 6 months.

I will try to fly past the next 2 years as it feels like I have taken too long over this first question…we continued to produce our brand of Breakbeat Techno, which was being categorised as Hardcore. By 91 we had a fully equipped studio & was busy banging out instantly recognised BTL style tracks we also had a few licensing deals for various compilations…one I remember in particular was also the same way that I first got to meet legendary DJ Micky Finn. The management company he was with who also managed Grooverider, Fabio, JJ Frost, Darren J to name a few were putting a compilation together and Mickey wanted one of our tracks from BTL Part III called "Running Scared" We later also licensed a few other tracks to Mickey for his "Getting Thin With The Finn" series of mixtapes.

Early 1992 we released a 3 Track EP called "Hard Times" It was at this time I first started to hear the term "Jungle Techno" as this was what some people in the music press were calling our track Hard Times…within 1 week of releasing the EP I had a call from Richard Russell who was head of A & R at XL-Recordings at the time & he invited us to meet up with him as he explained that they were interested in some tracks. I didn't think any more of it & just thought they wanted to license for yet another compilation. However as it turned out that wasn't quite the case & they wanted to sign us to XL. I'll cut to the chase here if I may…I wasn't happy about signing as BTL in fact I told them straight that would not be happening! After much moaning and groaning from XL management they agreed that we could sign under a new name. That name was Nu-Matic…we signed to XL with a £40,000 advance. They released the Hard Times EP and it sold around 38,000 copies and even appeared in the national top 100 at number 58 During this time we embarked on a

UK Tour doing live appearances all over the UK & played on the same bill as Prodigy, SL2 & Liquid as well as many others for around 3 months.

I became increasingly unhappy with the whole situation as XL were generally acting like they owned us. Things came to a head when we returned from tour & went to XL HQ in Wandsworth for a meeting with Tim Palmer and guess what? They wanted me to wait in the lobby while everyone else went in to the meeting & their explanation for such unbelievable disrespect towards me was that they felt I was too aggressive.

It soon became clear that they had been working on my long time partner in all things musical MrE and had twisted up his head!!! MrE said to me he no longer felt that it was working & that he was heading in a different direction musically…I said Enuff Bullshit brother!!!!

I took my share of the money and half the studio and signed myself out of the contract & told Tim Palmer that if he wanted any of his money back he should whistle for it!!!…That was the end of that chapter and the end of an era…Also sadly the end of Break The Limits…June 1992 was the start of the rest of my life in the music business & this time on my own & determined to carve a place for myself into the very fabric of time itself…Ruff Guidance Records & the artist now known as Bay B Kane was born!

Q: Do you remember what gear you were using during these times? Do you remember where any particular samples came from?

The first ever sampler I owned was an Akai but one of the very first they ever made and I cannot remember the model of it…was a black rack unit with a very basic LED display and 6 seconds of sampling memory!!!!

The first proper sampler I owned, meaning a sampler with a decent-ish amount of memory with stereo sampling & multi-timbral capabilities was a Casio FZ1 but the keyboard version and it was amazing for those days (1989)…it had 24 seconds of sampling memory! I also had a Mini Moog – Rogue, which incidentally was the reason for one of the track titles "Ryde The Rogue" on the BTL Part1 EP.

After the massive success of BTL Part1 we built a our first proper studio with the following hardware:

• SECK 24 Channel Pro mixing console
• Akai S950 Professional Sampler with 8 separate audio outputs
• Alesis Quadraverb FX unit
• Kurzweil K1 synthesizer
• Yamaha DX7 Mk II Synthesizer
• Roland Juno1 Synthesizer
• Roland SH101 Analogue Synthesizer
• Roland TB303 Bassline (Acid Machine)
• Roland TR-707/808/909 Rhythm Composers
• Atari STFM Computer Running Cubase
• Tannoy DC200 Gold Reference Monitors
• Marantz Professional Reference Amplifier

As far as samples goes from the BTL days I used to own a vast collection of vinyl predominantly hip hop as well as reggae, funk, soul, electro, techno & rare grooves. Main samples we used back then were countless breakbeats but my one favourite would have to be "King Of The Beats" by Mantronix which we used on one of the most sought after BTL releases today "Paranoize" on the same track we also sampled an opera track which had some type of church choir section as well as a piano piece by Richard Clayderman which we speeded up considerably & in fact that sample is the reason we called the track "Paranoize" as it no longer sounded like the sweet piece of piano by RC but a strange plinky rushing fluctuating type of noize! lol

We pretty much sampled anything that caught our attention or tracks which we liked but always made sure that no one could ever say anything that we released was ever a rip off of somebody else's work that was our motto…Sample whatever you feel to as long as it sparks a brand new creation & never an emulation or to put it more bluntly "Originate Never Pi-Rate".

Q: [Regarding the first sampler you mentioned,] was it [an Akai] S612?

Yessss!!!!…That's the one brother Hahaa Big up yourself!

Q: Did you get that extra drive rackmount thing for storage?

Nah…just the sampler unit & it was owned by TUF Records and I bought it from them at mates rates supposedly but was still a lot of doe for those times in 86…But was nice to be able to mess about with a real sampler if you can call it that! I could call it that then coz b4 that I used to use a Sinclair Spectrum 128K with a simple sampling program lol.

Q: Do you still have any of this gear? Before we get into you BBK career, maybe we can go over a bit more background info…What tune would you define as your first breakthrough track? Could you explain how you made it? The motivation/vibe/process? Also, here's a general question: Do you think technological development has affected your music over the years? What about in relation to production techniques?

No unfortunately I no longer have any of that gear from back in the day in fact that's not strictly true!…Coz I do have just 1 piece although not from the BTL era but a little later & that's an AKAI S2000 Fully loaded & capable of sampling at 48khz with over 5 minutes of sampling capacity! […]

Breakthrough track is a tricky one to answer from the early days point of view & also depends on the definition of Breakthrough! But in terms of getting the name Break The Limits established it would [definitely] have to be BTL Part1 6-track EP. My personal Favourite track from BTL is Paranoize for its total raw energy & power & the fact that it was recorded on TDK SA60 Chrome Cassette using Tascam 8 Track Porta Studio with on board 8 Track Mixer & no type of sequencing was involved in the creation of this track…We simply laid down the drum break (King Of The Beats) then one by one all other elements onto separate tracks…meaning rewinding the tape to beginning & recording each track while triggering the samples and sounds manually in real time…including the TB303 acid line which was not the easiest thing to do but the result was one of great satisfaction knowing we were

doing something nobody else was doing. I also want to add that all previous BTL EPs: BTL Part1, 2 & 3 were also recorded without the use of any type of sequencing the only difference being for those we used half inch 24 track Pro Fostex Multitrack recorder to lay the tracks down and mixed and muted manually for the final mixes which were released!

The initial motivation was a number of things…one being years of hard work for little or no reward. The absolute passion & love for music & knowing that we were on the verge of something which would change the whole music & underground culture forever. As well as the realisation that we were now grown up & I personally had major responsibilities to take care of plus the feeling that I was born to do this! I think you'll agree those are motivation enough to have had total focus on our ultimate target which was to make all this happen without help from anyone because we simply didn't want to hear not even one more person to tell us what we should be doing because we knew what we had to do!

Technology affecting the way I or we make music…NO DOUBT!!! Basic rules of progression apply in every sense of the word Evolution. As technology advanced I naturally advanced with it, as did most producers I'm sure. As much as I loved the old studio setups mostly run with lots and lots of hardware strung together by masses of cables & power sources I actually prefer the fact that today I don't need any of those things just my favourite DAW on my powerful laptop with ridiculous amount of storage space & almost infinite sampling time all the hardware I would have needed right in front of me on my screen…To me this is music heaven! Although I know that there are still many from back in the day who would not agree with me but that's cool because that's just my personal opinion.

Q: Have you worked with anyone else over the years? Did you pick up techniques from anyone? or were you taught techniques by anyone? Have you taught anyone how to make tunes?

Bruv I have worked with many people but during the years of BTL Satin Storm, Chris Energy, Gin & Tonic, One Tribe, Rock & Vibes, Reel 2 Reel, McMc, Cool Hand Flex, Uncle 22, Lenny De'Ice…The list goes on.

Of those I mentioned I would say that I definitely influenced & in fact turned on to breakbeat techno is Satin Storm as we used their studio to record BTL Part 1, 2 & 3…Each time they were a bit more blown away! Later when we went on tour around the UK we took Satin Storm as part of our entourage as they were our dancers on stage & we also took McMc who used to back me up on stage on the mic…back then he was an up & coming mc he later went on to become one of the best known & remembered MCs in the Jungle scene.

I also influenced Chris Energy in terms of music who back then owned a record shop in East London HNR Records where we all used to hang out hear all the new releases & exchange ideas and so on Many DJs would also pass through but all were always amazed at the mixing skills of my BTL partner MrE who was an exceptional mixmaster.

Of course I taught many who I worked with new skills & techniques of production but this often also works the other way around too as while doing so I also learned many things myself.

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? why? How many do you have in your collection?

My interest in breakbeats stems from my love of oldskool hip hop mainly which started way back before I even thought about making music. I used to be a B-Boy which for the benefit of those who are not familiar with the term means someone who breakdances & that's where my interest in breakbeats started.

How I select a breakbeat when making music depends on a number of things but first and foremost it depends on whether I have a specific starting point in mind or not. If it so happens that I do then the break I will choose will be one, which compliments the main focus of the track which could be a vocal hook or a melody or even some kind of noise pattern. Other times I may not have a start point in mind & this is when I tend to dig much deeper into my collection of breaks & will experiment with breaks I have not used before! Even though that last sentence may sound funny in the sense that you'd think in all the years I have been producing

breakbeat based music you might think there cannot be many breaks left that I haven't used but that would be an entirely wrong assumption as there are most likely more breaks than I have time left on this earth to be able to use them all!

Indeed I do prefer some breaks over others no question about it. I like funky patterns of drums and hard hitting sharp snare hits & totally love any break with cymbal rides. I also prefer off beat type of breaks like the backbeat style of main snare hits followed by softer off beat snare hits. Two perfect examples would be "Funky Drummer" & of course the most famous and absolutely the greatest breakbeat of them all the break from "Amen Brother" by The Winstons or more widely known throughout the world as "Amen".

How many breaks do I have in my collection is a very difficult question to answer precisely. But if I said well over 1000 usable & many more that I still haven't got around to editing would be as close as I can get to a precise number. […]

Q: Please rate on a scale of 1:7 (7 being the max) the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reverse reordering
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

• pitch modification: 4
• distortion: 3
• resequencing: 7

• reverse reordering: 7
• multibreak layering: 7
• multibreak alternating: 7
• timestretching or start point manipulation: 5
• filtering: 6
• flanging: 2
• reverbed: 2
• other:Double/Half tempo & multi tempo: 3

Q: Have your methods changed over the years? Do you think it has to do with the technology that you are using?

As far as methods of break editing is concerned of course over a period of time my methods have evolved although I don't put this down to the technology advancements because personally I don't use any kind of automation in the process of editing breaks as I could never trust it to do what I need it to for instance importing a break into a waveform slicing software for it to slice the sample into sections…NO WAY!!! It would never be accurate enough for me or know where I want the slices to be made. I also do not ever use quantize & instead manually place each part precisely where I want it to be this also applies to sizing of parts I would not trust a program to size parts & over the years I have learned and memorized the sizes in terms of digits and can simply type in the appropriate number into the size section. But in some other ways my methods have possibly changed due to advances in technology with the main one being the fact that I do not use a hardware based studio today & yet I can do so much more than I used to be able to when I was using 4 Akai samplers that cost a fortune…But having said that I do have a soft spot for the Akai sampler as they are the tools with which I learned my trade.

Q: When you perform these manipulations, would you say you try to preserve an ordering that emphasizes the beats? the downbeats? (for example, do you keep the ordering somewhat similar to the original break around the

downbeats?) Please (if you would) list your favorite 10 breakbeats, and at least 1 Hardcore, Jungle, or Drum & Bass track that has used them.

When I'm reordering hits & rolls and such from a breakbeat I like to preserve the "Funk" of the original break but I tend to decide the order in which they will go in accordance to the flow of the rest of the track…But not always as if it happens to be the case that its the break which is the starting point of a track then I usually lay down a series of freestyle sequences & listen to them switching between the whole range to feel a vibe from the break & usually ideas will start to flow & track progresses. Occasionally I might also incorporate half tempo edits within a break sequence too.

My 10 favourite breaks to list will be easy enough for the top 3 but the rest will be a tough choice but I will give it a go…

1) Amen Brother - No surprises there the undisputed king of the breakbeat!
2) Hot Pants - Bobby Byrd & JB's
3) Think - Lyn Collins
4) Assembly Line - Commodores
5) Humpty Dump
6) Soul Drums - Bernard Purdy
7) All Freestyles - KJ Sawka
8) All Freestyles - Jojo Mayer
9) Ike Turner - Funky Mule
10) James Brown - Funky Drummer

The list above is not entirely all my favourites but more like the breaks that I have used more often than others with the exception of my No1 choice as Amen is the king of all breakbeats and I doubt whether anyone who is into or works with breaks would argue with that statement. I would also like to add that the Mantronix version of the Amen "King Of The Beats" would for me be joint No1 alongside the original as I consider Curtis Mantronix to be one of the pioneers of electronic music which incorporates breakbeats & a total legend.

As for a track or tracks that have incorporated any of the breaks in my top ten…all I'm going to say is that over the past 23 years that I have been in this game I have released 500+ tracks and all of the breaks in my top ten & many many more can be found amongst them but if I must give an example or three I'll give one from my early years & two from more recent productions…

1) Paranoize - Break The Limits (1991) using the break of King Of The Beats by Mantronix
2) Unfolding Perspective - Bay B Kane (1994) using the break of Amen Brother by Winstons
and my most recent Future Jungle hit which has topped the Breaks Top 100 chart & has never
left the top 30 & still frequently re-enters the top 10…
3) Everybody's Gotta Learn - Bay B Kane (2012) using the break of Amen Brother by Winstons.

Q: Do you mind if I ask a bit more about what you mean when you say the funk of the original break?

Ok so, what do I mean when I say I try to preserve the "funk" of the original break when I use it within a track…Its my personal understanding that the term "funk" is a word which describes a certain feeling or a state of mind! As I am very much a vibes based producer I can feel the vibes within not only a particular song but even when I break it down to in this case just the drums it is no different as I feel the vibe of the drummer as he or she laid down the drum track. So to me its important to retain as much of that vibe as possible when I sample and reorder and sequence the different parts of that break which is also why its very rare that you would hear a track by me that has drums broken down to individual hits alone! Sure some may feel that is the way to reconstruct a drum pattern but doing this has a cost and that cost is losing the original vibe of the break because broken down into individual hits you will lose the feel of the drummer & so even though you have drum hits which were done live by a real drummer the overall feel of the piece is lost and to me this becomes synthetic

and not much more than a drum machine. I also want to say a few words here about sampling in general as I feel it is relevant whatever I sample whether it is drums, vocals, melodies or just individual sounds I always try to preserve at least some of the vibe from the original piece as this if you like is my way of saying that I appreciate where this came from & I appreciate & recognise the effort and emotions that goes in to making music. However as I have said before I don't agree with sample clearance as I don't believe anyone should have to ask permission to sample a piece of music or vocals the reason I feel this way is because I see music as belonging to everyone but in the interest of making this point clear for who ever may read this I am not suggesting that music should be free not at all! Artists should always be rewarded for their work & for me there's no compromise on this particular point…unless of course if I or any other artist choose to give away songs for free that is an entirely different thing and a choice that is made by an individual.

Q: Part of doing this interview was geared towards finding out how the genre was created by asking questions of one of its originators. I think it might be interesting to ask you directly about this (hopefully!): Where did Hardcore, then Jungle, then Drum & Bass come from? Are there social, musical, or technological influences or movements that you see as driving the development of the music? Conversely, do you see the influence of Hardcore, Jungle, and Drum & Bass outside of the genres themselves?

Hardcore, Jungle, Drum & Bass……Hmmmm! First of all I feel the need to say that I've never been very comfortable with the term Hardcore as it is far too vague in its meaning as it can and does cover too wide a range of musical possibilities…plus what was known as hardcore in the UK was very short lived & somewhat indefinable as far as I'm concerned therefore I'm going to skip hardcore for personal reasons which I have tried to explain above.

Jungle however is as real & as definable as any genre can possibly be but I need to make a point right here before I continue…I find it infuriating that so many music download sites today try to either lump everything that has the slightest link to each other under the heading of D&B or as it is in some cases splinter everything that has

the slightest difference in to individual & tiny boxes!!! I find both the above practices which are commonplace these days infuriating!!!

Jungle, which is a genre of popular underground music, started its life for those that may not know as Jungle Techno (not to be confused with J-Tek it just isn't the same thing). Jungle was born out of the urban underground dance music scene in the UK and specifically from London & even more specifically from the East & North side of London Originally a fusion of Techno elements & Breakbeats and bound together by very low frequency sub-bass…often with a sprinkling of Dub / Reggae samples too.

What I'm going to say next may sound like a bit of a cliché but trust me or if you prefer don't trust me and research it yourself lol. The first time that I recall seeing the term Jungle Techno officially in print was a review in Echoes Magazine which was the biggest and most respected underground music mag of the times and it was within a review of one of my tracks released on XL Recordings under the alias of Nu-Matic track called Hard Times. Although we and others involved in the scene were using the term since long before the fact that it was now used within the pages of a credible & popular music mag somehow made it more acceptable to more people & over the course of the following year or two as the music evolved and settled into its own unique style the Techno reference was inevitably dropped and became known as Jungle & now 20 years on it is still here but not only that it is going from strength to strength and has touched the lives of so many people from all walks of life around the world that its only right that it should still be around and is & if I have anything to do with it will continue to be around for the foreseeable future & beyond!

Drum & Bass was born directly from the seed of Jungle make no mistake there! Originally starting with the emerging "Intelligent" sub genre from within Jungle. It was a more drifty, dreamy, atmospheric type of sound. Less busy & more sparsely instrumental often with a vocal hook preferably female! The nametag is simply down to the fact that the dominant elements were always the drums & bass hence the term Drum & Bass. Was a great sound and one I was very much involved with at the time. The undisputed leader of this sub genre was a good friend of mine Danny Bukem better known as LTJ Bukem…The name Bukem incidentally comes

from the cult police series Hawaii 5-0 "book'em Danno" Fast forward to present time and today I do not associate myself with Drum & Bass as it is something completely different now. It has become a completely self absorbed soulless machine like sound which in a general sense no longer has any funk within it to speak of…sad but true. Plus today D&B flatly tries to deny that it is the direct descendant of Jungle like a rebellious son who rejects and distances himself from his father…I find this unacceptable & delusional.

Without doubt Jungle has influenced many things outside of its own circles and like many other popular music has crossed over into the commercial pop zone at some points and I'm sure will continue as all things work within cycles & everything is repeated that's the way it works within the universe so what is popular today may not be next year but to me personally and to those where Jungle is a way of life none of that matters simply because this is the life we live & we will keep it alive by that very same fact! Just as an example of Jungle influencing outside of its own circles…Today on UK TV 4 out of 5 Real Life police & Traffic shows incorporate Jungle tracks within the soundtrack of the shows & that's just one simple example! :))

Q: Can you tell me about the different movements/major changes in the music, and your impression of what caused these changes that you've seen (e.g., 1994 shift away from Ragga Jungle)?

In late 1994 there was a noticeable shift in Jungle from the raga-based [Jungle] towards what had started to be labelled as "Intelligent". This shift was led by the label Good Looking Records (GLR) owned by the legendary DJ/producer LTJ Bukem. This shift within the scene as time went by grew and became a massive divide not only within the music but also for those who followed the movement and attended the raves. Although it was somewhat inevitable I remember feeling that no good would come of such a massive divide within the scene. It was partly due to [the] crack culture epidemic which was sweeping the nation in late 94 through 95 and the crack dealers targeted mostly the ragga jungle raves this eventually drove away many who were into the music but not into the crack scene and all that went along with it meaning the robberies and violence that went hand in hand with the crack

epidemic. So those who were no longer attending the ragga jungle raves started to favour the intelligent sound and because of this more and more raves were happening where the theme would be the intelligent/atmospheric sounds of jungle which I should also point out quickly detached itself further by taking on the new assumed identity of Drum & Bass and was no longer associating itself with Jungle…when in fact it always was and will be a direct offspring of Jungle. This to me was the most regrettable of all the changes that I had witnessed within the scene as when any force is divided it inevitably becomes weaker. At one point in early 96 it became so ridiculous that we as producers were expected to choose which side of the fence we sat, as it were, so much so that certain producers and labels would not entertain working with producers who dabbled in ragga jungle & vice versa; labels known for D&B wouldn't mix with Jungle producers & the same went for DJs. This situation really damaged the scene as a whole and as a direct result record sales slumped and what was once an incredibly radical and powerful movement became fragmented and weak beyond recognition. In early 1997 I decided I no longer wanted to continue & chose to go off and do something completely different but knew that some day I might return.

Q: This weekend I was looking through my friend's collection and came across the attached image (which is pretty much what you've expressed!)[see Figure 2.5]. I've read that there was a "committee" that was associated with this divide. Is that true?

Jason I have to tell you that I find that little cover article you sent so infuriating even now!!! It was exactly that attitude portrayed within that article which helped the divide grow ever larger although completely inaccurate and totally falsified but to the less aware listener it must have seemed appealing somehow to be associated with what it claims it to be…meaning in a sense like to be able to say "I'm with the intelligent crowd" somehow implying that those who are into jungle are of lesser intelligence! It is so ridiculous & was so damaging to the whole scene and lets not forget where the so called Drum & Bass music comes from which unfortunately they

have tried very hard to forget over the years and of course it is JUNGLE which is why I believe the term jungle will always remain and rightfully so.

I fully understand and appreciate at the time [people] wanting to disassociate themselves from the crack element which attached itself to jungle raves but lets make no mistake it should have been made clear that this is what it was and not take this opportunity to jump in and say things like D&B is music that cant be put together in 5mins and that it takes time and talent to produce which suggests that this isn't so if you are producing jungle!!! And I'm still somewhat amazed that there really are such shallow [people] amongst us to have bought into all that rubbish!

But seriously where is D&B today? Can anyone say that what it has become is progressive or cutting edge? How about popular? The answer is NO on all counts D&B detached itself from Jungle and went to such lengths to remain detached that today in my opinion it is in danger of disappearing up its own arse…and I'm laughing :D) Because in everyday terms what they became is snobs which is a very pretentious state of being and has no place in the real world or at least not within the birthplace of this music which is the inner city ghettos where people have very real problems but pretending to be something they're not is [definitely] not one of them!

Q: In the music's heyday, roughly how much revenue was generated by a release? How much would a release cost to make?

Well that would have depended on a fair few things but ultimately it would depend on how good the vibes on the release were plus who distributed it and who as in which DJs supported it. But I can only speak from my own experience which I'm sure would differ from others…As I have mentioned before BTL Part1 sold 7,500 copies @ £3 per copy which is what we used to get from the distro and reason being coz it was 6track EP so for a 2-track 12" it would be less at around £1.50 to 2.20. But all said and done for me to release anything and sell less than 1,000 copies would have been unthinkable but that said as long as you sold 500 copies you could be sure to cover costs and have some change left in your pocket.

I never sold less than a 1000 copies of anything that was ever released with my name on it…That's not including promos which we sometimes pressed only 150 or

200 copies of but those we didn't consider as releases and they would normally be just white label hand written or stamped…only copies with full printed labels were full releases. My biggest release of those times was Hard Times EP on XL Recordings, which sold around 38,000 copies on vinyl I'm not certain how many on CD on top of that. But also surprisingly to me my breakbeat compilation CD Have A Break has sold in excess of 10,000 copies and is still available. Incidentally and without going into too much detail I am owed literally thousands of pounds for my releases which appeared on Whitehouse including Have a Break and thus far I have not been able to recover a penny of what I'm owed. Why? Because Whitehouse back catalogue in its entirety was sold off to an American corporation eventually but the real problem was the person who bought it in the first place from Whitehouse and I'm not going to reveal who this is but lets just say it is a name everyone would recognise. This person who saw an opportunity to make a large amount of money by buying then selling the back cat wouldn't even entertain helping me in any way shape or form not even to put me on the right track so that I could investigate the possibility of getting my money! Why? Because he made his money and does not want to rock the boat as he obviously feels this may cause problems for him! And this is the type of world that we live in today. So be it I'm not holding any grudges & it wont break me although of course it would have helped me in many ways but it wasn't to be & I will continue my mission within the Jungle both for myself and for others as much as I can simply because I believe in this music and it is who I am.

Q: Were you aware of "the committee" during all of this? Or has that been made out to be more than it was?

Yes I was aware of the so-called committee, and yes it was made out to be something that it really wasn't. The committee I felt were a bunch of self appointed so-called leaders of the so-called Intelligent movement who were nothing more than ignorant opportunists looking after their own interests and had no interest in helping the scene or anyone in it unless they agreed with the so-called Intelligent point of view…which lets face it was far from intelligent in its thinking! I fiercely apposed all this divide rubbish and often argued the point that restricting any artist to stay within

the boundaries of a virtual musical concentration camp was not the way forward & in fact it was a thousand steps backwards at the very least. During the year from late 96 to 97 I was bombarded with calls on a daily basis from people within the scene & from both sides of the fence and always about the same thing arguing the case for either one or the other side & urging me to basically choose which side I would stand on…which I refused to do & continued until late 97 to make both Jungle & what was then described as Intelligent D&B because I could and always had been able to relate to both in terms of music and could never understand why I should have to choose between the because to me they were both parts of exactly the same music & same scene.

Today I cannot stand by the same statement that I made above because Jungle & D&B have moved so far apart that they simply no longer represent the same music. I personally prefer the more organic sounds of Jungle & what we now call Future Jungle to the almost completely synthetic soulless sounds of today's D&B in general…but I'm not suggesting that is the case for D&B as a whole because there are still exceptions to the rule today although very few and far between sadly.

C.11 Lindo, C. (Alpha Omega)

Q: Tell me about the music scenes you were involved in before Hardcore, and Jungle. How did you find yourself involved in Hardcore and then Jungle?

Well, before hardcore formulated I was really into hip hop and electro which goes as far back to 81 or 82, pretty much when I first heard 'Planet Rock' on the radio. US hip hop & electro was a huge thing for me growing up and also the b-boy culture which existed around the music. I thought of myself as a rapper in my early teens and really thought I would make it in to a proper career but life had other ideas I guess.

Before my love for hip hop surfaced I was a massive Soul/R&B/Rare Groove lover. Growing up in London in the 70s & 80s you couldn't help but be into the Soul music of the time. When producers started incorporating the more synthesized/electronic sounds along with drum machines I lost my mind. Those guys infused so much soul into the machines along with amazing vocals and first class musicianship. 80s soul will always have a special place in my heart.

Fast-forwarding to the late 80s early 90s the whole House music thing had seeped into the landscape and I was always dipping in and out of it, alongside everything else. I was checking it out on pirate radio stations and buying the odd record here or there but I never got to fully embrace it like Hip Hop or Soul. This was mainly because my friends at the time weren't into House so I couldn't get anyone to go to any House clubs with me. The funny thing is as soon as break beats and bass lines started coming into the scene and the early strands of hardcore started to take shape, every single one of those friends did a 180 and were going to raves on a weekly basis!

At the time Hardcore hit I was a bedroom hip hop mc/producer and almost overnight I dropped any aspirations in that field and started trying to make hardcore records. This was around 91/92. I also borrowed some equipment from a good friend who had a proper studio setup and he would teach me how to use samplers, sequencers and production techniques. It took me about 3 or 4 years before I made

anything worthwhile and once that happened I got something signed to DJ Stretch's AKO records under the 'Da Elite' guise. Around the same time I played Stretch some darker tracks I had just completed and he played them to Dego from Reinforced and that led to them signing the first two 12" releases from 'Alpha Omega'.

Q: Do you remember any particular Soul/R&B/Rare Groove artists or releases that were using synth/electronic sounds with drum machines?

Some of the soul artists that really inspired me early on were Loose Ends, Jimmy Jam & Terry Lewis, SOS Band, Stephanie Mills, Cameo, Gap Band, Kashif, Lilo Thomas, The Dazz Band, Evelyn Champagne King, Fatback Band, Zapp.

There were many more that made soul music with an electronic edge but these guys really nailed it and had a huge influence on the musical landscapes which followed. Just take Zapp (Roger Troutman) and his influence on Doctor Dre's productions to this day as an example.

Q: Do you recall who you friend was with the studio? Could you tell me more about this studio (e.g., what synths/samplers/sequencer/computer (if any)?

Matthew Guadeloupe was the studio owner who helped get me started. He ran a commercial studio from his house in Northolt when I was in High School. He was a couple years older than me and I got to know him through his brother, Justin, who was in my class throughout High School. We originally came together to run a sound system called 'Ghetto Life' which was started around 1990/91 and lasted about 2 or 3 years. Thinking back now I have to state the importance to sound system culture for myself. Listening to the best sound systems at the time in Carnival, cassette tape or a house party was a life changer for me. Nothing has ever come along to replace that experience, no matter how convenient Apple & Google make things you won't be able to replicate the feeling of bass frequencies tearing through your chest and an MC and DJ intent on elevating the dance floor into another galaxy.

Getting back to Matthew and his studio help, I remember him using Akai s1000 samplers, Atari 520st, Cubase, Allen & Heath mixing desk, Sony DAT machine, Roland workstation and a couple outboard bits that escape my memory. He produced a lot of reggae and I think he still does along with a lot of radio jingles & sound bites. I'm not sure how it happened but he lent me his Akai s1000 & built me some midi/audio cables and I bought an Atari 520st and got a copy of Cubase and a small Samson mixing desk. That was the nucleus of my early studio setup and was what I continued using until around 96/97 when the upgrading began after getting a couple releases under my belt. The first thing I bought was an Akai CD3000xl to replace the borrowed s1000 and it was a complete revelation…just having resonant filters and the ability to have two different filters running at the same time was a trip. The Akai 3000 really changed things for me and a lot of Jungle producers at the time.

Q: How did you meet Stretch? Did he live nearby?

DJ Stretch was a long time friend of Justin & Matthew and we met through that connection. Actually, at one point Stretch lived about two minutes from my front door!! By time we met he was already making waves in the jungle scene with his releases on Reinforced and his remixes. Stretch & Tee Bone were really pushing the jump up reggae style in a more tasteful manner than many of the copycats who followed.

Q: Regarding your sound system, could you explain to me how you ended up doing this? Do you happen to have any pictures from back then?

Unfortunately I don't have any pictures from my music career whatsoever. It's a big shame really but I never thought about the 'big picture' (pun intended) at the time and didn't really document much, if anything, that I was experiencing at the time.

The sound system idea was something Matthew & Justin really wanted to pursue and wanted to make it a school friend's project where we could hang out and play music that we loved wherever we were allowed to. I don't think we got that

many gigs but it didn't really matter; it really served as learning ground for us as DJs, producers or music lovers.

There were maybe 6 or 7 of us involved, all from Acton High School, except for Matthew who was in steady employment at the time as he was 3 or 4 years older than us. I think Matthew & Justin built the majority of the equipment from scratch since we didn't have much money at the time and what money we did have was spent on records. Fun as it was it really fizzled out soon after we finished our college courses and started careers and pursued other musical loves.

Q: You mentioned the release on AKO under the Da Elite alias. I assume its "Check Dis/Too Deep'? Would you say this was your breakthrough tune? What year did you write it? Do you remember how you created it (any particular sample modifications etc.)? Did your experience with this tune change how you approached making subsequent tunes?

Speaking of the AKO records release as Da Elite (Check Dis/Too Deep) I was listening to a lot of DJ Hype/Zinc/Kenny Ken/Jumping Jack Frost at the time. This was around 93/94. I think, I wrote those tunes around 94/95 and they were released in 95 at some point. Matthew figures in these because this was during the period he was teaching me how to use the equipment and he would also give me a lot of feedback on my tunes and where I could improve things. Sometimes he would even throw samples and sounds my way that he would discover in his record collection or sample library and I think there's a Michell'e vocal sample somewhere in 'Too Deep' that he sent my way which might be from an Eazy E record (produced by Doctor Dre). Check Dis was a vocal sampled from some live hip hop show, I've forgotten who, but in the days of cassette tape & pirate radio I used to have bucket loads, literally, of recordings of shows and anything like that was perfect sample fodder for me. I think there's a Puff Daddy/Notorious BIG concert sample on that 12" somewhere.

Another thing to mention is that I was abysmal at mixing down songs actually it's still something I am not confident in and really need to improve. Anyways, Matthew mixed that 12" down for me at his studios and did a great job. He was a guy

that would actually read manuals and learn about frequencies, compression and production techniques so I would always look to tap into that knowledge whenever I could and if it wasn't for his assistance and support those early releases wouldn't have happened in the way they did so I owe a huge debt to him.

The funny thing with Da Elite is as soon as that 12" took off I came up with my early Reinforced stuff and became consumed with that sound for the next decade or so. People might think I'm anti-jump up but I used to love all strands of Jungle so I wasn't anti anything but unfortunately I didn't get around to exploring much of my love for the more energetic styles of Jungle/Drum and Bass.

Q: So the first instrument that you used was the s1000—before this, had you ever used any synthesizers? Was there something particular to sampling or synthesizers that drew you to the music?

The Akai s1000 was definitely the first instrument I got to know in a studio, music production manner. At school I played the drums for a short time and picked that up pretty quick but didn't keep up lessons once I moved up in to the next school year. I even had a couple piano lessons but I didn't take to that at all. I'm not sure if it was the teacher or the instrument but it just didn't interest me like the drums did. Funnily now I would love to play keys like a Kaidi Tatham or Amp Fiddler.

Back to the sampler, as I was learning how to use that it taught me about envelopes, LFO's, modulation, filters and oscillators but using the samples as your own oscillators and building sounds from that. Using the sampler in that way has never changed for me, I still program my samplers as if they are synthesizers and construct sounds in that way. I tend to stay away from using sounds quite straight, as I prefer when sounds have some effort put into them and changing the character and timbre of whatever sounds I start with. My first synthesizer was a Novation Basstation mini keyboard, which was cheap as could be but still very capable with a bit of effort. All of the bass lines on my early drum and bass started from that thing. I still have that somewhere at my Mum's place.

Q: Before we get into the Reinforced era, could we possibly take a step back to discuss the club/party scene between 1990 and 1995/6? What types of parties did you attend? What kind of music were they playing? Were you part of these nights? What DJs were big at the time?

When I look back to my early days and listening to 80s music, my ears would always pick up on anything electronic, something which sounds like it came from outer space or the future. That change of frequency really attracted me. Even the popular music of the time like Thomas Dolby, Kate Bush, Art of Noise, Herbie Hancock, Marvin Gaye, Talking Heads, Tom Tom Club, Human League, Yazoo, etc.…I always had a deep penchant for electronic sounding music, especially when it had soul and warmth infused with it.

Regarding the part scene in-between 1989-95 well I was going to house parties, not house the music but parties that somebody would hold in their flat somewhere and charge a small amount of money to get in. These were often called blues parties or rent parties, as the owner of the flat would often use the money to pay their rent that month. I was around 14/15 at the time and someone that age wouldn't normally get in but I was quite big for my age so I could pass for 18/19 and never had any hassles getting in. The majority of the music played at these parties was reggae, soul & rare grooves but later on around 91/92 some of the early Acid house music would start creeping in for an hour or so, nothing too long as the crowd would only tolerate small chunks of that sound but I loved it and to be honest it was so different a sound and energy that everyone would absolutely go mental for that short period. Things like LFO-LFO and much of the early Warp releases, Lil Louis 'French Kiss', Kirk's Nightmare would smash it!

I never really had a huge desire to DJ the music back then but I loved dancing and listening to music. That was a big thing in the music scene when I was young, it was all about who had the baddest dance moves and best clothes. My older cousin, Tony McDonald, was deep into the soul party side of things and he would make me tons of tapes with the latest records and tell me about the parties that he was going to and you'd see him practicing his moves whilst putting these tapes together. You know, looking back to the times going to any party or club, especially with a large

black audience, it was all about the dancing. Dancing came first and foremost and the more successful DJs at the time were the ones who played the tunes the dancers could freak out to. The likes of Soul 2 Soul, Norman Jay, Paul Anderson, Robbie Vincent, Trevor Nelson, Gordon Mac, and David Rodigan were some great examples of this.

When things started shifting into hardcore in the early 90s you have to look at Fabio & Grooverider as major pioneers with that. Alongside them were Carl Cox and Jumping Jack Frost. These guys really pushed that break beat fusion with house and took no prisoners. Without their representation of that sound I very much doubt Jungle would have took shape the way it has, if at all.

Q: So on the tail of the Da Elite work, you started working as Alpha Omega? What caused the shift? What was your breakthrough track as AO?

The shift from Da Elite to Alpha Omega has an overlap. Originally Alpha Omega was a pseudonym I used to do some remixes for a reggae label in 94/95. Just basically making jungle from these reggae vocals this label owned the copyright to. The label owner was a guy called 'Wally' and I can't remember much else. It was Matthew who initially sent them one of my early demos and they got in touch saying they would love for us to do a bunch of remixes. I think the label was called 'Vision Records' but don't quote me on that. Anyway, that was initially me and Matthew taking care of those and Wally would let us use his label's recording studio overnight to do these remixes. Matthew would bring in the Akai and we would use whatever else was there. I think there was a Moog Prodigy somewhere in that studio but I don't remember much else equipment wise. These remixes surfaced in 94/95 I think and that might have been where the initial funds came from to buy my Samson desk and Atari ST.

Q: When/how did you meet the Reinforced crew? Can you describe the first major signing(s)? How did you make these tracks? Do you recall the synths used etc.? Did you work with anyone during this time (either collaboratively,

or developing in a similar way that you did during the earlier years with Matthew Guadeloupe)?

So that came before Da Elite really but the real breakthrough for Alpha Omega was the first two 12" on Reinforced in 96. They heralded a change in sound and direction and a sort of independence on my part. Matthew and I pretty much went our separate ways around then, he was always a reggae producer at heart and I was in love with the new Drum and Bass sound that was emerging then and we sort of moved on to concentrate on our individual projects. I never felt the urge to collaborate much after that, especially since I had a clear idea of where I wanted to go with my music. The only thing was I still needed those 12" to be mixed down and I was not confident to make a good job of it so once Dego decided he was interested in signing those he offered to mix them down at Dollis Hill. When you listen to Realism (original 96' mix) that's Dego on the filters on the breaks, I think he was putting them through an sh101.

That was a huge honour for me, I mean I was around 22 at the time and had looked up to Reinforced from their very first releases back in 1989/1990 and to then have one half of 4 Hero mixing down my tracks to release on their label was a dream come true. By then I was using an Akai cd3000xl and I would have absolutely everything coming out of that while still using Cubase for sequencing duties. In terms of sounds I was sampling anything and everything. Tapes of radio shows, movies, my voice, records, sample CDs and my Novation Basstation. If it sounded good I was willing to sample it and use it somehow. Back then I would sample into the Akai and program it quite extensively, then put it through my Samson desk and eq it a bit then add on FX from my Zoom 1000 which was the cheapest FX unit I could buy at the time. Then I'd either leave it like that or just record it to tape or dat machine, if I had one borrowed at the time (from Dollis Hill HQ mostly) then resample it back into the Akai then start again.

Jumping back a bit, my introduction to Reinforced came through DJ Stretch and he arranged for me to go down to Dollis Hill and play them those early tunes I did which were Realism/Visions/Outer Dimensions/New Armageddon. They were pretty much signed on the spot with the contracts signed and the recording advance

in my bank account a week later! You can't beat professionalism. Here's something most people don't know but about a week previous to me going to Reinforced me & Matthew had gone to No U Turn's HQ which was nearby and played those tracks to ED Rush, who was in to them and wanted us to come back to meet Nico and play them to him. Once the Reinforced hook up happened I didn't bother following up that interest especially as signing to Reinforced Records was like me winning the record label lottery. So, if Reinforced didn't like those early tracks things might have been very different indeed.

Q: Maybe its a good time to get into the techniques and breakbeats…this one might be a long one. Can you elaborate on your sourcing for samples? What types of sounds would you look for? How would you manipulate them?

I would source sounds from anywhere and everywhere, really and truly if it could be sampled I would sample it. Early on my main source of samples would be radio stations. I would record hours and hours of shows from all across the board and use anything that sounded interesting as sample fodder. Things like classical music, plays, talk radio, interviews, live shows would be perfect for getting different sounds that others just wouldn't take the time to check out.

I would record much of this on to cassette tape and them sample directly into my Akai sampler, sometimes I would run it through some outboard equipment to mangle it before sampling. My zoom fx unit and Waldorf Filter unit were great for this. Once they were in the sampler I would further edit the sound to make it into something usable and then program it with envelopes, internal fx, tuning, filters, layering to create something which sounded very different to what I started with. The possibilities are truly endless with sampling and you're only limited by your imagination.

Q: Also, in an interview on L Double's show, Mark Mac was talking about the reinforced DAT tapes. Can you elaborate on this? What it included, how some of these sounds were made, etc.? Had you incorporated any of these into your sound?

I'm not sure when the Reinforced DAT tapes came into existence but I know while I was there Mark hooked me up with tons of sounds, DATs, accapellas, percussion, breaks, everything really. Mark was always in the studio building sounds and programming, so much of the sounds were the fruits of his labours. Mark was always looking to help and guide young producers and DJs so whatever he could help out with he would try his best to make happen. When 2nd Wave came about in 2000 he made a lot of sounds available to whoever was on the label and showing support to the cause. I still have a pile of these sounds on cd and really should revisit them sometime soon and see if I can incorporate them into what I'm doing today because these were not your average throwaway sample fodder! The majority of the tunes I did on Reinforced post 2000 would have used much of these sounds somewhere.

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? Why? How many do you have in your collection?

My interest in break beats stems from my hip hop background. I started collecting old records when I was a young hip hop fan with dreams of producing and emceeing this soon turned into a love of old black American music. Much of these breaks were pillaged once Jungle started came into focus. I was never a scientist with breaks like Photek or Dillinja but would always look for something that had enough frequency present, in the kicks and snares particularly, that it would sound heavy when sped up. The Amen is the pinnacle of this without question but there are others that illustrate this point like the Rotary Connection break (My favourite break ever!), Apache, Action, Sally (Dyke & The Blazers), Think, etc.

The best breaks would have a prominent kick & snare with some tight hats/percussion on top (i.e., Think break) this would make it easier to edit and program once sampled. It would also sound better than something which was very light or too complex. When you have complex drums you really need to know what you're doing or else it can just become an overwhelming mess. Photek and Paradox are really the guys to check out if you really want to hear complex breaks handled by

scientists. I was always looking to get a simple groove going with a few twists and turns along the way to keep you interested and keep your head nodding but nothing too crazy. In terms of drum programming Dillinja was always in a league of his own, not in terms of complexity but sound and groove. I really looked up to him and how he made everything sound incredible back then and he would have definitely been an influence on how I tried to get my records to sound. Regardless of how his career has gone now he carved a path that was definitely his own and had very few peers back then.

Q: Please rate on a scale of 1:7 the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reversing
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

• pitch modification
Scale: 7
I would use pitch modification on almost all breaks/drums I've used in the past on my Alpha Omega productions. Now there is no need as samplers have become so powerful that you can choose whatever pitch you want, when you want but before then I would get the break at the tempo I want then alter the pitch to what I want in the Akai. It would take forever but the results were worth it.

• distortion

Scale: 2

Distortion is something that sounds rubbish in the wrong hands but very useful if you know what you're doing. Many of my early mixdowns had a lot of distortions in places due to me being too hasty and inexperienced with sound engineering and producing. As a result now I very rarely use distortion in anything I do.

• resequencing

Scale: 7

I resequence any drums I use. Always have done and always will. Make that sound your own is the mantra I live by in the studio and resequencing is certainly a part of that.

• reversing

Scale: 6

Reversing sounds, loops is something I do constantly and feeds into my mantra (see above).

• multibreak layering

Scale: 6

If done right this is a very powerful technique of creating bigger than life drums.

• multibreak alternating

Scale: 5

I love this technique (See Dillinja reference). I never got to incorporate this enough into my tunes but to be honest others did it better than myself so I guess that was a good thing.

• timestretching or start point manipulation

Scale: 5

I did a lot of timestretching early on but didn't use the results in the typical way. I would take the timestretching to the extreme then use the sound as a synth or fx sound that would contribute something entirely different to the music. Vocals are amazing for this and with a bit of effort can be twisted into all sorts of useful sounds (synths, sound fx, hits, bass).

• filtering

Scale: 7

A must use tool with drums and not always in the most obvious ways. Sometimes you have to high pass hi hats and snares to stop them clashing or to sound cleaner or use a low pass on a kick to make it sound warmer or remove them remnants of some high frequency sound you want removed. Filters are the swiss knife tool in a music producers arsenal, use them wisely!

• flanging

Scale: 4

It was too obvious an fx really so I didn't over use it….I hope.

• reverbed

Scale: 7

A must have but use wisely. Less is more definitely applies here. If not then mud will ensue.

• other:_____

Equalization

Scale:7

Incredibly important and this is something I'm finally learning to get to grips with. As a result my productions have improved immensely. Good EQ'ing technique cannot be under-estimated in all areas of music production, engineering and mastering.

Resampling

Scale: 6

Resampling is the daddy of sound mangling techniques. Every time you resample you start fresh and can take that sound in any direction your imagination allows with all of your cpu resources freed up and at your disposal. The new identity that you can impose on that sound from what it started out as can be mind blowing at times. I never get tired of resampling and the possibilities it brings.

Q: Are there any AO tracks that you would say are emblematic of these kinds of transformations? When you perform these manipulations, would you say you try to preserve an ordering that emphasizes the beats? downbeats?

Some tracks from myself that really sum up my approach to sound design best would be:

The Electro Cyanide/Landscapes Rivet 129 12" on Reinforced is a good example of how an open minded approach to sound design opens up your possibilities immensely and allows you to make music that doesn't sound like what everybody else is doing.

Landscapes in particular, eschews much of the drum and bass tradition that went before it both with the sequencing and sound programming and selection. A lot of the sound fx and atmospheres come from small hits and waveforms put through a variety of fxes within the Akai cd 3000xl and also my external fx units (Zoom/Waldorf Filter) then resampled. Then timestretched, reversed, equalized, normalized and replayed and resampled only to begin the process again.

Looking back and listening to these tunes again I realize how far off the path I went from the normal structures of the time. I've never felt right just following the exact structuring and sequencing of popular songs just to have my songs played by big DJs. If I went down that path then I lose the authenticity to what I'm doing. I consider the world to be a place of infinite possibilities so why would I spend my time here just copying others to fit in? This goes both in life and music.

One thing I was cautious of when processing and sound designing was that I had to ensure there was a strong, menacing drumbeat that ran through everything I did. Once you have an interesting drum beat in whatever kind of music you're doing then you have something the listener can latch on to and maintain some sort of familiarity, even if everything else is from another place altogether. A good beat acts as the foundation that you can build your vision upon so I tried to get that right, as best as I could.

Q: You've mentioned a few breakbeats that you use…could you list your favorite 10 breakbeats, and at least 1 Hardcore, Jungle, and Drum & Bass track that has used them?

Speaking of beats, my top 10 breakbeats would be the following:
Rotary Connection- Used by Goldie 'Manslaughter'
Hot Pants- Bobby Byrd - DJ Trace 'By Any Means Necessary'
Cold Sweat - James Brown-Subnation 'Scottie'
Apache - The Incredible Bongo Band-Scarface 'Never Seen A Man Die' (4 Hero remix)
Amen Brother - The Winstons- Bukem 'Atlantis
Humpty Dump -The Vibrettes- Studio Pressure 'Fusion' (Photek)
Soul Pride - James Brown-DJ Cystl 'Crystalize'
NT-Kool & The Gang - Digital 'Easy Groove'
Assembly Line - The Commodores - Future Cut 'Obsession'
Let A Woman Be - Dyke & The Blazers - Digital & Spirit 'Phantom Force'

Nothing out of the ordinary really just some absolute classics.

Q: Over the years, have you taught anyone how to make tunes?

So far I haven't actually taken the time to teach someone else how to make tunes. It's something I would like to do at some point, you know pay it forward to someone who can benefit from whatever knowledge I have about music making and

technology. I'm very open about my studio knowledge and techniques and would relish the opportunity to pass on what I know, especially to people who are passionate about music and you know will soak up what you teach them and put it to good use then take it as a means to find their own experience in the music world.

Actually DJ Krust is doing something right now with his creative workshops and I think it's a brilliant idea. You won't get anyone more experienced and knowledgeable than that guy and it will be interesting to see what creative talents develop from him dropping knowledge and giving others a positive environment for creative growth and exploration.

Q: Where did Hardcore, then Jungle, then Drum & Bass come from? Are there social/musical/technological influences or movements that you see as driving the development of the music? Conversely, do you see the influence of Hardcore, Jungle, and Drum & Bass outside of the genres themselves? Do you find the techniques of breakbeat/sample manipulation from the 1990--6 era relevant now? If so, how do you use them in a modern context?

From what I can remember, the origin of Hardcore comes from people, like 4 Hero, Shut Up and Dance, Frankie Bones, DJ Hype (Scientist), adding breakbeats to, what was essentially, house tunes then the DJs of the time noticing the reactions they were getting and speeding those tunes up (i.e., Fabio & Grooverider & Carl Cox). Of course other producers and DJs start to pick up on this and start to follow suit and that's how the scene started developing. Along with the breakbeats, heavier basslines (mainly sine waves or 808 kick drums) began creeping in. This influence started growing quickly, especially when labels like Reinforced, Moving Shadow, Production House, Suburban Base, XL, Kickin, Formation, SUAD, came into the picture.

The real underlying influence for Hardcore, then Jungle was a fusing of past musical influences, in particular Hip Hop & Reggae. Once the sampler was understood producers realized they could incorporate anything they were into within this new sound. That's what made the music so intense and creative. You were able to showcase your past, your present and mould the future. For example, when I

heard Shut Up and Dance back in 1990 I instantly understood everything, the hip hop breaks sped up, the heavy reggae basslines, soulful vocals from Nicolette, Techno sounding pads and FX and that London ruff neck attitude that held everything together. For a UK teenager back then it was musical Shangri-La and something I still hold very close to my heart.

Hardcore had so much potential and scope its influence can still be felt in the musical landscape. Not only in jungle, then Drum and Bass but also in Dubstep, Broken Beat, UK Funky. Sometimes you hear tunes from older artists and you can hear these guys embracing that attitude from early hardcore of straddling genres and incorporating as much of your influences as you can and ignoring the nonsensical constraints of 'genres'. 2562, Martyn, Kode 9, Aardvark, Seiji, Falty DL, Jon Convex are just some artists that are blurring the lines of the musical landscape for the better. The one thing I still take from Hardcore is the idea that you can make anything you want and fuck anybody that tries to tell you different. The idea of rebellion against tradition, I guess that stems from Punk before that but it was certainly underlying within Hardcore and the rave scene and has influenced much of my musical output over the years.

I am always trying to push myself in the studio and improve my knowledge and technical ability but alongside that ethos the approach I had in the 90s is slowly creeping back in and subtly shaping my sound again. The music is different now but the idea of sampling anything and everything and sculpting it into something completely new is so appealing to me again. That's what Hardcore was, taking anything and everything and forging it into a new form of existence and ignoring the established rules of constraint artists were supposed to follow.

Q: Can you tell me about the different movements/major changes in the music, and your impression of what caused these changes that you've seen (e.g., 1994 shift away from Ragga Jungle)?

Well the initial hardcore crowd was incredibly mixed and had everyone from your typical football hooligan, funky dreds to more psychedelic types and all in between. It was quite an experience to be raving alongside people that you just wouldn't

associate with in your normal life. As the darker sounds and bass in Hardcore got amplified and mutated more into the Jungle scene there was a split and possibly mini exodus that occurred. That hardcore sound went it's own way and ended up morphing into Happy Hardcore which didn't interest me and then Jungle took the darker/bassier sound and incorporated more of the hip hop influences much of the inner city youth had grown up on. Now that was right up my street!!! That was a very contentious time in the music regarding the DJs/producers that were big on the scene at the time. I remember hearing about committee's and secret meetings and all sorts of collusion trying to control the way the scene progressed but ultimately what counted in the end was people just getting on with what direction they wanted to represent. Fabio & Bukem are probably good examples of this. They didn't really take to the ragga/jump up side of things and started their own club promoting their take on Jungle and that really helped shape another strand of Jungle that's just as important as anything before or after that time.

When I look at the crowds back then the Jump up side had a very young 'urban' crowd and that energy was incredible. Jump up has become a little bit of a dirty word in D&B but I don't buy into that limited way of thinking so easily. I would visit the likes of Roast/Dessert Storm/Lazerdrome and even a few events at The Hippodrome and hearing jungle blearing out of these huge systems with the likes of Randall, Jack Frost, Ray Keith or Dr. S. Gatchet was an incredible experience. You were also raving alongside people you saw on a daily basis in your estate or local area, school or college, which helped spread the music and culture very quickly. In fact it was when the split occurred that you really see the likes of Kool FM becoming hugely popular and further contributing to the growth of the Jungle scene.

I was always into all strands of Jungle so I also kept close tabs on what the likes of Bukem & Fabio were doing and would occasionally make it down to Speed/Raw then later on Fabio's night when they went their separate ways. The jump up/hardstep clubs could get quite hectic at times so these more melodic events were a nice break from things but the music was still energetic just in a different way. More melody, slower tempos and a more easy going, open-minded(?) crowd. Well, most of the crowd. There were a small snobbish element in there as well who would

turn their noses up as soon as something to 'ragga like' got played but I guess every scene will always have it's snobs and small minded folks :)

Q: In the music's heyday, roughly how much revenue was generated by a release? How much would a release cost to make?

Well those were great days for vinyl and a flop would sell about 800-1200 copies…I shouldn't say flop but this wouldn't be a particular good or well received tune. The average release would see 1500 upwards and the bigger, known tunes would sell 4000 upwards with the 'hit' tunes hitting the 10,000 mark and more.

From what I could remember the cost worked out to be 1 pound per vinyl pressed on the lower numbers and this would decrease the more you pressed. As an artist you would make around 1 pound per unit sold after all costs were deducted and the label took it's split, on top of that you would get publishing which was quite substantial if you had something played on the radio, signed to compilations and also sold a lot of units. Sometimes the publishing side of things would make the physical royalties look like small fry!!!

Like I said, that was great days for vinyl and no matter what anyone tells you there was a lot of money going around and people in and around the music scene could eat well and have a good annual income from making music alone.

Q: Earlier on you mentioned your history with the sound system. Do you also have knowledge of Dub culture as it pertains to UK sound system culture and Jungle music? How so?

From what I could see growing up in the late 70s and 80s is the soundsystem culture was something that originated in Jamaica and was basically exported over to the UK once Windrush took effect in the late 40's and 50's. I'm from Jamaican parents so I was always surrounded by the culture. As a youngster I remember my step-dad running a soundsystem with his brothers and pretty much playing parties every weekend, if not elsewhere then at my house. To me it was just the way everyone

lived, I thought it was the norm to have a huge soundsystem in your front room and stacks and stacks of vinyl and tapes.

It was when I got older, in my early teens that I started to understand a bit more about the history of this culture and it's relevance in the UK. For many Black people it served a myriad of needs. Community, friendship, music, dance as well as economic needs were catered for with these parties. You know, much of the door policies in the UK were quite restrictive (racist) so it was impossible for us to get into many of the established clubs at the time […] So a whole community of people were forced to build something away from that, something where you could dance away the troubles of the week and still retain a connection to your heritage without worrying if you could get in to a club because you were the wrong colour (or had the wrong shoes on!). Many believe when hardcore became more reggae influenced that it was racist club owners that gave jungle it's name by saying the were not allowing that 'jungle bunny' music in their clubs and producers at the time reversing that on them and using it to label the music as an act of rebellion. How much validity there is to that theory I don't know.

Q: Have you ever had any interactions with pirate radio stations? Could you tell me about these experiences?

None really. I listened to it all my life whilst growing up and living in London and loved it but never got involved. Actually the engineer I mentioned, Matthew Guadeloupe, him and his brother Justin became morning DJs on a station back in the 90s, I can't remember the name of it but it was the closest I came to being involved in pirate radio as I'd pass by the studio occasionally when they were on.

You know, radio's an unexplored area for me. I'd actually like to try having a radio show someday, not necessarily a podcast but actually having a show, going to an actual place and being involved with people in running a radio show or station. It really holds an important place in my life and for the first 12 years of my life was the only way I could independently listen to and record music until I started buying records in around 85/86. Even then radio played a huge part in my musical education and development. So, I feel like I owe radio something, some part of my

life and would like to give something back to the medium one day. Before that I'd have to sort out my erratic and scattered music library though and maybe practice my Barry White speaking voice :)

Q: When I started making music, I would take a breakbeat, then make a copy of it, and cut off the first note of the copy. Then I would copy this copy, and cut off the first note of the copied copy. I'd continue with this until the end, and this way I could access any point of the break and connect and parts of the break (by adjusting the release time of the held note and triggering a different note) while preserving the original feel of the break. Later on, I started to use recycle, which outputs individual slices and a midi file. How did you go about this? Why? Were there constraints due to the gear? Did you change techniques at some point?

The way I used to chop up breaks was to sample the whole break into the Akai sampler then apply some effects like EQ, normalize. Once I got something that was different enough from the original but still useable I would make a copy, trim the sample to the start of the next hit and copy again until the whole break was chopped into each hit. (The same technique as yourself)

Then I would set those samples up within a program on the Akai and assign each one to a different key and start to compose a loop in Cubase while getting the tempo right and altering parameters like envelopes, filters, pitch, etc.… When I got an Akai cd3000xl I started adding in the internal effects on some parts and when the s6000 arrived I could actually resample the whole loop within the sampler and start again. That's when the real madness started happening!!

Later on I moved on to recycle to chop samples but I've never felt happy with the results in recycle for some reason and I was never able to get the same kind of flow into the drums that I got when manually chopping up beats in the hardware samplers but what it did have was ease, speed and the ability to save in a variety of formats so I could send the samples to Logic (when it was on PC) and compose using the EXS24, which is/was a brilliant sampler that I really do miss :0(

The one thing I learnt using recycle was to get the break sounding right before you went to chop it up. If you got it EQ'd exactly how you wanted and got a nice, clear sound, Recycle found it super easy to find the hits. It was then I learnt how to clean up a sample that had a bit too much 'mud' and unnecessary artifacts with simple equalization and a small amount of compression.

Presently I tend to use drum hits when composing drums so have no need for chopping up beats and recycle but I do see myself returning to using breaks sometime soon and will start to look at new ways of doing this. Kontakt seems capable but I'm not overly impressed with how it handles chopping up beats and feel it is quite cumbersome in this regard. Maybe I'm just not using it right???

C.12 Macciochi, R. (Macc)

Q: Tell me about the music scenes you were involved in before Jungle and Drum & Bass.

I wouldn't say I was involved in any scenes—I was just a kid playing drums, had a couple of rubbish bands (and one really good one), and was listening to various sorts of music. Jungle was just one thing around the place in my younger years, but not something I really listened to a great deal. I was 14 in 1993 when it was really taking off, so it was all around school. I didn't really connect with it until a few years later though. While at University, I got more into making music with a computer, and was a part of a loose collective making all sorts of nice electronic stuff. It was all just for fun, not a real 'scene' or anything.

Q: How did you find yourself involved in Jungle and then Drum & Bass?

When I went to University I took up DJing, because there were turntables there and it was a good way to get stoned and be sociable. Ok so it was mainly the getting stoned bit. I started buying some records, fast forward a few years and I'd got really into the more drum-oriented stuff (Reinforced, Paradox, etc.). I got back into actually recording/making music with the advent of programs like ACID, and alongside the collective stuff mentioned above, recorded some terrible drum takes, stuck some bass and atmospheric sounds over them and sent out a 4 track demo to Paradox. He signed one of the tracks but insisted on my tidying up the drums. So I reprogrammed what I had previously played, using a whole ton of individual drum hits I recorded, and the track was eventually released on Outsider. I sort of got stuck in doing drum n bass from then on.

To be clear—DnB was never my first love, though I've always enjoyed making it. I always felt a bit guilty having 'used' it to get somewhere in music; there are true junglists who still work in offices while I've gone via dnb to end up running a studio. Bit cheeky really…

Q: Did any of your friends also get into production or DJing? Or was this a solo endeavor on your part?

Completely independently, my friend John/dgoHn got into electronic stuff when he went to University somewhere totally different from me. I remember he sent me a double CD of stuff he'd copied, some of which are still among my favourite tracks ever. By the time we returned from Uni we were both using computers to do stuff, though of course he was using rubbish software (Deck 2) on a Mac. That had a profound effect on how he made music, which persists in his stuff today—but that's another story…

Q: What year was it that you picked up DJing?

Must have been 1997/98.

Q: [What year was it that you picked up] Recording?

I'd been recording since I was a kid, doing joke radio shows with my friends, haha. I was recording music at 11–12 though, which would be around 1991 (HOLY SHIT!!). I was most definitely recording/mixing my own stuff by 1992, that I know for sure.

Q: Which tracks did you send to Dev? I'm assuming the one you are referring to was Gutteral? How did you make it?

That was done by playing the drums (basically a beat I came up with that was in the Paradox mould) and making a tune along to the recording. Like I say, it sounded terrible and that was really the thing that got me started in drum programming. I explicitly remember panning the old recorded/live drums left and the programmed drums I was making to the right, so I could make sure it played exactly what I had played for real. That was kind of weird, haha.

Q: How did you learn? What gear/software were you using for production?

I'd been mixing for years so that was already well bedded in (though I remember struggling with red lights not sounding as good as they did on the old Tascam multitrack), and programming drums was a piece of cake from the word go. That sounds arrogant, but you know…I'd been playing for 7-8 years or something by this point, so it was just a different way of doing the same thing. And you could fix mistakes. :D

When I very first started, I was using ACID version 1, and a dodgy version of Sound Forge. Oh, and Cool Edit Pro for noise reduction. All the Radium cracks. Those really were the days…

I got into Cubase (which I had used before but only when it was midi only) around v3.7 when Neon first came out, and didn't look back from there. Using Soundfonts on a Soundblaster card, Reaktor v1 via Hubi's Midi Loopback Device…all that stuff.

Q: So everything you've done is based on software then?

The stuff I've done in dnb is mainly done entirely in software, though it depends on how you view recording and using your own samples, say, of one's own drum kit, or guitar or whatever. I've also used real live musicians for some stuff, knowing that they had exactly the sound I was after. One particular example being the track Be Like Water, where I had the melody but knew I couldn't get the sound I wanted; it had to be my friend Ian Doty (aka Dodz). That boy has guitar tone to die for.

Q: Can you explain the evolution of your setup (and possibly tracks of yours that you associate with particular setups)?

I used software only for a long time, before beginning to integrate cheap, characterful hardware effects a bit later on. I have a deep love of spring reverb, and it's one thing that is arguably too complex (read: rubbish) for proper software

modelling. Universal Audio did extremely well with the spring unit in their RE-201 Space Echo plugin (and they have a great article on their site explaining why it's so hard to model springverb), but it's still too static. I also liked to use cassette for tape effects—much better than any plugin.

Having mentioned the Universal Audio stuff, I am a big fan of their UAD cards/plugins. They do great stuff and really bring a nice sound to the table. They can be quite addictive…

Q: Any advantages/disadvantages to any of the software/gear you've used?

Hmm, everything has advantages and disadvantages. Most general it's a case of sound vs. convenience, though the gap is closing year on year. If you ask me it's about finding the balance of both. Nothing sounds like real tape, though the newer UAD plugins get very close, so if you really want that, you 're going to have to deal with the I/O, realignment of everything etc. etc. Really, you can make a great mix whatever way, whatever you find most comfortable is most likely to give you what you think of as a good sound. That makes making music much more satisfying, when it sounds how you want it to in your head!

Q: You mentioned dgoHn earlier and described working with him. Could you explain in more detail how you guys interact when making a tune, and how that differs from your normal workflow?

I should preface this by saying we haven't made any music together for 4 years or something—we used to live near each other, but don't any more. Essentially, back then the process went something like this:

- Go round John's
- Get stoned
- Chop up break, make new beat, hand over to John
- John plays […] melody stuff, puts in one or two notes as a bassline
- Call John a […], compliment is duly returned
- Start eqing stuff while John gets more stoned and falls asleep

• Write a few parts, maybe have a 32 bar loop

• Laugh at John for being asleep

• Go home

• Come back a week later and John has gone mental on the loop, changed it, deleted the bits he didn't like that you really did like, expanded it into a full track, done loads of edits that don't sound anything like a drummer might play, moan about that, he says he doesn't care, 'why does it have to sound like a drummer?', argue a bit (ok, a lot), eq a bit, work on it a bit more, get stoned, play Grand Theft Auto. Think of 'clever' title. Something like that. I miss those days…

Q: The live element is a big part of your persona. Can you explain how you've incorporated your instrument into your music? How does this affect the new music you make and vice versa?

This is a very interesting, and also pertinent, question. I've kind of come full circle. My musical life, potted: I started playing drums way before anything else, and all I ever wanted to do when I started making music with a computer was record my drums and make tracks along to them. I got heavily caught up in break editing etc., ended up making those tunes, and then doing the live show. The live show is the same track with the breaks muted, and me doing the drumming live. I never listen to my own music, so after playing these tracks so many times, they had effectively morphed into 'that's how the track is'. When I did listen to one or two of the original, programmed versions for work reasons a while ago, I was surprised at how far they'd moved; the basic groove was the same, but the interpretation of the live thing just felt so much more right. As you'd expect, I suppose. :)

Now. In my work I am in a studio all day, so I've not made any music for some time now, but I miss it terribly. However I just can NOT be dealing with the 'required' break editing. It has to be a certain way, which takes time, but half my job is editing. It's just not fun, especially when I could just play the bloody things. Ok, so I am not a good enough drummer to play 'computer tight', but I don't really care about that any more. I just want to make music, and have it be sustainable/easy/painless, dare I say FUN. So I am setting up a corner of my studio

warehouse specifically for this. Sit down, headphones on, hit record, play drums, job done.

So, after this painfully long reply, I'm back where I started. Just hopefully better equipped…sadly not a much better drummer!

Q: What music has influenced the sound of your music over the years?

All of it. I think it's very important to take 'negative inspiration', if you like. Even the most brainless pop music has stellar production values; there's something to like about almost anything. Part of my job is being able to answer the dreaded 'so what did you think of the music?' question. You can easily end up groping for something like 'I liked the harmony part on the second line of the third chorus, that was great'. That's actually very close to the truth! Anyway, I like to think I learned this skill around the same time I started to grow up, and open up, a bit musically. I don't understand the 'X music or stfu' types. There's good and bad in whatever you listen to. You have to eat something to know you don't like it, but you might like it cooked in a different way…Anyway. Enough food analogies!

To give you an actual answer: Musically, if I had to name names, Slint would probably be the biggest single influence. I daresay John would say the same. It's pretty much the one thing we don't argue about :)

Q: Regarding your production work, would you say that the overall landscape of the music has changed since you began your life as a mastering engineer? If so, how? When did you begin?

[…] Certainly I hear less Paradox-alikes than I did, though the general proportion of amen-manglers remains about the same. In general you might say things are a touch straighter rhythmically overall, but there were signs of this anyway. Maybe I'm just hearing more of that…I dunno.

In any case, I'm hearing less dnb overall, but I suppose I'm just getting work from a wider variety of sources (ok; a lot of dubstep). But the people doing it are doing it properly, so that's something.

Q: Let's talk about breaks. Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? why? How many do you have in your collection?

Ha, I can't remember how many I have, but last time I looked (years ago) it was probably 1000 or so. In terms of how I select them, I dunno, it's a pretty nebulous group of factors:

• the sound of the drum kit (tuning, etc.)
• the sound of the recording (reverb, grit, etc.)
• what the drummer actually plays
• resulting from the above things, 'what could I do with this?' i.e., flexibility/ability to express

My interest in breakbeats (and subsequently dnb) started purely from a drummer's perspective, really. 'Nice beat, could I play that?' or 'how the hell do they lay that?!' (see: Funky Drummer)

Q: Can you explain your process of converting a break to used drum sounds?

Cut exactly what the drummer played. That's the long and the short of it. No other approach makes sense to me. I see it as using what was played, and re-playing it another way.

Q: Please rate on a scale of 1:7 (7 being the most often used) the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reverse reordering
• multibreak layering
• multibreak alternating

• timestretching or start point manipulation

• filtering

• flanging

• reverbed

• other:_____

• pitch modification: 2

• distortion: 4

• resequencing: 700000000000000

• reverse reordering: 1

• multibreak layering: 4

• multibreak alternating: 3

• timestretching or start point manipulation: 2

• filtering: 6

• flanging: 4

• reverbed: 5

• other:_____

Q: […] when you say Paradox-alikes, what do you mean (can you explain what the characteristics of this music are)?

Old funk breaks re-arranged at ~170bpm to make new rhythms, hopefully with a coherent, tight groove, accompanied by deep sub bass and usually ambient/moody samples of some sort.

Q: You've mentioned flexibility in breakbeats. Which breakbeats would you say embody this characteristic the most? What do you think governs this?

If you want to be able to totally rework something then tails are your enemy—so reverb and ride cymbals can be very tough. Ride cymbals 'expand' sonically as you play them, so grabbing a snare from later in the break to replace an earlier one may sound completely unnatural. This might lead to a workaround whereby you have to

take a little segment from later to use an entire ride part (which may encompass several other hits), thereby restricting the freedom you have in other drums—if keeping it natural is a concern of course.

As for which breaks…I just can't really remember many names (sorry!!).

Q: How do you go about cutting the breaks? What software do you use? Do you cut stick bounces as well as full independent hits?

I mostly used Recycle back in the days where I actually cut stuff, but moved to Zero-X Beat Quantiser for a while. It depends—I did that if I was going to use the slices in a sampler, but often later on moved to just using audio in Cubase's arrange window due to a) excellent x-fade functionality, and b) being able to layer other stuff alongside. So maybe there was an isolated cymbal hit somewhere else is the break that could come in handy for making tails out of nowhere, which could get around the problem described above. Sometimes. Ok not often but it DID happen. Honest.
Stick 'bounces'—of course I cut them. The idea that they are random bounces and somehow unrelated to the beat just because they are quiet is (very) mildly offensive, unless the drummer is really bad. They'll be a subdivision, or intended to be a subdivision; be it a 32nd or a 16th triplet or whatever, they are *played*. Therefore they are cut and resequenced appropriately. The obvious 'exception' is a press roll, where they are deliberately one stroke and a tail of pressed bounces; they can be cut as one (but are very rare really).

Q: When you resequence a break, do you try to preserve a feeling of the downbeat that is somehow informed by the original break? What do you have in mind when you are making a new arrangement?

Past tense man—my resequencing days are pretty much over to be honest. Anyway, I think that if you have any intention of keeping something natural then you are obliged to have the feeling informed by the original break. That might be another way to define flexibility—[for example,] being able to play whatever you want with the break, while not losing the feel. This might be why [the] Amen works so well.

Q: Can you tell me about the different movements/major changes in the music, and your impression of what caused these changes that you've seen (e.g., the 1994 shift away from Ragga Jungle—even if you weren't into the music then)?

It's a horrible way to express it, but it basically got turned into more 'white' music. An increasing emphasis on technique and cleanliness over vibe and soul. Dubstep's suffering the same thing now.

Jungle also suffered because of the bad reputation of the rave nights, attracting wannabe thugs/gangsters and so on. I wasn't into it at the time, but I saw it all happen—growing up in East London it was all round, all the time. One of the worst things happened at the local club we used to go to, the Island in Ilford (we went to the indie nights with our floppy hair and Doc Martens), a dude got refused entry and they came back and shot the bouncer through the door. That was 1996, which puts it right around the time the sound started to change significantly. Could be coincidence though.

Q: Where do you see Hardcore, then Jungle, then Drum & Bass coming from? Are there social/musical/technological influences or movements that you see as driving the development of the music?

I see it as Essex and London music. I am from Essex/London and grew up in that area, so maybe I see it through that lens, but most of the 'senior' people I know and have met who have been in it from the start are from that kind of area. Much like any trendy/cool underground music, eventually the posher kids get a hold of it, get mummy and daddy to buy some kit for them and away you go. That's a massive bastardisation of what would/could be a huge essay in its own right (written by someone OTHER than me, haha), but I can think of at least two 'names' that got into it that way.

Technologically, digital/plugins changed the face of it forever, but again, that's a huge topic that I'll probably save for my blog…

Q: Conversely, do you see the influence of Hardcore, Jungle, and Drum & Bass outside of the genres themselves?

Adverts. It's on adverts all the bloody time…

Having said that, I think that it did help push use of technology (specifically bonkers bass sounds). The sad thing is that somewhere along the way, at some point in all the history glossed over above, the archetypal two-step rhythm became 100% synonymous with 'drum n bass' in the general public's mind. And that's a real shame.

C.13 Minner, D. (AK1200)

Q: Please tell me about the music scenes you were involved in before Hardcore, and Jungle. How did you find yourself involved in Hardcore and then Jungle?

I owned a small record store in 1990 or 1991, I don't recall really. Anyway, back then, it was all just underground music. Techno, Acid House, Hip House, Balearic, Breakbeat….all the pre-rave stuff. I guess around 91, things started to split up. All the break beat stuff started to get more wild, and a little faster, and started using cool samples in new ways, and really crafting a sound of its own. The other side of that coin became progressive house, where it was about the long journey and slow builds. I think from then on, it was Hardcore Breakbeat. Then it was called Rave, or Jungle Techno, then Darkside, then Hardcore Jungle, then Jungle, then Drum and Bass, etc. etc.

Long before that however, I was always following music scenes and the underground edge of popular music. For whatever reasons, I always had an upper hand on cool music compared to most of the people I knew, I guess I dug deep into music from an early age and unknowingly crafted a career from it.

Q: Do you remember any of the producers from the 1991 era that really stood out?

From the pre-rave era, it was more about the labels, as sometimes the artists would have multiple names. A few artists that stood out and were pretty consistent were 2 Bad Mice, Bizarre Inc., Moses P, Wood Allen, Rhythm Device, Genaside II, Lords Of Acid, Altern-8, KLF, The Shamen etc.…but the labels, like R&S, Kickin, Chill, Production House, Shut up and Dance, H.U.M., Jumpin and Pumpin, ZYX, XL Recordings, etc. all were instrumental in paving the way for what was to come.

Q: Did you have any friends that were DJs or producers at that time?

The people I came up with in Orlando like Kimball Collins and DJ Icey, etc., but way back then the records used to have contact phone numbers on them, and they were normally the artists cell phone. I used to call all the numbers to all the records I liked and introduce myself tell them I love their record and could they send me anything new etc. That was pretty much how I quickly became popular with these people. I remember getting a record in by Urban Shakedown, and it had 3 different numbers, as there were 3 different people in the group, and the number I had called was Gavin (Aphrodite), he, as most all of these people were simply excited that someone from America was feeling their music and, I dunno, maybe that gave them the sense that their music could become something bigger? So yeah I started all these relationships with scores of artists and labels in the UK. My closest relationship ultimately would be with Sub Base and Moving Shadow.

Q: How did you come to meet Dan Donnelly and Rob Playford? What kind of working relationship did you have then?

Well, both of them were great mentors to me in my life. I am not sure who I became friends with first, but in 1992 I started going to the UK quite a bit. I would stay at Dan's house or Danny Breaks' house, or stay with Rob, or with Simon of 2 Bad Mice. All of them became dear friends of mine, and working partners to various degrees. Dan Donnelly owned the Sub Base label, and was also recording under the name Q-Bass. He took me in and showed me around, and looked out for me from the beginning. He got me my first gig in the UK December 1992, and I was the first American to play UK pirate radio earlier that year because of him. Danny Breaks worked at the store Dan also owned, called Boogie Times. Danny and I became really close friends and later worked together on several tunes. I also met Shimon for the first time through Boogie Times, which also led to Andy C and the Ram records crew. We did a Suburban Base Rave here in Florida in June of 1995, which was the first time Andy C had played in the USA.

With Moving Shadow, it was a bit different. I initially got to be really close friends with Simon and he would send me loads and loads of records every month,

and write down what style each of them were and what sort of vibe it was etc. Icey actually brought both Moving Shadow and Sub Base crews over to his club The Edge many times each in the early 90's and this made all of us get a bit closer as well. Anyway, Rob and I started talking all the time, and over time we became very close friends, I would say he is one of the best friends I have ever had, and even today, the thought of him losing trust in me, would be devastating. He helped teach me so many things about music, the industry, how to make music, how to read a crowd, etc. I guess everyone I have ever known has helped mould me into who I am but Rob especially is the one who has stuck with me over the years and never once lost contact. Over the years at Shadow, there were some falling-outs. Needless to say, at a certain point, Rob entrusted me with aiding the label with signings and picking people to get remixes from etc.…I helped with the label all the way up until Rob decided to let it rest and remain one of the best independent and influential dance labels of all time. I still speak with both Dan and Rob, and pretty much everyone else I ever developed any friendships with.

Q: Can you tell me more about your experience on pirate radio?

Well I had always heard about Kool FM, that was the big station for jungle. From what I recall there were loss of little stations though, what I knew about them was it would be a shitty little set up somewhere in an apartment building, and they would have someone driving around nearby with the transmitter so they could maintain their signal without getting locked in by authorities. I think that was half the fun of it all for them.

Anyway, my specific experience was in 1992, I was in Essex, Romford to be exact with Dan Donnelly and Winston aka Runtingz was going to do a little set on format FM for Swift and Zinc's show (side note—this is not Mampi Swift I am referring to, there used to be a DJ swift, who was a white guy with blond hair). Anyway, since I was in town, I was invited to do a little guest slot as well. so yeah like I said before this was in some seedy little flat in a lower income apartment building, and the turntables were set up on a kitchen counter by the sink, and I did my set. Actually, I remember they recorded that set and there was a rewind I had done, and

they used that rewind for one of the tunes on one of the Sub Plates series' and etched shout to the AK on the inside of the vinyl. Don't recall which tune it was, but it has MC Special A saying "my man come again 'cos you know this is rough" and that is the sample used in the tune, but yeah that was from my set on the radio.

Q: When and how did you start producing? What gear were you using?

My very first introduction to production was in England, and was simply watching, but I believe they were using Atari computers and there was an Akai 950 or 1000 sampler. From the Atari it went to the Mac power PC. I started on Cubase, as that was what everyone was using. This was 1992/93 so yeah Cubase was the one. My first actual thing I done was a remix for Flex and Fats "somebody" which was released on a [collaboration] LP between Moving Shadow and Sub Base, called The Joint. That was 1994. It was always Mac with Cubase, and various out board gear. I had some analog synths, like a Yamaha CS60 and we had this old school science box thing that was a sine generator, and we had a couple compressors and eq and some effects racks. Nothing major, just enough to make a tune back then I suppose. Later Logic became the software of choice, but I would spend my career bouncing back between the 2.

Q: What would you say your breakthrough track was? Could you walk us through the creation of this track (e.g., motivation, gear, samples, any particular sample modifications etc.)? Did your experience with this tune change how you approached making subsequent tunes?

I don't know that I ever really had a breakthrough track. I have had very successful remixes that preceded any of my better known original tunes. I have worked in so many studios with and without other people for so many years that I am not sure I could walk you through any creation process unless you asked me to think back to something specific. All of my tunes mean about the same to me, I mean, I never really separate my feelings from them or have less or more emotion invested to any

certain tune. Its how the general public receive each tune that makes it significant to anyone else. They are all the same to me.

Q: Can you tell me about how do you select breakbeats that are used in the tracks you make or remix (e.g., do you use the same breakbeat in the remix)? Do you prefer certain breakbeats over others?

I like to use a few classic breaks, but always looking for new ones in random places. I never really use the same break. I mean, I use certain breaks the same way, like I use amen for backgrounds much more than any other break, but don't make many amen tunes, know what I mean? Like I use it in the background with a high pass on it and turned down quietly so you can feel the shuffle and motion of it without it being the thing you hear. I do things like that with loads of different breaks, but usually on a tune, I find the main breaks to use for backgrounds and then I effect them and sit them in the back and come over the top with my main break, which is usually made from a kit.

Q: Please rate on a scale of 1:7 (1 being the lowest, 7 being the highest) the amount which you used the following (if you can, please use the entire scale):

- **pitch modification**
- **distortion**
- **resequencing**
- **reversing**
- **multibreak layering**
- **multibreak alternating**
- **timestretching or start point manipulation**
- **filtering**
- **flanging**
- **reverbed**
- **other:_____**

• pitch modification - 7 - need to make sure whatever I use is in key to what I need, pitch does this
• distortion - 7 - a must for beats and leads
• resequencing - 7 - again, a must for beats and any samples etc
• reversing- 3
• multibreak layering - 7 - essential for making a good jungle roller
• multibreak alternating - 6 - everyone needs the switch ups
• timestretching or start point manipulation - 7 - essential for production of any genre
• filtering - 7 - bass
• flanging - 2 - eh not so much anymore
• reverb - 5 - good for snares and vocals and lone lead or bass stabs

Q: Here does "kit" mean an actual drum kit, or samples from sample CDs? If the latter, are there sample CDs that have been "go to" sample CDs for you?

Initially I would go through sample CDs and drum kits on there, find a couple kicks, snares, and hats. It could be from 20 different sample cd's and only find 1 kick I like. I do not have anything that is "go to" apart from a template that uses a basic break shuffle. I can't give away all my secrets, but I try to find a few kicks and layer them together and EQ them differently so they stack. Of course I remove all of the frequencies I do not want the kick itself to have. I do the same thing basically with snares. For hats, I tend to only use them on 1/4 notes, 1/2 notes and full notes as I use the aforementioned high passed breaks for all the motion.

Q: When you perform manipulations on breakbeats, would you say you try to preserve an ordering that emphasizes the main beats? the downbeats? (for example, do you keep the ordering somewhat similar to the original break around the downbeats?)

If I chop up a break completely and re-use it, then I won't bother with what it originally sounded like, but usually, yeah doing edits is just a way to maneuver the swing in the percussion to fit better with the pattern my main break has.

Q: [Could you explain your thoughts on] modern tunes and "the drop"?

I come from the days where dance music took it's influence from traditional music genres. Disco, Rock & Roll, Funk, Soul, R&B, Hip Hop, Reggae, Calypso, Jazz, Rare Groove, etc. …Music had structure. Songs had structure; they had a hook, a groove, and a melody. They had substance. The majority of music, well dub step music specifically is an 8 or 16 count, [and] then balls to the wall. You get maybe 64 bars of that, [and] then break down and the DJ can simply slap the fader to the next tune. Even with DnB, when things were made especially DJ friendly, there were usually 32 bars, then either a breakdown or the drop would come, but it was always done so it was mixable. Beyond that, there were always huge selections of tunes that were "builder" tunes, they would gradually add 1 or 2 elements at a time and layer after layer, become a power house of a tune, which would then strip parts away for the new mix to come in and breathe.

Q: Can you tell me about the different movements/major changes in the music, and your impression of what caused these changes that you've seen (e.g., 1994 shift away from Ragga Jungle)?

The things that change music tend to be the technology, and the kids who use the technology. Everyone always looks for the next thing, and then they try to perfect it, once someone does do something out of the ordinary, it becomes the standard, then it becomes emulated until something else comes along to replace it. It's how things are now, and how they always will be. There is nothing wrong with that, but every few years, someone out there needs to remind people how special things were in the first place, and what made it so special, so they go back to the basics and revisit and older sound and recreate it with modern technology, and it creates a new bit of momentum for more talent to come in. We are at that point now in EDM, where

someone needs to go back deep into the basics of song writing and come with an incredible album of those style songs, to get people to want to work that much harder to find influence in something other than what they know from the last 2 or 3 years…

Q: In your opinion, what pieces of technology have defined the genres at different points in time? Is there a definable sound that comes from certain machinery? If so, is it possible to describe it?

The biggest bit of software that has come in recent years, which caused a significant change in the sound of a tune, has been Native Instruments MASSIVE. Every dub step, moombahton, trap, etc. producer has rinsed that synth out for all it's worth, and in turn made almost every single tune out there sound the same. Its the synth that makes all the drill sounds or the wobbling LFO patterns.

Q: In your experience across the many years you've been involved in the music, who are some of these producers that excel in the song writing aspect?

The people who have been in it for a long time and stay relevant are those who excel in this field. For the genre I represent specifically, I would say J Majik, Total Science, Gridlok, A Sides, Teebee, etc.…so many.

Q: Where did Hardcore, then Jungle, then Drum & Bass come from? Are there social, musical, or technological influences or movements that you see as driving the development of the music at its different stages?

When house music and techno fused together and the "scene" exploded with lots of new fans, new kids came and sought out the craft of production. These new kids had more of an urban background, and wanted something more edgy so rave music happened, and hardcore was an extension of that, made by kids who liked hip hop and wanted the raw feel of hip hop and scratching etc. blended with their tunes.

Once that happened, momentum carried it through. Ultimately it was a social thing, this was the first chance many of these kids had to find a name for themselves, and they used all of their influences to portray in music what they felt in their heads from all the music around them. It's been like that since the beginning of time. You are influenced by what you are exposed to. When jungle came. It was even more of a culture thing. Mostly black youth in the UK with soul and reggae influence came in and learned how to chop beats and utilize a sampler. Jungle became known as the UK's response to American Hip Hop. Drum and Bass came along soon after, once a new wave of mostly white middle classed music hopefuls came of age and put their twist on what they had been listening to.

Q: Conversely, do you see the influence of Hardcore, Jungle, and Drum & Bass outside of the genres themselves?

I see influence of jungle and dnb in almost every type of music around. Certainly anything referred to as "bass" music has strong influence from dnb. Its a shame these people don't dig deeper to the past to truly gain respect for the evolution of music, because that would enable them to see the bigger picture and use influence from a greater period than say the last couple of years, which is where people are stuck at now.

C.14 O'Dwyer, C. (DJ Code)

Q: Please tell me about the music scenes you were involved in before Hardcore, Jungle, and Drum & Bass. How did you find yourself involved in these genres? How did you come to be involved in Hardcore, then Jungle, then Drum & Bass?

I was interested in music from an early age, I can remember being 5 and dancing around the living room to 'Chart Hits 81' when my Mom used to play it. I was mainly involved in the 'Irish daytime radio' scene as I grew a bit older but that's as far as it went—pop music. I was also learning the piano and some other instruments from the age of 8 or 9 and did so until my mid-teens, but I wasn't too interested in pursuing that side of things even though I did like music a lot. The music being taught wasn't really to my taste.

I graduated towards electronic music in the early nineties. I was living in the countryside in Limerick county and all my musical knowledge came from what was broadcast on national radio. In the eighties I picked up on bands like Erasure (don't laugh!) and the Pet Shop Boys who had a very electronic sound. Snap's - 'The Power', and Inner City's 'Big Fun' also made me sit up and listen. I noticed myself focusing in on the drum tracks of different tunes. I used to love John Secada's 'Just Another Day Without You' because every so often there was a double snare hit that I loved! You can only imagine how happy I was when things like the Shamen and the Prodigy finally infiltrated the mainstream! DRUMS!

I had a friend in secondary school in Tipperary Town (shouts out to Dotsey!) we used to swap tapes and he used to record loads [of] dance music from MTV and give it to me. He was pretty much the only guy in the whole school besides myself that was into music like that!! Long story short, a cousin of a friend of his lived in London and was over on holidays in Ireland and brought over a load of early Hardcore (as Drum & Bass/Jungle was known at the time)—LTJ Bukem at Dreamscape, DR S Gachet and DJ Monk on pirate radio and a few other bits and pieces. Once I heard those tapes that was it. I mean The Prodigy were doing a similar

style at the time but the music on these tapes had more attitude. It was a crazy mash up of lots of different styles and the drums were unlike anything I had heard before. That was the summer of 1992 and I listened to copies of those tapes over and over. I began reading some dance music magazines and got to know some of the names of the people behind the music. One interview that was particularly inspiring was with a guy called 'Goldie' talking about the UK 'Hardcore' sound. He talked a lot about Reinforced Records. Shortly after reading that, I just happened to find a mixtape by DJ Randall called the 'Definition of Hardcore' in a local music shop in Limerick. I dunno what the chances of that were because they didn't stock things like that very often but it was just meant to be I suppose! I found Reinforced's address on the inlay and sent them a letter asking them to send me a catalog of their tunes. A few weeks later I got it and from that I bought my first Hardcore/Jungle record, the Enforcers 5 picture disk—the music amazed me and that big 'Metalheadz' logo printed onto the disk made an indelible impression on me. There was no turning back ! That was the start of what would become a very large Jungle/D&B record collection!

Q: What are your favourite Darkside tunes?

1. Nasty Habits – "Here Come The Drums" (Reinforced) :: 1992
Probably one of the first dark tunes that became an anthem I think. Dark synth sounds and mentasms are the main hooks and some back-wards vocals make it sound darker still. Love it for its rawness and energy. Also, because if you listen carefully you can hear what actually sounds like a cartoon style bomb lighting over the beats (flanged or something) with the consistent repeated alarm sound going off and the sustained one string over beats, it makes for all out mayhem. The production is very good considering it's from 1992 with the amen snare slamming harder and crisper than usual.

2. DOPE – "When I Was Young" (Original Dope Re-Edit) (Rugged Vinyl) :: 1993
The darkness in this one is mainly created with the bell / synth combination that comes in during the first breakdown and the "warbling" feedback style sounds underneath.

The atmosphere is added to by the use of a sinister voice repeating what sounds to me like "She says" (but who knows!) Other sinister elements are introduced and re-introduced during the track—another vocal with some strange "freezing" effect as the voice trails off is also quite unsettling (comes in at 3:03). The bassline has quite a dark/menacing feel throughout.

I like the dark euphoria of the tune. Also how the dark bell and synth combination is made into the hook of the track, very different to the big rave style hooks prevalent at the time. Like most of my favourite tunes it was featured in a mix I played a lot in my early days of listening to this music (DJ Ratty - I think it was the Quest 9 mix) which gave it an extra resonance.

3. Boogie Times Tribe – "The Dark Stranger" (Suburban Bass) :: 1993

From the intro it's clear…Horror film style synth drones/sinister laughing sounds and then the drums and a mystical sounding echoed riff are followed by the moodiest of sub-bass lines. "The Dark Stranger" is repeated in a sinister way, the effect of the words helped with some time-stretching.

Time-stretching is also used on some of the beats in breakdown sections (like at 2:02)—these beats, when accompanied by the eerie vocal material are really impart a feeling of darkness. Also many samples/sounds are pitched down to make them more gloomy.

I love the balance between the darkness and the mystical in this one. Also the way double kick/crash at the start of the drum loop is answered by two more crash (or open hats ?) at the end of the loop. The drums in this case being like a hook of sorts. The overall arrangement is constantly changing, stopping and starting but always remains interesting and coherent.

Goths need to hear this stuff !!

One other track I was going to put in here but it just feel outside the top 3 in the end (though you might like to hear it anyway):

Anthill Mob – "Black Rushin" (Anthill Records) (1993)

This track is almost anti-rave. Very gloomy and moody throughout and not even that much focus on mayhem like a lot of other dark tracks of the time (i.e., "Here Come The Drums"). Also different in that there aren't that many elements within the tune

which was unusual for a hardcore track. Instead of several switches and drops this one rolls out.

[Additional comments regarding Bristol Drum & Bass:]

[It] would probably be worth mentioning V Recordings alongside Full Cycle and Dope Dragon. It wasn't run by the Bristol crew but V pretty much exclusively released music from Roni Size, Krust, Die and Suv with only the odd exception from 1993–2000.

[Additional comments regarding Techstep:]

It would be important to mention Dom & Roland's contribution to this style/sound. Also the Moving Shadow and Prototype labels.

For example this tune (still not sure if it should be called 'Killamanjaro' or 'Subway'—Killamanjaro is my bet, just [because] of the sound sources) was engineered by Dom, and was a big tune in the nascent techstep scene.

Also 'The Storm' by Dom & Roland on Moving Shadow was one of the most popular early tunes in this mould. Also I'm pretty sure Dom engineered [the Skylab] EP for Ed Rush…another definitive slab of early techstep.

I would describe Dom's sound very heavily engineered, precise and as being industrial in it's nature. Though the No-U Turn style could hardly be described as clean, Dom's tech-step was certainly a bit dirtier, with more switching, editing and filtering of the breaks. Also, while Nico tended to distort basslines, Dom tended to use this technique more on drums, a good example being 'Mechanics' (1996) released on 31 Records.

As I also mentioned, Prototype was a big influence on the introduction of the tech-step sound. Releases by Ed Rush & Boymerang in 1996 and the Prototype Years compilation and Optical's 'Moving 808s' 12" in 1997 in particular.

31 Records too…with the aforementioned 'Mechanics' by Dom & Roland + Shadow Boxing (Original & Remix). The Techsteppin compilation on Emotif Records was a big influence too and one of the first compilations to showcase the

sound. Also Renegade Hardware was another of the main sources for that sound. Early releases by Future Forces and Genotype were especially influential.

C.15 O'Shea, S. (Naphta)

Q: Please tell me about the music scenes you were involved in before Hardcore, Jungle, and/or Drum & Bass. How did you find yourself involved in the genres?

I can't say as I was really involved with any music scene before Hardcore/Jungle. I was listening to a lot of 'indie' rock in the early 90s, mainly stuff that friends had introduced me to, such as Jesus Lizard, Sonic Youth, Swans, etc. But there was plenty of other things in there too: Dead Can Dance, Spiritualized, Loop etc. and that stuff had kinda prepared me for The Orb and The Prodigy, which were my two big gateway acts that enabled me to get into dance music.

Prior to all that, in the late 80s, I'd listened to some Goth stuff: Sisters of Mercy and so on, but I was never particularly down with the sceney mascara-wearing thing, it just wasn't my thing. Music was generally more of a headphones/private thing for me before Rave, or something that you listened to with a small bunch of friends.

Q: So what was it about Hardcore? Were your friends involved too? How did you get into DJing and producing?

Dance music was starting to filter into my musical consciousness from around '91, but I didn't get exposed to Hardcore properly until '93, via a friend of a friend. Something about breakbeats had already clicked though: the beats on Stone Roses' 'Fool's Gold' for example…and of course other breakbeat rave tracks had been also charting over those years and were impossible to ignore.

However, my baptism into dance music proper came via my first E in Brussels in '93. It took drugs to get me past my previous snobbery about dance music—and to help me appreciate that its power had to be physically felt to be understood. Plus it offered a much more transcendent high than boozy rock could ever hope to. Rock had come to seem so staid to me, so tied up in the egos of its performers, whereas

dance music (initially at least) was quite democratic in its anonymity…the DJs weren't superstars, just facilitators of the experience; all the focus of attention was on the dance floor. The DIY aspect of its construction and delivery also really appealed to me. I should add that it seemed almost fitting that rock's last great hope, Nirvana—who I'd liked at first—were obviously being eaten up by the industry machine, and Cobain's suicide in '94 (on the night he was supposed to play Dublin—I even had a ticket for it) really felt like the end of an era for me.

After that, I gobbled up dance music, but I didn't spend long in 4-2-the-floor land: the Breakbeat Hardcore I'd heard on tapes just seemed to eclipse everything else—for energy, urgency and sheer creativity. Its sample-based form also seemed to make total sense; it seemed very post-modern…cutting up tiny slices of twentieth century culture and using them to make this incredibly dynamic music!

So I was buying Hardcore by late 93 and then lucked into DJing the following year via a chance offering of a Saturday morning pirate radio slot to myself and a couple of mates from a local record shop. By that stage, breakbeat dance music had been effectively banished from the dance music scene in the UK and Ireland; 'Charly' and 'Sesame's Treat' had given the entire genre a bad name and the house and techno heads had gotten musically snobbish about it. So we were like the misfits of the local scene, playing out this awesome stuff to no-one on a Saturday morning—the almost sole representatives of a genre that the cognoscenti had declared was dead.

For the next two years, I lived and breathed Jungle, doing the radio alone and desperately trying to get a club night together in Dublin. It was a weird experience—in retrospect, this was the golden age of the music, and yet for quite a while I was one of the only people I knew who was into it. Dublin really missed out on some amazing music during that time—but progressive house ruled the local dance scene with an iron fist.

It wasn't until I met Rohan in mid '96 that the possibility of bringing the emergent drum n bass sound to Dublin really began to take shape, He had had a lot of experience with promotion in London and had returned to Ireland to see if he could kick off this new dnb thing over here. I had the knowledge and DJing experience (honed from endless hours alone on the decks or on the radio), plus I was

fanatical and totally uncompromising about the music, so I guess we complemented each other! Hence Bassbin was born…

Between '96 and '99 we fought hard to get venues to accept us and to attract crowds to this strange 'foreign' music. Bizarrely, even the small number of people who liked dnb couldn't work out how to dance to it! Ireland was very white at that time…However our philosophy was to try and build a homegrown scene over time, with a network of shops, radio shows and DJs, and ultimately studios to start making our own tunes. Myself and Rohan were adamant about that; we couldn't just do the standard Dublin thing and get over foreign guest DJs for one night only with some nameless local support—we had to seize hold of the music and make it our own.

Ultimately, Bassbin succeeded in doing that for a few years, and lot of talented producers emerged courtesy of our initial efforts to make a scene. Personally, it took me longer to get into production though—partly due to my technical ineptitude and partly due to my knowledge of the history of hardcore/jungle/dnb—I really struggled to try and bring something new to the table. I guess I had high standards—possibly too high to be practical! Anyway, I started sketching stuff in 98 and then got heavily into it in 1999/2000, just as our Bassbin nights were beginning to take off…

Even though I wasn't mad about the direction dnb was going—with the 2-step rhythm dominating—it was still a very exciting thing to be involved in. And as we built an audience for a regular club night, it was amazing to be able to slowly introduce our crowds to the years that they'd missed out on—dropping older classic tunes into the mix or doing themed old skool nights.

Ultimately, the scene sorta died a death locally; a generational shift saw it fall apart by the middle of the decade. Ireland in the early noughties was going through an obnoxious 'celtic tiger' boom: cocaine and superstar excess was in; transcendence on a democratic dancefloor was out. Of course drum n bass music itself was also becoming increasingly retarded, dumbing down, without any of the charm and inventiveness of hardcore. By 2006, I'd run out of records to play and had nowhere to play them. Not long after Bassbin's 10th birthday, it seemed a good idea to pack it in and leave the scene to younger heads.

So much had changed in the interim: the advent of the internet meant that nothing would be the same any more, for good or for ill. I guess local music scenes

can still function the same to a certain extent, but in this age of information overload, that shock of the new is over. Now people can pick and choose their music culture from the internet, research it, assemble it and try it out for a while – but because it's so easy to do, there's no reason to commit. So, yeah, the landscape is totally changed.

Q: What were you using for production at the time? How did you decide on these devices/softwares?

I started off using a wav editor, Soundforge, collecting and cutting samples and doing simple cut-n-paste edits. Then I graduated onto Acid, a basic wav sequencer and finally onto a hardware sampler with Cubase as a sequencer. The sampler was an Emu 5000, a standard sampler for dnb at the time (early 2000s), apparently a very powerful processing tool, but a painfully complex one for a luddite like me. I never liked it. In recent years I moved to Ableton, which is infinitely more user-friendly and much more suited to my approach. Basically I need something that can handle lots of long samples and that can allow me to layer and edit them with ease.

My approach to making music is entirely defined by my experience of jungle. My last 2 albums ('Democracy Now') were created employing exactly the same approach to using samples.

Q: To your knowledge, where did Hardcore, then Jungle, then Drum & Bass come from? Are there social/musical/technological influences or movements that you see as driving the development of the music?

As for the argument about where hardcore, jungle and dnb came from, this has become the biggest turn off in the music to me. Youtube is filled with imbeciles claiming to know exactly what hour of what day somebody declared the beginning of a new genre or sub-genre. This endless theorising is all after the fact. Back then, people weren't wasting their lives arguing about such shit. The music was coming out too fast and was too exciting to be getting bogged down in soul-sucking debates

about which track was dnb rather than jungle. Anyone who gets caught up in that shit today is, quite frankly, missing the point.

Q: Conversely, do you see the influence of Hardcore, Jungle, and Drum & Bass outside of the genres themselves? Do you find the techniques of breakbeat/sample manipulation from the 1990–6 era relevant now? If so, how do you (or others) use them in a modern context?

Regarding this music's evolution, Simon Reynolds is pretty much 100% bang-on in his book 'Energy Flash'. He fell blissfully head-over-heels in love with the music during its hardcore phase—as I did—and followed it into jungle and then into dnb. And like me, he began to have doubts as No-U-Turn's vital early techstep began to morph into something that was more linear, flatter and basically more one-dimensional.

Some sceney UK heads don't like Reynolds—partly cos they prefer to cast him as an outsider—and partly cos he didn't slavishly continue to insist that the music was "all good" even after it began to turn to shit in the late 90s. For me, the overall 'narrative' of dnb's journey ended with later 'neurofunk' e.g., Bad Company (which I couldn't stand). IMO the militant 'survival of the fittest' creed cynically expressed in hip hop-influenced dnb had finally come true. Dnb had dumped its expressive, creative yearning—its last vestiges of Rave dreaming and had instead settled for making a place for itself in the mainstream music industry—dumbing itself down to make itself more marketable. The 'evolution' of Dillinja over that time pretty much symbolises what dnb did to itself: he went from being a ghetto-ninja with attitude, to a lumpen sledgehammer with tinnitus.

I think cocaine, constant touring and increasing exposure to crowds unfamiliar with the history of the music (i.e., outside the UK) all contributed to dnb's decline. Once the producers had cottoned on to this, they stopped making tracks that asked anything of the audience—and this is the climate in which Bad Company became such a hit – and the vanguard of the new dumbed down sound.

92–96 was the golden period for me, when the music still had analogue warmth and rhythmic urgency—and crucially: when people still didn't really know

what it was. Once the 2-step rhythm became the industry standard and took all the urgency away from 97 on, people like Paradox were left fighting a rearguard action in an attempt to save the music—and from that point on, even the periodic good stuff that made it out felt somewhat like an attempted revival: the overall forward thrust of the music's evolution had ended.

Dnb has probably had a certain technical/engineering and rhythmic influence over other genres but I don't really care about that [to be honest]: Is it an achievement for the genre to have some sports programme on tv that has a vaguely dnb-lite soundtrack in the background? Personally, I don't think so. Obviously the early dubstep scene modelled itself on dnb in a great many ways—sound-wise, vibes-wise and scene-wise; hence it was interesting to observe the trajectory of dubstep, which seemed to burn itself up even faster than dnb had.

Q: Did synthesizers factor into your music making?

No, synthesizers don't factor in at all. I'm too brain dead to be able to learn them, plus I'm not in any way musically trained. However, if I find a synthesizer at hand I may try to make some noises with it, that's about it!

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? Why? How many do you have in your collection?

Breakbeats—when employed in the junglistic style—create a powerful feeling of urgency. Pushed to the fore of a tune, they can also be used melodically as well as rhythmically (e.g., Renegade Snares or Droppin Science Vol 1), they can be used to mess with your sense of time (Terminator) or to create something that feels like an actual sound-environment (Let It Roll). Breaks have tone, character and vibe and IMO can be employed almost like words in a language. The whole 2-step rhythmic palette that came to dominate dnb is, by comparison, nothing more than a solid backbeat—a timekeeper.

I don't have any particularly favourite breaks. Obviously, as a producer, you soon figure out the enduring popularity off the Amen, Funky Drummer, etc.—they have that urgency, they can be cut-up and re-sequenced easily, plus with them you have a wide range of pitching options at varying tempos—and the breaks still retain their timbral quality. I've no idea how many breaks I have (probably thousands)… these days they're very easy to get, whereas pre-internet, you actually had to crate-dig.

Q: Please rate on a scale of 1:7 the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reversing
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

• pitch modification 7
• distortion 1
• resequencing 7
• reverse reordering 4
• multibreak layering 7
• multibreak alternating 3
• timestretching or start point manipulation 3
• filtering 6

• flanging 2

• reverbed 6

• other:_____

Q: Your last 2 albums have been entitled Democracy Now. Can you describe the motivation behind the albums? Does much of the albums' content correspond to material associated with the concept?

I guess the motivation came from a couple of different things. The US-led invasions of Afghanistan and especially of Iraq angered me but the general complicity of the western/Irish/UK media in these ventures angered me even more. Euphemisms like 'enhanced interrogation', 'contractor', 'rendition', 'collateral damage'…armchair generals with their glib talk of 'regime change', the new demonisation of Islam (as if the 'War on Terror' was actually a crusade to liberate women from their burkas—and not just a cynical oil-grab)…as a student of history, I found this new enthusiasm for war/mass bloodlust disturbing—even frightening.

At such a time—and when the effects of war abroad could be felt in an urge to roll back civil liberties at home—at such a time, the minutiae of drum n bass came to seem pretty unimportant, even trivial. As an artist, I felt a responsibility to reflect my real-life concerns in my music. As an artist who worked with samples, I was constantly hearing sounds and soundbites that begged to be used. So I began to write short pieces focused around the 'War on Terror'—and over time these evolved into the first 'Democracy Now' album (2009).

The second album arose out of my interest in post-Soviet Russia and its own supposed war on terror—against the Chechens. I'd always harboured a fascination with Russia dating back to the latter years of the Cold War—when I was growing up. Having assumed—like most people—that post-Soviet Russia was now a 'democracy' (like us?!), I discovered that not only was it anything but—but that many Russians had no interest in becoming more like 'us'. Capitalism they liked—but 'democracy less so…and their treatment of the Chechens' bid for independence provided an extraordinarily brutal test-case of their spurious commitment to so-called western values.

The second album in this series proved far harder to make. I read up extensively on it for three or four years but at the end of the day, the Chechens and their story are virtually unknown to most westerners and I could do little more than try to provide some incentive for people to learn more by themselves.

I'm not 100% on what you mean by the second question here…but you could certainly call both albums 'concept' pieces I guess. They are entirely focused on the subject matter—and in the case of the second one especially, all of the sounds are sourced exclusively from the cultures/areas that are the subject of the album.

Neither album is a documentary piece, nor a cold historical analysis. Both are impressionistic, thoroughly sourced, argumentative, provocative (I hope), but also representative of my *emotional* reaction to these subjects. Neither album offers a simple resolve or a simple answer to any of the questions raised.

Q: Regarding the breakbeats you use, do you attempt to preserve an ordering that's related to the original breakbeat order? Do you attempt to preserve the feeling of the original around the downbeats?

Preserving sections of the break in its original order can help retain the original funk to some degree.

Q: You mentioned […that…] the Amen and Funky Drummer […] could be cut-up easily. What do you think makes a breakbeat easier or harder to use? Does this play into why you choose them? Is this related to the patterning, or timbre?

Not a musicologist so I can't say exactly what makes one break more versatile than another. Some have more clarity which makes each hit easier to isolate and treat separately—if need be (e.g., Soul Pride). Some simply have more explosiveness, more energy (i.e., Amen)…perhaps that's because of timbre…? Others have energy primarily because they have a shaker over the beats (e.g., Think), or a whole load of bongos (e.g., Apache).

Also re: pitching, the Amen can be pitched way up or down and still retain something of its original quality. Other breaks are much more limited in terms of pitch…they just end up sounding too squeaky when pitched up, and too dull when pitched down.

Q: How do/did you go about preparing breaks? What equipment did use for this?

I've always used the wav editor, Soundforge for preparing samples.

Q: What would you do in Soundforge?

Normalise and trim sample length. Cut up breaks into individual hits.

Q: What about sequencing? Is there a method that you use to create tracks?

I had no real method for sequencing drum n bass, which was probably of the reasons why my stuff wasn't played by DJs very much. However, I was always very conscious of the limits imposed by orthodoxy in an increasingly conservative scene. When I was making dnb, it HAD to be 170bpm, the intro to the first drop HAD to be 1 min 30 seconds etc. Maybe things have lightened up a bit now, I don't know. But compared to the early to mid 90s, the late 90s and early noughties were a creative straitjacket for dnb, where formulas had to be followed to the letter. Even a short deviation from the 2-ubiquitous step rhythm was regarded as 'weird' or 'unplayable'—very odd when you listen back to Jungle in all its earlier polyrhythmic glory.

C.16 Parsons, P. (Voyager)

Q: Please tell me about the music scenes you were involved in before Hardcore and Jungle. How did you find yourself involved in the genres?

I was very lucky to have grown up and very musical household. My mum was always listening to all kinds of different music; Rod Stewart and the Faces, Rolling Stones, lots of Jazz and stuff, and my dad used to work up at the famous Ronnie Scotts jazz club in London, so naturally I rebelled against all of that and was into Rock. I loved it! I had the hair and the denim jacket with the patches and badges, went to gigs and "headbanged" from start to finish. I was also into the punk/new wave scene as well, and also the 2- Tone/Ska sound (The Beat, Specials etc.). All through the 80s I didn't have a clue about dance music, dance music to me was like Disco or something, which was alright, but I would never have bought any or gone to clubs or anything. So when I was in the bands at school, we'd play GBH or Discharge covers, or a bit AC/DC and Hawkwind, and then when I was in bands in the 80s it was all about The Cult, U2, The Police etc. However, I do remember hearing early Hip-hop stuff on the radio; Public Enemy etc. and on a seminal TV program called "The Tube" which was watched religiously every Friday night. Also one of the great thing about Punks back in those early days was that a lot of them were into Dub, so I'd hear a lot of that as well. I never knew who it was or what it was called, but it sounded awesome!

Q: So you played in bands in the 80s. What instruments did you play? Did you have any formal training?

I was the drummer, and like most drummers, was a frustrated guitarist as well. I haven't had any formal training in anything. I'm very fortunate to have some natural ability in the instruments I can play, and am still learning every time I pick up my guitar or sit behind the kit. In fact, if I had any training it was all "on the job"

training at the studio, where I really needed to learn how to play and program synths and program beats to a high standard, and do it quickly as well.

Q: Do you remember the names of any of the places you went to hear Dub in the 80s?

I can't remember exactly where, and I wasn't going to any clubs or anything like that. I just seemed to hear it quite a lot in those days. One of the best places to hear it was always at Carnival, I remember seeing Aswad in Meanwhile Gardens in 83, which was recorded for the Live and Direct LP. I was there with some mates sitting on the grass and just soaking it all up, was an awesome gig.
http://www.amazon.com/Live-Direct-Reis-Aswad/dp/B000025XJ1

Q: This one I'll probably ask often. Do you have any pictures of yourself in your musical environment at this stage?

I used to have quite a few, but fortunately or unfortunately (can't make my mind up!) they've been misplaced somewhere, but I was there with the peroxide hair, Nike hi-tops, baggy army pants etc.

Q: How old were you at this age?

I was late teens to my late 20s in the 80s…….it was a lot of fun.

Q: Were you always "the arranger" in the bands you were in? Did you have this skill prior to your training at the studio?

I'd learnt about song writing and arranging by the time I started in the studio in Jan 1990, through being in bands, which was always a collective process when it came to song writing, the great thing with being in a band is that you can just jam things out until it sounds good and go from there, you record it and listen to it back, and try to work out what it was you all played. I also had some of my own home studio

equipment as well which I began to use a lot more, Tascam Porta 05, Alesis HR16, Roland D50 and an old 2nd hand electric guitar. I also had a friend that had an Atari 1040 with C-Lab Notator (which I thought was a nightmare compared to Pro24) and used to go round to his house and jam with him as well as learn the basics of programming the Atari.

Q: What prompted your interest in production?

I guess it just carried over from working in bands, having done that since I was 15, it was a natural progression into being more of a producer and engineer. As the drummer, whenever we went into the studio, I was always the one who was finished first, so could spend the rest of the session hassling the engineer and working with the rest of the band on their parts. Also, as most people who make music probably know, you are constantly listening to everything and subconsciously pulling it apart in your head to hear how it all hangs together. It's almost a curse sometimes, because it can stop you from just enjoying music without constantly analysing it, and of course, that helps in production. I love being able to mould and shape a piece of music, as a producer you get to have your musical and arrangement ideas put into the track, or at least considered. But if you're both the engineer and the producer, you're able to get the best of everything, you control how the track actually sounds sonically, and also as the producer how it sounds musically.

Q: Do you recall the name of the engineering course you took?

I can't remember the name of the course, but it was in a big old place called, The Garden Studios in Shoreditch, London. I think it belonged to the guys from "The The". It was a six week course that was split into two halves, the first being about live band recording and mixing, and the second half being about midi and sequencing. It was an invaluable experience, although I'd had lots of studio experience before, and had friends who had an Atari, it gave me a lot more "desk" time, they had a huge Neve desk and loads of outboard and patchbays everywhere, so I got a lot of experience doing more of the engineering side of the job. The good

thing as well about the course was that the guy running it was a bit rubbish at keeping order in the studio, and it soon descended into a "let's get wasted in the studio" type vibe by a few of the other students, so I got even more desk time, and saved my R+R for when I got home. ;)

Q: What prompted the decision to work in engineering? Was Monroe's the first place you went? Did anyone else from the Hardcore/Jungle era work there (even later)?

Yeh, Monroe was the first and last studio I worked in, was the best job I ever had, and leaving there is one of the very few regrets I have. I've always been a creative person, so working in sound and engineering peoples music and instruments was an awesome job. Every day was different, the place was alive with different music on three floors, it was the best place to work. I really enjoyed all the challenges as well, because you never really knew what your day was going to be like, you'd be doing anything from one to four sessions in a day, with different people working on different music, using different equipment, and all with different temperaments and ways of working. It taught me so much about music and also about working with people, especially musicians, who can mostly be very cool and amazing to work with, but can also be total nightmares and can test your patience to breaking point. I don't think anyone else worked as an in-house producer/engineer there, that was from the scene, but of course, plenty of DJs/artists/producers and writers used the place.

Q: By the time you began at Monroe's, did you have a good grasp of programming the D50? When did you become adept in sampler editing? Did any of your gear play a prominent role in any future productions?

I have to be honest, I remember trying to mess around with the D50 a few times, and not really getting very far, I just didn't really understand the architecture of the thing, and it wasn't mine it was just a "loner" so I didn't want to kill off all the presets with a bunch of useless noise. The first proper session on my own with a client at Monroe was with a guy who was doing a cover of Nu-Shooz "I can't wait".

We had the Akai S950, Roland U220 and of course the Atari 1040 with Pro24 and a record deck. I'd been given a 10 minute tutorial on how to sample, edit, keygroup, assign outputs, tuning, name, save etc. and was told if I had any problems to come downstairs to the main studio and ask him for help if I needed it, and away we went. It took an hour or 2/3/4 to get my head round it, and I deleted most of the samples and screwed up the keygrouping loads of times before it started to come together, but we got there in the end. I soon got used to the Akai as we had one in every room and it was the workhorse of almost every session. I got quick on that puppy, and used it pretty much all the time.

I brought the Alesis in and sampled it all, as again, it was a loner and had to give it back, but the gear that I had was nothing compared to the mighty 1040/S950 combo, in fact right up until I left Monroe in 97/98 we were still using [an Akai] S3200XL and 1040's running Cubase VST1.

Q: Had you dabbled in electronic music of any kind prior to working as an engineer at Monroe's? Its quite astonishing that someone with no initial interest in a genre can become one of the genre's leading producers, creating the genre's most resonant tunes.

I had a couple of friends who were making electronic music, and hung out with them a little in the studio, and at their houses when they were making tunes, but nothing apart from that. It all just took off for me at Monroe. Most drummers are frustrated pianists or guitarists and I found a medium for me to be creative and more melodic without having to go through the torture of learning to play the piano or guitar to a standard where I could do that. Sampling and sequencing was still kinda new at that point in the early 90s and there was a feeling that pretty much anything goes, and along with the earlier Punk sound of the late 70s, you didn't have to be a proficient musician to make music, you could just do it. So when I was working with a lot of those early clients, we'd sample all kinds of weird stuff and play chords with it, de-tune it, time-stretch it…was awesome, although most of it sounded totally shit, but sometimes it worked. But the sampler really brought a new kind of musical freedom into play. You could hear something on a record, tape, TV, film whatever and use it.

Electronic music really found its wings with sampling, and of course nobody really paid any attention to copyright, so it was a free-for-all on whatever you wanted to sample. I had a lot of fun working with other people's samples and sounds, it unlocked my musicality and enabled me to be creative in way that hadn't been done before.

Q: Who were some of the notable clients in the early years?

I started at Monroe in Jan 1990, and some of the earliest clients I had were DJ Seduction, who was making early Rave/Hardcore, The Brotherhood who came in and made "Descendants of the Holocaust EP" which is where I hooked up with DJ Crystl, Caveman who made "Positive Reaction" Erique Dial (Raze) who was, and still is writing and producing some quality House music, DJ Fokus who was making early Rave and Hardcore as well.

Q: Can you describe a typical session (if there was such a thing)?

I guess a typical session would begin with sampling up sounds and beats, and then editing and chopping up the samples, keygrouping and generally setting up the sampler. As we'd be doing this I'd already start to get an idea of how the track was going to shape up from the sounds and beats that were being fed into the Akai. Although sometimes, some people would show up with nothing and expect me to provide pretty much everything, or would draw poor samples or ask if I could remove something from a track and just take that! We would then jam with the samples, and I'd get info from whoever it was I was working with on the vibe they wanted, and away we'd go. Sometimes tracks would come together very fast, and would almost write themselves, if you had good sounds, samples and beats then it was pretty easy to a vibe going. We'd work on a main pattern of beats and melodies or samples and get the track sounding how the client wanted to……or sometimes how I wanted it to, and then map out the arrangement. Working with DJs was always wicked as they all knew about where to add drops and edits and were always pretty spot on about the arrangements. I'd also be tweaking the sounds as we went, so there

wasn't a point in the session when we completed the arranging and then pulled all the faders on the desk down to start mixing the track. I always found that just altered the track, as the way the beats hung together and the sounds and samples all balanced each other was so important and could easily be ruined by pulling it apart sonically. I'd always mix it almost "live" and add EQ or compression as it was being made as it all added to vibe of the tune. I also did mixdowns as well for lots of clients and found it a bit more difficult to catch a vibe sometimes as I'd not heard the track before, or at least had not been a part of its initial creation, but still got a result were everyone was happy anyways. I'd then mix the master down to a DAT and recorded it as hot as I could go, so it was comparable in loudness to other tunes out there. Sometimes all that happened in a 6 hour session, and the track got sampled, arranged, mixed and mastered in one go, they were the tracks that just flowed from start to finish!

Q: What were the synthesizer sources for much of early rave/hardcore that you worked on? Did you notice the change as it was occurring? Were these early tracks already using breakbeats in 1990? or did you also witness this transition as well?

The main synth was the M1, that Piano1 sound was just all over the place on so many tunes, and also some of those nasty metallic drums sounds as well. The majority of the sounds I've always used have been sampled sounds, either breaks, pads, stabs loops etc., I was never really one to get deep into programming sounds. Breakbeats were very much in use in the early 90s tracks, though they were a little bit more hidden and augmented by the 909 or other sampled loops. The main loop then was of course "Funky Drummer" which was just cained beyond anything else, if you thought Amen has been over used, the FD just killed it. There was also a lot of beat layering going on as well, and it wasn't that uncommon to hear 3 beats all layered on top of each other.

Q: As breakbeats became used more, edits and sample manipulations started to become more present. Did you notice other producers at the time doing similar things?

I have to be honest and say that I didn't really listen to what other producers were doing, the only time I'd hear other tracks was when someone brought a track in to sample it, and then I'd hear it, but the majority of the time I was doing my own thing. Just vibing with the guys who I worked with and getting their tracks to where they were happy. We did listen from time to time to what some other people were doing so I could recreate a certain edit or filtered drum pattern, but most of the time I was getting ideas from the clients or jamming to the beats myself.

Q: Your productions have several sections—one of which is this one I can only describe as floating. So, in the beginning of a track, say DJ Fokus - Watch Out, you have an intro of 1 or 2 sections with cutting edge sound work with sparse drums, then a rolling section where the drums are a bit more repetitive, then start to go into the atmospherics, then there's the bit with the pads and the drums drop out. We've arrived at the core. This is something that I've only heard Jungle and Drum & Bass (actually more so only Jungle really) pull off. How did you come up with this? What influences did you bring into this?

Most of the time the arranging was all about getting the flow and feel of the track right. Sometimes, once we had created the patterns it as so obvious that this bit goes here, and then that section carries on till 32 bars and then this drops and blam, away you go! It was always important for me to try and get a good balance in the tracks. I always found that worked best as the sounds or samples would work with each other to create that ethereal vibe, and along with the beats would create a bit of journey. Getting the first drop was always the most important thing, as you'd want to DJs to mix it in early and use the drop, and then roll it out with the beat patterns to bring people to an epic middle breakdown. I loved to create that feeling of space, depth and atmosphere in the middle sections, it was like a musical oasis of bliss in a sea of chopping beats and mayhem!

Q: Where did the contemplative aspect of jungle music come from? Many writers often discuss the frantic or paranoid aspects of jungle or dnb, but listening to many of your productions, there is a sense of serenity, assuredness, and positivity, all the while with intensity from the drums and edits. Having not been part of the club scene yourself, was this something you came to understand from working with the DJs who came to work with you?

I could get very existential here and say how those vibes were an extension of my inner peaceful musical self, and how it was all an expression of emotional tranquility…and maybe in a way, it was. But it was really about doing something different from all the darkness that seemed to be around in the music at that time (92/93) It was really about that time that Hardcore/Rave and Jungle went in two different directions. I could never see myself following the Hardcore route, as the Jungle DJs and producers I worked with were a bit more experimental with what they were doing and that vibe suited me a lot more. I was also able to be way more creative with the sounds we were using and due to the chemical enhancement of a lot of the early Jungle scene, they were all up for a bit of blissed out epicness in the breakdowns. I was a bit bored with the early dark sound of Jungle and saw my rebellion as adding a bit more colour and melody to the tracks. It always sounded good in contrast to some nasty ass twisted stab sound or something, and helped to balance the tracks more. So I just continued to find the more melodic patterns and layered samples and played chords with sampled pads and stuff to create some of that blissed out vibe, and it seemed to work. The DJs loved it, it gave the tracks a taste of a bit more musicality, which again balanced well with the more raw and simple melodies, and in some cases added to the sense of drama in the track, and made it a bit more cinematic.

Q: Could you describe the intention and motivation in creating these sections? How long would a track like this take to make?

I guess my intention was to try and make something that contained an element of beauty or of something a bit more ethereal, that would be opposite of the frantic beat chops and some of the other sounds. It was always my favourite part of the arrangement, trying to combine samples or sounds into a moment of bliss that was a brief distraction from the intensity of the main arrangement. Sometimes we'd get lucky and the sounds would just work together, and sometimes it would sound like an out of tune train wreck. But there were always sounds and bits I could use from my own library if we didn't have anything that worked together, as well as dipping into the many CD sample disks I had at the time.

Q: The Brotherhood album certainly has NWA aspects to it (and the amen has some lineage in west coast hip hop). Was Crystl heavily influenced by west coast hip hop? What was his/your relationship with the Amen, and what did you guys aim to do with it?

I'm not too sure about Crystl's Hip Hop influences, but the Amen break just killed it for us, once we discovered its editablity and how sick it sounded, we used it quite a lot, we messed with the tuning, compressed the hell out of it, reversed it, and generally stamped all over it, kicked into a corner and rinsed it hard!

Q: What kind of arrangement details would DJs provide?

The DJs were always the best at "feeling out" the arrangements, because they all had the frame of reference of playing tracks and knowing what worked and what the crowd were jumping about to, and also what kind of new sounds or production techniques were being used that month, as styles, chops and licks were always changing. In the earlier days of DnB it was in a constant flux of change. One minute everyone would be extreme low pass filtering, then it would be a reverse bass sound, then assigning filters to the pitch shift wheel on the keyboard etc. etc. There was a constant flow of creativity and experimentation from everybody in the scene with me being a kind of DnB amanuensis for the DJs and producers I was working with at the time.

Q: Can you tell me about your work with Seduction? What had he been doing prior to your work with him (e.g., bleep breakbeat tunes)? He was the first person you worked with in Hardcore right? What kind of material was he bringing in to work with? Do you know the origin synths that were used for these sounds (e.g., you and me or hardcore heaven)?

I think he was making acid house or bleep house, that kind of thing. I'm not too sure of how he came to start making Hardcore, but once we hit a vibe it was a very productive partnership. Seduction always knew what he wanted and was very much in control of the arranging and production of the tracks. He'd bring in records and we'd sample stabs, beats, strings, etc. and then use sample LP's for vocals and other bits and pieces. I'd play much more of an engineering role in the whole process, by being more involved in the mixdowns and controlling the sonic quality and overall sound of the tracks.

Q: How many tracks did you guys do together, and during what years?

I think we hooked up in 90/91. I worked on Hardcore Heaven and the follow up tracks with him for London/FFRR and then went on to continue to work with him and some of the artists that were releasing tracks on his Impact Records label till about 94.

Q: Is there an example of a tune that uses the M1 drums you were mentioning?

I can't think of a track in particular, but a lot of those early Seduction tunes used a few of the sounds, there was the whip-crack sound and some of the other drum sounds as well.

Q: Was there a particular source that you used for your synthesizer sounds? Also you mentioned sample CDs. do you recall the names of any of these?

I would have used a few of the M1 or U220 sounds, as they were the only synths we had at Monroe at that time, but back then it was all about sampling. I'd be constantly looking for beats and sounds, strings, pads and vocals and stuff. In fact I only really started using synths when I switched to using the PC and soft synths in late 90s. By then I had the studio at home where I had a Korg Trinity, and an MS2000. The sample CD's were; Zero G series, Fatboy Slim - Skip to my loops, Cold Cut, Vince Clark - Lucky Bastard, Uberschall etc.

Q: Regarding the different sections in the tracks, did you ever conceptualize a set number of sections that a tune would contain, or would you just know that it would need to, as you mentioned, allow for the DJ to mix in, have rolling section, the get into the breakdown, the back out to a section for the DJs to mix out?

It really was all about feeling it through. That method just felt right to me, after I'd heard the tracks played out a few times, and got some feedback from DJs I just stuck with it I suppose. The old saying of "if it ain't broke don't try and fix it" always stands. Not that every single tune is approached in the same way, because some tunes will always have a different feel about them…some are just straight up rollers with no need for big breakdowns, and some are a bit more cinematic and have different dynamic needs, it really is all about feeling it.

Q: How much did sci-fi play into the creation of these sections?

I've always loved Sci-Fi, it's such a great subject to allow your imagination to run wild, and dream up all kinds of different atmospheres and images, and it's no wonder that so many artists and producers are real sci-fi freaks, maybe not the dress up as Worf and hit Trek Fest kind, but definitely deep thinkers and vibe feelers. I think we're all after that feeling of depth and expansiveness that space or sci-fi conjours up when you really think about it, and it's again, no wonder so many artists and track names are taken from that subject. I've seen the first two Aliens movies so many

times, and they never age or get tedious or boring whenever I watch them. The scene that was sampled from Aliens with Ripley and Burke was such a tragic moment in the movie, when she had just woken up after kicking some Alien butt, only to be told she'd been floating around for 57 years and that her daughter was dead and that the world had moved on considerably since she had been there, it felt like such a cosmic headfuck that I had to use it, it summed up that melancholic vibe of being thrown into the future with just one sleep, thinking you'd be picked up in a couple of months, only to find pretty much everything is gone and your screwed! Sci-Fi is for me, the ultimate DnB resource.

Q: In your opinion, why is the Amen is so editable?

Its the perfect length, about 8 bars, and has been played very cleanly, but just human enough to not sound like a programmed beat. When its pitch shifted up a few semitones it still sounds fat and seems to sit so well with other beats and sounds. It's got a clanky metallic snare and quite a thuddy kick drum, and also that ride cymbal that pushes all the top end, so its got great EQ potential across quite a wide frequency range. The amount of edits you can get is just perfect. The first bar is great for a rolling beat, the second bar is more a steppers vibe, and the cymbal……pppshhht sound can be used to accent patterns and crazy edits. It's the big slick of the beats world for sure, followed by Bird, then Soul Pride, then Think then…??

Q: Regarding your work w/Seduction: At some point did he end up taking on the production process himself or did he end up working with another producer?

I'm pretty sure he went on to produce and engineer all his own music, I did do a couple of engineering sessions for him in 96/97 for some tracks he was working on, and I think he was working with some of the artists who were releasing tracks on Impact Recs, doing the mixdowns and production work with them.

Q: Who did you start working with next? Was the connection you had with the DJs word of mouth, or did you/Monroe's advertise your expertise?

Around 91/92 I was working with a lot of different clients in the studio, working on Hardcore, Hip Hop, House etc. with people that had found out about the studio and myself through word of mouth and by seeing the credits on sleeves, we did virtually no advertising at all. I think the studio may have run a few ads, but they were mainly aimed at singer/songwriters rather than DJs and producers. Seduction introduced DJ Rap to me at the studio, she needed a mixdown done (think it was Divine Rhythm/Desire) and had booked a session after Seduction. So we mixed the tracks, got on really well, and pretty soon we were working once/twice a week. We had a great working relationship and were good friends, we both tapped into a vein of creativity at the same time that saw her make some excellent tunes with myself and also Aston. Pretty soon my client list began to grow and I was mixing down and engineering for lots of clients pretty much 24/7 for a while…they were good times for sure.

Q: When did you start working on your own Jungle/D&B? Did you find it somewhat difficult to make tunes with the same vibes that the DJs brought to the collaboration?

My first release was in 1994 under the very dubious name of Rev P - Rhythm Process/1994. I'd been making some hardcore/rave tunes before but I'd released nothing by myself before then. I found it very easy to make tunes in the same vibe as the DJs and producers I was working with because that was my kind of style. Of course I had all that time working with all those guys and had learnt so much from them all, so I knew what would work. I didn't feel like I was biting anyone's style, as every one of my clients always brought their own vibe, and stamped their own particular style into the tracks we worked on. A lot of the time though I found that I just didn't have the time to make my own stuff, I was seriously busy, so I'd grab a few hours here and there, or if a client cancelled I got some time to make some tracks of my own.

Q: Were you able to tell that Jungle had become its own genre by 1993? From your perspective, what was it about the music that stood out from Hardcore you were hearing? Did these characteristics somehow inform the decisions you made in the studio? Did you develop any production techniques that you might relate specifically to Hardcore or Jungle?

There was definitely a moment when Hardcore/Rave parted company from Jungle. It was around that 92/93 time as the production styles started to go a bit darker, tempos increased, 4 on the floor kick drums got dropped, funky drummer finally stopped being rinsed and there was a general vibe of "lets twist everyone up" which was completely different from the Hardcore/Rave mantra of "lets keep it on a happy vibe" That first journey in the dark side, which has happened a few times since then, and will probably return again at some point, was I think, a direct reaction to the over commercialisation of the genre. As far as the production techniques were concerned, it was the speed of the tracks that really made Jungle a different musical style. I remember the slow increase from mid 150 up to mid/hi 160 bpm and how different it sounded. It gave Jungle a rawer edge and injected it with a kind of kinetic energy, and seemed to make the syncopation of the sounds and beats work so much better. It also worked because the half-time rhythm became more apparent as well, which gave it a rhythmic advantage over the slower hardcore/rave tracks. It also meant you could sway around to Jungle, and not have to dance like a maniac to the faster rhythmic patterns all night. Jungle definitely came of age in that period and became a genre in its own right. The production sound changed as well. With the increase in tempo came the increase in melodic pitch, which also affected the EQ of a lot of the sounds. If you have an sampled loop or beat playing at a higher pitch, you have a higher frequency range, so a lot of the breaks started to sound a bit more tinny and thin which left more space for bass. The lower mid-range frequencies that had been taken by slower breaks and added kick drums wasn't there any more, so you had a hole in the lower mid range and bass frequencies that was filled with monster 808 bass lines.

Q: Other than Hypersleep, where/how do you see sci-fi rearing its head in your work?

When I was working with Crystl in the studio sometimes, we'd play Blade Runner Blues just to get a vibe going! Sci-Fi for me can mean so many things, it can be ultra modern, technically advanced, cold and digital…and it can be warm, melancholic, beautiful and expansive. It is only really limited by the imagination of the listener or writer/producer. I think I've been obviously influenced so much by those movies as well reading lots of books on cosmology and science etc. that it bleeds into the depth, atmosphere and emotion that I want to create in my tracks. Check: Apollo, See Forever, Voyager Pt2.

Q: What was Aston's role in the music he made with Rap? How was Rap's production output different when she worked with Aston?

I think Rap and Aston worked in pretty much the same way as we did. They'd been working together for only a little while before we hooked up, and they continued to work together on and off for a while after. From what I remember the production sound was slightly different, but not that radically different. They did some great tracks, most notably of course, the original version of Spiritual Aura.

Q: Did DJs often work with multiple engineers? Were there any particular techniques that you would say that you developed during your work with Rap?

I think a few did, mainly out of hook ups with other DJs and producers who used other studios, or had their own gear. Back in those earlier days, PC's weren't around yet, or certainly weren't the machines they are now, so if you didn't have a studio at home, which very few people did back then, you went to a big studio and worked with someone like me. So I think most of the clients I had back then worked with me pretty much exclusively until they bought they're own equipment, or hooked up with other artists in other studios. One of the main techniques that Rap always

insisted on was that the first and second drops were as bangin' as they could be. She was always making her tunes with the dancefloor in mind, and knew, as most of the DJs did, when it was working, and when those drops would get the rewinds and the floor going mad.

Q: There was somewhat of a divide caused by the word intelligence. Was there any reaction to the album name when it was released? Do you recall any vivid memories from your work on *Intelligence*?

Yeh, there was a little bit of a backlash from the title, which was typically, "So if your stuff is Intelligent does that make my stuff stupid?" kinda thing, which wasn't exactly the most intellectual argument, but it didn't last long though. I didn't get much stick for it at the studio, though I'm not sure how much Rap got from the other guys. I don't remember too many specific moments, but one of the best things with working with Rap, was that we pretty much always got something finished at the end of every session. We very rarely had to come back and finish off a track the next session, which meant that the album tracks were all finished pretty quickly. Back in the mid 90s DnB changed so fast, so if you were doing an LP, you had to make sure it was completed as quickly as possible, otherwise it could all be out of fashion by the time it got released. Which was kind of what happened with my later album, Future Retro.

Q: Were you using the same equipment on this album? Did you upgrade your sampler (or other equipment) at some point during your time at Monroe's?

The equipment stayed the same for a long time at Monroe. Because I needed as much sampling power and memory as possible, I tended to have the S3200 all the time and we also had an S1100 as well for more outputs and samples. I do remember us getting an Atari Falcon which was the first time we had Cubase in colour…a big moment! I also used to hire in various synths to use in sessions and sample all the pre-sets.

Q: What were some techniques employed in order to make the drops big? how has this changed over time? seems a tune like abyss has as much impact in the start of the sections without drums as they do with drums. are there any specific gear techniques used to generated these effects?

Breakdowns and drops used to be about 32/48 bars with fx or reversed sounds to bring the main drop, or a sampled drum roll or snare/kick sounds on 16th note rolls…but then it all went a bit crazy. Snare and kick rolls started to get longer and longer and shorter and shorter note lengths until over half the breakdown was the roll to bring everything back in again! Its got to such ridiculous formulaic states now, where almost over half the track is the roll to the main drop! which has kind of missed the point really. The only gear effects I can think of would be specific sound parameters like Portamento and Glissando that are available on pretty much everything and anything. There were also reverse reverbs and cymbals, slow flangers and of course low and high pass filters sweeping through frequencies. I also had some samples of some F14 Fighters taking off from an aircraft carrier once, and they sounded pretty cool for some lead-in sounds for sure. There's also the technique of creating space and depth before the main drop, as that always gave more emphasis to the fullness of the track and the basslines when it all slammed back in again. So for me it was more about creating emptiness and giving everyone a sonic punch rather than a predictable endless snare roll.

Q: What kinds of techniques did you employ to ensure that the bass was as up front as it needed to be? For example, an 808 bass is originally very low and to get it to have the low mid-range presence it has, it needs to be compressed (often limited). Did you often use the same samples for bass? Did they also come from a particular sample library?

It was a mixture of low and high level monitoring on mixdowns and making sure that I could hear bass on the NS10s and also on the big custom Tannoys that I had in the main studio (which would probably explain my Tinnitus) when I was using the NS10s I'd also check the VU levels to see the increase and decrease in dB when the

bass was muted to make sure it was loud enough, and also check the monitors from the side to see how much the cone was vibrating. I'd add compression on the 808 and not add too below 50Hz otherwise it would just swamp the whole track and would upset the balance of the rest of the mix, plus you'd loose the higher notes of the bass melody because you couldn't have the level high enough to hear them. I'd stressed a few of the 808s through the desk inputs and distorted them into the Akai as well to get some nasty sounds, also time stretching the 808 on the Akai gave some pretty sick results, as did over-driving the sample into the compressor and squashing the hell out of it and then resampling it.

Q: As Ragga Jungle became the new face of Jungle, what sonic changes did you notice? Did the DJs give you any idea of what kind of changes were occurring in clubs? Did you work with any Ragga Jungle DJs?

The Ragga sound seemed like a natural progression, as the half-step tempo was perfect for the rhythmic timing and phrasing of the vocals. Plus Jungle/DnB always had a element of dub and reggae in the basslines and other sounds like dub sirens, piano skanks, self feedback delay loops, vocal samples etc. Sonically, the basslines got a bit more melodic and dubby, and of course there were a lot more full vocals in the tracks. I worked with DJ Ron on a couple of tracks and did a few other mixdowns for some people, plus a few things with Rap; Ruffest Gun Ark and Intelligent Women. I also did a Sluggy Ranks remix, but didn't think I nailed it rhythmically, it was way to rolling and not enough half-step and dubby.

Q: You've mentioned funky drummer before. Were people chopping and rearranging the drums of funky drummer during Hardcore? or for the most part was it a straight loop?

It was definitely chopped up, but not to the extreme that beats are chopped these days. The main problem was that if I only had the S950 to work with, then I couldn't go mad making loads of edits, so I mainly used only two or three edits on the beats,

and sometimes only the one, as I had to conserve space for other samples. There was some beat chopping and edits going on, but it was mainly all about rolling loops with the emphasis more on the samples, stabs and other melodic parts.

Q: So when Hardcore became Jungle, to achieve sync with the rest of the material, the drums were sped up, and inadvertently they were pitched up as well due to the technology of the time.

Yeh, as the only way you could get around that increase in the pitch was to either pitch shift the beat down again and re-sample it, or time-stretch it. These were the days before PC's and plugins, so there was quite a lot of…tonal imbalance. But sometimes that was the "sound" of the label or producer at the time.

Q: Did the process of break chopping change for you at all during this point (or previously)? For example, when I started making tunes, I would take a breakbeat, then make a copy of it, and cut off the first note of the copy. Then I would copy this copy, and cut off the first note of the copied copy. I'd continue with this until the end, and this way I could access any point of the break and connect and parts of the break (by adjusting the release time of the held note and triggering a different note) while preserving the original feel of the break. Later on, I started to use recycle, which outputs individual slices and a midi file. How did you go about this? Why? Were there constraints due to the gear?

Not really, no, I still used the same methods for editing as before, but I was starting "jam" a bit more with the patterns.

I did pretty much the same thing. I had the original loop, plus snare and kick edits as well as ghost snares, ride cymbals and any other little snippets that were in the sample. I'd have them all lined up on the keyboard next to each other, tune the beat into the tempo and then play the samples off the keyboard. As I'm a drummer, I like to play the beats into the sequencer in real time, and get a few different patterns going before opening up the key edit window to add any triplets, 32 or 64 note edits.

I'd always have the ADSR on 0,99,99,05 as I found that with the release on zero you tend to get a short clipping sound even if you edit the beat very tight. Once the PC arrived, of course Recycle did all that for you, and depending on how chopped up you wanted it, you could cut it to pieces. However, for me, I lost the ability to play the beat live into the sequencer as all you had on the keyboard were loads of tiny little edits, which were perfect if you did all your beat programming in step edit, but that isn't how like to program my beats. Before the PC, I had to have both the Akai's in the session as the clients nearly always had lots to sample, and there were always lots of edits to do.

Q: So jungle arose out of Hardcore, in its first form of Dark. Were you engineering much for any producers of Dark music?

DJ Crystl, was the main guy for that darker stuff back then, and also DJ Fokus who was releasing stuff on his own Suicide Records and also through the Monroe in-house label. Some of the stuff I was doing with Soapbar as well, and also with other artists and producers who used the studio form time to time. The thing though with the dark stuff, was that I was always going all floaty and deep with the tracks, which worked a few times, but didn't really get me a name as a producer of too much Darkcore back then.

Q: As the Ragga scene waned, the ambient scene became more popular…what stylistic differences accompanied this shift? Did you start to have new clientele? Do you recall any differences in approaches from previous styles?

I don't remember too many differences in styles for what I was doing, as I always stayed pretty true to my own vibe and style, which was probably why I didn't do too much of the Ragga thing, as floaty strings and deep pads didn't quite work with that style. I did do some mixdowns for a few clients who were on that tip, though I can't remember any specific names, but not that much production stuff. There were no

real sonic differences in the styles, it was more about the dub samples and vocals really.

Q: Can you tell me about the background and creation of Promised Land?

I'm afraid I don't know that much about it, other than it was unforgettable to hear all those tracks mixed by Bukem, and to record Conrad vibing over the top of it all. I was chuffed to have my name on a lot of those tunes, along with the artists, DJs and producers as well. All of the Promised Land series had some amazing tracks, but the first two were, for me, the best.

Q: Your mention of Cubase in color reminded me of this question I've been meaning to ask: Throughout the years, what technological breakthroughs would you say affected the music you made the most?

Without doubt, PC/MAC and all the software. When I think of all the limitations we had back in the earlier days of DnB compared to now, its just so completely different. The sheer amount of options to manipulate and process sounds these days is incredible, access to hundreds of softsynths, huge hard-disk and RAM capabilities, monster sized screens, incredible processing power……and yet some people still manage to turn out the most awful shite ever. I think that in a lot of ways, back in those earlier days, creativity was pushed more, purely because we were limited by the equipment. It didn't take long to hit the processing and sampling ceiling, were you had to make the best of what you had, sure there were some people who had access to more equipment, but it wasn't accessible to everyone like it is in the present day. Getting the opportunity to make and release your own music was still a relatively expensive thing to do, as you generally had to know someone with the gear, or have the money to come and book some sessions with someone like me. But as soon as PCs and Macs kicked in, it opened the game up to pretty much everybody, it allowed people, for relatively little money or technical expertise to make music, and you didn't have to go to big studios anymore, you could just mix it down at home, burn the CD's, hand them out to the DJs……sorted! This did though unfortunately mean that a lot of genres were flooded with a lot of shit music, as everyone and their

brother got involved in making tunes. However, on the other hand, it opened the door to a lot of young people who wanted to make beats and get creative and spawned a new generation of underground producers, DJs and artists in many of the established genres and created some new ones as well.

Q: How many tracks have you been part of? (I've [seen some] numbers on discogs)

Oh man……I really couldn't say with any real accuracy, but probably around the 250/300 mark I reckon, there's quit a few on Discogs, with a some pending submission as well, so I think that's probably a respectable number.

C.17 Rumney, N. (N.R.G.)

Q: Please tell me about the music scenes you were involved in before Hardcore and Jungle. How did you find yourself involved in the genres?

When I was about 12 or 13 yrs. [old], my brother got me into hip hop by listening to a ground-breaking British DJ on Capital radio called Mike Allen. His weekly frontline chart had the latest imports from the US, and we both got hooked on the sound, and tried to find out how they were making the beats. When I was 16 I got some cheap decks, which I adapted with a home made kill switch and started to teach myself how to scratch records, and keep loops going on two turntables. I got money together & bought a Boss drum machine and a Roland sh101 mono synth, which I could hook together to make drum beats and basslines. I'd play some house parties playing old breaks, hip hop and then got into making pause mixes of tunes and breaks by bouncing them down on a four track cassette recorder. the sound quality was pretty bad, but the mixes used to be played on a local radio station's hip hop and soul show and at local club nights and all dayers. By the age of about 19 I'd got my own show on a pirate station playing a mixture of hip hop, breaks and freestyle like Frankie Bones and early house tunes. id just bought my first sampler—a Hohner HS-1 sampling keyboard. It's a 12-bit sampler with a great crunchy sample sound. I started making my own tunes with the sampler and an outboard Alesis sequencer. I was playing my own productions on air when I was approached by a guy from an underground label to release my first tune on vinyl which was The Terminator—a bleep breakbeat tune on Chill Records.

Q: Do you recall what year it was when you were 12? Which Hip Hop artists were you into?

Probably around 1983/84 when I was 13/14 yrs. old I first got into hip [hop] thru my brother. Early artists I liked were Whodini, UTFO, Ice T, World Class Wreckin Cru (producer was a young Dr. Dre).

Q: What are pause mixes?

Pause mixes were made by having two cassette tape decks with one playing into the record input on another. The manual pause/record button was tight enough that you could record only certain sections of a hip hop track, then hit pause. Put another tape in on the playing tape deck, find the part you wanted to use next, cue it up and lift the pause button on the taping deck at the right moment to record the right part next on the recording. It's basically like splicing together bits of different records together into a mix. Lots of hip [hop] tunes had good fills and breaks in them to make [the] job easier. Like 16 bars of a Run DMC track, then in the last half bar, you'd drop in a James Brown sample for just half a bar then kick in with a Mantronix track for instance. As you can guess the sound quality wasn't great but there was no digital audio to have compared to anyhow. Like a very crude and noisy Pro Tools! Amazing looking back at the huge time and effort and hours that went into a 5-min. mix that can now be done so much more accurately with perfect quality digital sound.

I eventually got a 4-track tape deck, which split a normal cassette tape into 4 mono tracks that could be played simultaneously. This meant I could record turntable mixes with basslines and scratch over the top and even add some vocal accapellas from vinyl.

Q: Hohner HS1—that's the same as the Casio FZ-1! Do you remember the sequencer?

The Hohner HS-1 was cheaper than the FZ-1 but was identical. It was a great keyboard and it totally transformed my music making potential. For the first time I could accurately sample and loop parts and have several things playing at once. I

used it with the Alesis MMT8 sequencer, which could hold different patterns and songs which I could use to construct whole tracks.

Q: Can you explain the genre of bleep breakbeat? Is it the same as bleep house? How did you get into this genre from hip hop? Were the two closely related in the UK?

Bleep breakbeat tracks featured lead sounds and melodies from a sawtooth bleep sound looped on a sampler and played with breaks running underneath. The Scientist's The Exorcist is a great example. Mine came about with me messing around with different keyboard patterns overdubbed on the Alesis sequencer and after coming up with 3 or 4 I liked, and playing some looped breaks underneath. Nobody else I knew was making music until about 1990, when I started meeting other producers. I didn't have any tutorials to follow with no internet or anything like it out there. TV shows like Dance Energy sometimes showed producers in the studio and I'd pause the video tape to see if I could see what was in their studios!

I guess I moved from Hip Hop more into breaks when I started on the pirate station and heard what the other DJs were playing. Some of the breakbeat stuff from the US like Frankie Bones and lots of the Sleeping Bag releases influenced me.

Q: Do you remember which Boss? Also, do you recall why you purchased the HS1 and Alesis? Was there someone else you know have the same setup?

My gear choices were solely money based as I had virtually none! The Boss drum machine was a DR-220A which was click sync[ed] from memory which meant it could link to my non-midi Roland SH101 and would trigger the SH101's sequences from the DR-220A's click track. I didn't really have any means to record other than cassette tapes, and I don't think any really survived. The earliest records that I definitely do have is The Terminator and NRG in the House which were made on the HS-1.

I used the SH-101 on lots of stuff and it still is an amazing fat sounding keyboard. To be honest I never recorded the DR-220A seriously as the

sounds never really hit the spot for me. I was trying to emulate sounds from the US, which I later found were being made on E-mu SP12, SP1200, Oberheim DMX, Linn Drum, etc. I always wanted to get hold of a Roland 808 and 909—they were the holy grail for me but I never got them in the end. I had an SP1200 years later, which was an incredible piece of kit.

Q: Could you tell me about your experience with the pirate station?

The pirate station came about through a mate of mine that started the station Pressure FM around 1989 in Luton. There was nothing else like it around the area at the time, and the shows got a good following. He invited me to do a show for him on Saturdays, and my slot was 2 hours between 4 & 6pm every Saturday and before DJ Swanne who was a well established rave DJ at the time. He's now label owner at Circus Records dubstep labels, and manages Flux Pavilion and Doctor P. He used to play some US imported breaks and house tracks, which inspired me at the time. The studio moved around to secret locations all around town although never stayed secret for long. When I left some shows, there would be cars along the road outside with people locked into the station. I first met Damon D'Cruz there who was a record shop owner and label boss at Chill Records. He also had the Jack Trax UK label before that. He signed my first track The Terminator for release, and that was my first outing on vinyl.

Soon after, I went full time into producing, and left the station.

Q: Did your outlook on the music change from your experiences on the station?

Yes definitely. I was drawn more into harder music and higher tempo—about 130bpm. Back then it was considered very fast to dance to when average tempos were around 115bpm.

Q: What was your next hit after The Terminator?

It was a track called Tripswitch, which was inspired by a track I loved by T99 called Anasthasia.

Q: What were you focusing on when making tunes at this time?

I was focusing on making the tracks as intense as possible when they were played out. I had no restrictions in mind on sounds and samples I'd use as there were no real strict genre rules like there seems to be today. The only common element seemed to be higher tempos. As a young producer I think you have less barriers and more confidence about putting things into the mix. It's the time when you're desperate for people to hear your tracks and you're hungry for productions. It's also the time to be most careful of the industry as you're most vulnerable to shady record deals when you're young and keen!

Q: When did your interests change from bleep breakbeat?

About this time 1991 when I was hearing a lot more rave music than house and break tunes. I got drawn right into the scene from going out.

Q: What club nights did you attend? What did you learn from these nights?

We used to party at Slime Time in London on Weds nights, Rage at Heaven on Thursday nights, Friday would be a house party somewhere and Saturday nights would be further out to a big event like Raindance, Fantasia, etc.

I learnt the impact that the right drop can have on a crowd. The best tracks in my opinion were creating the wall of sound that I'd describe as intense, building, musical confusion until dropping out into a single element like a simple piano/bass line/break that was totally stripped back. If you got this recipe right, the effect on a crowd would be incredible. Good examples of tracks that did this are Zero B - Lock Up, Manix - Feel Real Good, and later Jonny L - Hurt You So. Also Liam from the Prodigy was a master at this. The formula's been taken to a scientific level with

Dubstep now, where technology and technique allows drops to be more intense and louder that we were ever able to achieve 20 years ago.

Q: How did you make Tripswitch? Same studio setup? Do you recall the samples (synths, breakbeats) being used? How were the breakbeats prepared (e.g., did you loop them or cut them up and resequence?)

Tripswitch was made on the HS1 with the Alesis sequencer running it. It used a sample from the start of Anasthasia replayed into my own riffs. I can't recall the break I used as I trawled my own breaks collections and my brothers hip hop vinyl collection as well as mix tapes to get together a library of break beats on disks. I'd source my beats from there. The only downside being unable to say where they originated. Lots of my basses were samples from the Roland sh101 into the hs1 either as one shot samples or as sequenced loops from the sh101's on board pattern sequencer. Most tracks then used breaks as 1 sample tuned to play over 1 or 2 bars. Sonically this meant some producers tracks would run slightly out of time by the time they re-triggered. There was no way to see any transients in the loops then. My way was to cut the sample in two to play the first kick up to the snare, and then the remaining 3 beats of the loop starting from the first snare. I could get the beats sounding very tight that way, and easily create better variations of the break by triggering kick and snare at different points.

Q: What would you say are the main sonic differences between the rave music and the house and break tunes that you heard in 1991?

The main differences were that music gear and longer sampling times gave rise to the sounds and sampling in rave music. Workstations like my eps16+ and the Roland and Korg workstation keyboards made much more possible and opened producing to more people without the need for a recording studio. The earlier tunes were using much more analog gear and drum machines, with samples being restricted in time, so used more sparsely. Also they were mixed on proper desks as opposed to on keyboard workstations. Vinyl cutting engineers told me they had some problems

cutting some tracks with wandering frequencies. Too much sub would mess too much with the actual groove and the resulting track wouldn't run a stylus properly.

Q: Did you go to Rage from the start? So when Acid House was in full swing in 1988, Fabio and Grooverider had started at Rage. What was the vibe in comparison to other nights during that time? Were Fabio and Grooverider playing music with breaks in it from the beginning?

I went to Rage in the early 90s and Fabio and Grooverider were residents. The night always had a great crowd and the atmosphere was amazing. So many people from my town made the journey into London every week without missing. You'd hear a UK-made Prodigy or Acen record alongside a US-made Frankie Bones tune, belgian techno from Joey Beltram or even US house tracks like Crystal Waters' Gypsy Woman. That tune still gives me goosebumps with memories of Rage as they often played it as the last tune when the lights were up. They also had live PAs some weeks and seeing the Prodigy play there was inspiration to me too. They were promoting their 'What Evil Lurks' EP. Android and everybody in the place are amazing tunes from that era.

Q: Would you say that much of the music that's made in these genres is a process of hearing something that is made, and trying to incorporate a similar method, style?

The majority of rave tunes were producers trying to replicate a style they'd heard in their own productions. The piano stab from Carl Cox lets do it must have been used in hundreds of rave tracks, some of them not so good, but others [had an] amazing use of it. Same as Frank de Wulf's or Joey Beltram's techno sounds from their R&S releases used by so many producers including the prodigy to great effect.

Q: With you break slicing method, do you mean that you would split the breakbeat into two parts, preserving the rhythm of the breakbeat in two segments?

Yes exactly, just the two segments.

Q: When you would do this re-triggering, would you say you tried to preserve an ordering that emphasized the downbeats?

It would always be the kick and [then the] snare and rest of the break. I'd play the break then just like a kick and snare, and the run-on from the snare would fill the rest of the wall of sound.

Q: Did you continue to use this technique for future tracks? with newer gear?

Pretty much the same technique until I had an Akai s1000 sample rack unit, which I'd cut everything up into for more accuracy.

Q: Any studio upgrades between Tripswitch and these later releases? Do you recall any techniques that the new gear afforded?

I had the same gear until around 1993, when I started to use a proper mixer and a permanent studio location. The new gear brought more possibilities and better quality of mixes, but bought the problems of blown channels and patch bays etc.!

Q: So next was the Feel the Fury EP on Chill and the R&S release - two of the same tunes that were on the EP? I'm guessing Terminator and Tripswitch did quite well. Was the break cutting technique described above used in these as well? Was it something you heard about or came up with yourself?

The same break cutting technique was my own as far as I know, although others might have discovered the same way.

Q: How did the R&S deal happen?

The R&S deal came about without my knowledge as my label boss was far too sharp for me in those days, and kept me in the dark about lots of his dealings. I took legal action but it came to nothing as he went bankrupt. Aside from my monthly retainer payment, I got pretty much no royalties in the end. It was after that I went on my own with labels Ruff On Wax, and later with Smokin Beats with a mate from Manchester.

Q: Please rate on a scale of 1:7 the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reversing
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

• pitch modification 7
• distortion 1
• resequencing 6
• reversing 2
• multibreak layering 7
• multibreak alternating 6
• timestretching or start point manipulation 2
• filtering 2
• flanging 2

• reverbed 1

• other: Overlaying with drum machine beats 5

C.18 Stewart, D. (Subject 13)

Q: Please tell me about the music scenes you were involved in before Hardcore and Jungle. How did you find yourself involved in these genres? How did you come to be involved in Hardcore, then Jungle?

Before hardcore [and] jungle I was into hip hop & electro. I was a scratch DJ (turntablism)…collecting breakbeats and rare funk records to cut up and mess about with…I would play loads of these tracks at local parties. As we know turntablism is the art of manipulating sounds and creating music using 2 or more decks. This is what brought me into making music. My decks became instruments of me learning about music—how to add things in odd places at different times with different feel—it taught me about creative arrangement and intros, outros, drops etc. I learnt about 60% of what I know today from turntables. That then bought me into wanting to play and produce music.

Q: Do you recall which hip hop and electro tunes were stand out to you in these early years? About what year and location was this?

The tunes that blew my mind and got me into this whole music thing were as follows:
TLA Rock - It's Yours
Imperial Brothers - We Come To Rock
Jonzun Crewe - Space Is The Place
Cybotron – Clear
Kings of Pressure - You Know How To Reach Us
Weather Report [- Birdland]
Charles Mingus - Meditation On Integration
Head Hunters - If You Got It, You'll Get It

Q: Did you teach yourself or were there other friends of yours that you learned with? If so, did they go on to get into hardcore too?

I was self-taught at first and a few years after releasing my first record I decided to get my diploma in audio sound engineering.

Well not being too presumptuous or anything as I made my first tune from mainly my own influences as a creative person and I guess the artists […] in my list alongside some early pirate radio playing the very few good like-minded tracks of the time. I was an early producer but not one of the first.

But what I can claim to be is the first to filter out beats as I had this lovely black Casio what had massive filter sections on so I just messed about with it one day on beats and the rest was history in the genre…synth sounds from the likes of Weather Report etc. and modern techniques of that time by the likes of Cybotron were massive influences in how I would shape my sound for the future. In my second session ever in a studio I decided to bring my records in a try out a idea: I decided to keep the pace of Cybotron and the synth type sounds from Weather Report, which I played on a Juno 106 merged with the famous but hardly used then sampled [James Brown] break and the rest is history. This was my first ever record I made called Eternity in 1990 on Vinyl Solution Records.

Q: When did you first hear Hardcore?

There were a few radio stations of the day playing hardcore as we know it now but mixed up with acid house and normal house as there wasn't enough of it then for DJs to play a out and out hardcore set but a few months after there was more than enough for a 2/3 hour set as things were blowing up as people were loving this new hardcore sound emerging and kids were jumping in studios trying out ideas and pushing boundaries.

Stuff like Mr. Kirk's Nightmare etc. stood out for me as something that I liked and told me there's a new sound about to break the mould. I had sniffed this possibility in the studio before hearing these tracks but on hearing these on radio it confirmed I was not alone in this thought of thinking…like-minded kids were using

there love on these music genres of hip hop/electro techno/house with the new emerging Akai/Casio samplers and Juno synths of the time and hence hardcore the term was born…don't know who called it hardcore though?

So I guess heard the first emergence of possibilities in late 1989, but 1990 is when it was officially born and given its name hardcore.

Q: Was it a Casio FZ-1 (or FZ-10M)?

Yes it was a Casio [FZ]-10M Rackmount 16 bit sampler.

Q: So Eternity was your first record. What tune would you define as your first breakthrough track? Could you explain how you made it? The motivation, vibe, and process?

The record was produced back then when things were quite different…I took a bunch of records, which were a mixture of electro[,] acid house and rare break beat stuff.

The night before I had wrote down my arrangement on paper in a format that looked like the sequence page on Notator, which was the program that everyone mainly used back then just before Cubase came into the picture. I always wrote down my arrangements in formats similar to the program I was using at the time.

I gave this sheet of paper to the engineer at the time and we followed it with me explaining bits the engineer couldn't understand, we used the JB break and a few Michael Jackson samples and a old acid bass sound from a old tune acid house track that I can't remember then we chopped up bass and spread across the keys then I played the bass melody line from that. The engineer, Danny, played the riff on the Juno 60 then I arranged it and added a few more samples here and there and we were more or less there. Looking back, it was simple but it seemed like a eternity in itself making the track. The record company got in this guy called Alan Scott to mix it as he was big back in the day and had a wealth of knowledge on the mix and we were ready to orbit this baby into the universe from there.

Q: Also, here's a general question: Do you think technological development has affected your music over the years? What about in relation to production techniques?

My answer to technology changing my recording technique is easy…yes.

I'm one who sees it as a good thing as the quality of the music is better It's a progression but it still needs to be used in the right way. Yes my techniques have change a bit for sure but many techniques learnt early on remain as there original to me and that's the essence of my individual outlook to creativity. I won't talk in detail about how I produce music these days as I live by this Albert Einstein quote: The secret to creativity is knowing how to hide your sources. The reason being [that] we'd all end up sounding the same.

I also sometimes think on the flip side of all these wonderful technological advances it could one day become way to easy to make music with the rate of how fast these companies are developing new amazing software programs, but for now these advances are an advantage as the consumer gets a higher quality of music. I also see some point again of those with a opposite view saying that you don't have to have any musical talent or skills as mistakes are all super corrected and near on impossible to make. So yes, all will continue to change with time…very interesting indeed.

Q: Once Eternity was out, and you were enjoying its success, what was next?

After eternity was out and the profile started building I went back into the studio this time with Alan Scott to work on the next single "The Promise".

Q: Can you tell me how you hooked up with Vinyl Solution and Underground Level? Did you start to build your own studio at this point or did you keep working with Danny (O'Shea?).

I never bought a studio as I was not paid much money and being [happier] with just making records I didn't really question it sadly; a mistake far to often made by fresh artist to the industry.

I think the promise for me was quite a cheesy record. We had sold a lot of records of the first track and at the time Vinyl Solution also had a group called Bizzare Inc who were charting high and making TV appearances on some big programs in the UK and I guess I was influenced to go in that direction, which sadly I did…don't get me wrong its a cool record but not something done with complete conviction for what I was really about.

The hook up with vinyl solution came from the engineer Danny. He asked me if he could take the demo up to this label in Portobello Road so of course I said yes and of course that was Vinyl Solution.

The hook up with ULR came about with me knowing a guy called pat who used to be a DJ and had run into quite a few wealthy mates who had this idea to start a massive distribution with a host of record labels under it. I went down and checked them out and liked what they were doing and signed a deal with them, they had some really good labels in that time and the likes of carl cox had just started doing his techno/house stuff then with them so there was a good buzz around that this thing was going places.

Q: How were you introduced to making music on computers? You mentioned it was self taught, but how old were you, and was this at home? or in the studio environment?

I was introduced to working on computers by finding a local recording studio in my area called Islington music work shop (IMW). I found a leaflet in a shop advertising it…later people like Rebel MC, Dr. K, who now we know as DJ Hype, and The Ragga Twins just to name a few would record at IMW. So when I say self taught it was because all I had at home was my turntables so I just paid for studio sessions at IMW and brought my records in then I'd copy the look of the computer screen onto paper and draw in the parts were I wanted the sounds and melodies, etc. to be. This was my journey of falling in love with arrangement. From early on I knew what I

wanted and were I wanted it to go. This could be quite frustrating at times for engineers having to read off my papers so I knew at some point when I had enough money I needed my own set up as I was learning in the studio by my watching and writing down method and using my drawings as my computer screen at home…creative ideas are never a problem as I can write on a good day 3 or 4 tracks and I kid you not here, so my self taught schooling was a mixture of home and studio. A few years later I took my diploma at the same place and got my qualifications as a audio sound engineer, as I knew I needed the technical side of music behind me to have better control of my ideas, which would able me to work faster and more freely.

At the very start of this journey I just wanted to try out my ideas and see what they would sound like so that first session I paid for got me a record deal but this wasn't my intention or goal to have a record deal…I just wanted to see what my ideas would sound like.

Q: Did you continue to work with engineers on your productions? What was this working relationship like? Did you use different samplers and software later on? You mention Notator and Cubase. When did you make the switch? ever use any trackers or was it strictly Notator, Cubase, then into modern DAWs?

I continued to work with a couple of engineers. The relationships were not great…I mainly felt at times I was asking for things that were impossible. To me everything's possible if tried out. I started to realise some of these dudes were either a bit lazy or just not able to apply all these ideas. Fact was, many of these engineers learnt a hell of a lot from me and it opened up there minds to so-called impossible things, but also I learnt a lot from them by watching what they were doing. So yes, I knew at some point soon I had to learn there job and combined it with the most important part, which is having the creative ideas. Don't get me wrong as I'm not saying all the engineers were crap, as some were very good indeed but I knew what I wanted and I guess I was quite demanding with what I thought was possible.

At the time we mainly used the Akai and Casio samplers for Eternity and the promise I made the switch to Akai and Cubase fully when I got my own first proper set up.

No trackers used strictly Cubase.

Q: Did you have contact with any of these people that did recordings at IMW?

Yes I had contact with Rebel [MC], and Hype for sure.

Q: Do you recall which Akai? Why the switch? What else was in your setup at that point (e.g., what computer were you using, mixing desk, etc.)? Was this in 95?

The sampler was Akai [S]900.

I switched because I wanted to see what programs felt better. I'm always like this as I do think people take to some program better than others. For me it's not about what everyone's using its what make you fell more at ease and more creative to get your ideas out.

Mixing desk was a Mackie I think, not to sure on that though. When I remember correctly I'll let you know. Wow, this has made me have to think […]

My first small set consisted of Dynaudio monitors, Juno 60, Mackie 16 track, Akai S1000, bass station, Alesis compressor, Casio FZ-1 keyboard, digiTech reverb unit, running cubase on Atari ST computer and a DAT player from 94 or 95 I think?

Q: What tunes did you make on that first setup? Seems that you had an explosion of tunes in 95/6. At this point were you working alone?

I took about 8/9 months learning my stuff in my studio, but the thing mainly what I was most unhappy with was my mixdowns. After my second release (The Promise) with Vinyl Solution, I had had enough as I didn't get my due respect of payments and being very new to the industry I didn't know were to turn for legal help or advice so I just cut my losses and left the label. I was confident as I had a new set up and

most importantly my creativeness. I knew the mixdowns were the only thing that needed sorting out and it was the only area really were I had not got hands on with in previous releases, then after say a year out just learning and doing odd jobs here and there for money I got into my the ULR period were I met the Intense boys through Pat who had signed me. My first release on ULR was a tune called Techno city, which I let myself down with I would say; the mix wasn't right. In fact it was terrible. I think I rushed this out because I felt it had been a little to long since the last release The Promise. As much as I love everything I do, this was by far my poorest release and served has a moment never to forget when and how to do things correctly, so I'm now happy that happened as I take a positive out look on the release as never getting to that low standard ever again…but in answer to the question of the first track released on my new set up this was the first :(…Lol,

I've told a few of my good friends about this interview and one of my mates who's a grade A pianist said my early writing down of arrangement are like manuscripts like in the writing of scored music its just that mine was with electronic music. We laughed as they know my odd leftfield approach so well.

So after landing at ULR, Pat, who had got me on the label introduced me to the Intense boys (who were based up in earls court west London). We spoke and got on so well and obviously had so much in common from football to music to ladies, etc. I started recording here and that's when the explosion of releases happened. It was easy to see why, [I] was still bringing my writing manuscripts, which amazed the Intense boys and gave us all some fun moments of laughter as they never seen electronic music written down in paper form. Now I had stuff at home that I could save samples and sounds and ideas onto disk alongside bringing my manuscripts and records up to the Intense boys things were ready to orbit and I knew it and this fueled my creative levels even more and I knew I was gonna have a massive outpour of writing. I was very happy and my whole productivity was flying. Plus I write very fast as the Intense boys will tell you. I've tried so many times to write slow, but it just doesn't work for me. We're all different and for me things have got to flow and it they don't I just scrap them.

I've always known what I wanted and know had time to be prepared before hand with all ideas and set up around me knowing when I hit the studio with the

Intense boys it would all fall in place, and without being big-headed, I could and still can hear tunes/ideas from top to bottom in my head before I've created it. Of course things change when actually applying the idea but I have a basic form of the track from start to finish before I've even started. This is why I love arranging so much as I find it so easy. It's like I have a few different templates of arrangement and then I fit that into the idea of the track and combined the right idea with the right arrangement template then your away and the rest falls in place. So things were moving rapidly at this point were you rightfully noticed around 95/96.

So my mixdowns were no longer a problem as the Intense boys were amazing at this so I let them mixdown all my tunes of that period. By now my studio set up was changing as I had heard a quality of sound from these guys what was the best by far. I bought an Akai S3000, new Mackie 24 [mixer], added the [Yamaha] NS10 monitors to go with my Dynaudios and a few other bits here and there…but still I was going up to intense as they new what I wanted and that gave me time to really learn my mixing down without the pressure of having to release stuff when I hadn't quite got the mix correct. But also saying that and in answer to another question you asked about what was the first tracks released from my own set up. Second one I did was for a release with Kenny Ken's label Mix n Blen', which was loads better than the terrible mix of Techno City.

The track on tracks mixdown on Kenny Ken's label was fine, but knowing me and my obsession with mixdowns, fine wasn't good enough and after Techno city I vowed that if it wasn't perfect than its not going out. [We] all now know perfection does not exist…lol.

But the track on Mix n Blend is good when I listen back now and I'm proud of it. So I decided to keep the mixes coming out of the Intense studio until I could mix as good as they could, but in all honesty it was more than the mixes why I recorded there so long. We were all good buddies it was so much fun and a great period of friendship and music—something I really treasure. Those guys helped me reach a level of production that even my diploma course couldn't give me. I owe a lot to intense and these guys are firmly placed in my heart and I have the utmost respect and love for the dudes: Beau, Dan and Simon (Intense). It was through us all going down to the west end were Fabio and Bukem were the residents of a odd sounding

mid-week night, which I'm sure you know what I'm talking about as I will clearly state for the record (MADE DRUM N BASS).

It all started going crazy as it was a whole different sound going on. It was totally what Subject 13 was about.

Q: What was your next big single (was it faith?)? Can you walk us through how you made it?

Yeah I would say faith was the next big single…I had put out some lovely stuff on Vibez like Mystical Flight [and] Oceans on Fabio's label, which is still my fav track of every thing I've done. Jazz Style with Fabio's label and other bits here and there but faith was when I wanted a release with GLR to so I put a lot of time into that tune thought wise even though it was written quickly. I was also listening to a lot of fusion jazz those days. Charles Mingus was on constant rotation at home alongside weather report and Carl Stanley. My love of jazz fusion was most evident in Faith and the title itself was a testament to were I was after my struggle to get paid correct from my vinyl distribution days.

The track was simple in how I wrote it. I found some odd intro drums that had a different fell as it needed a strange time intro to catch peoples attention from the normal intros of the day. Then I broke it down to some nice lush intro string then a drop into a big round live fusion bass, which a got a bass player called Lee Rodgers in to do. I got Lee to play a 8-bar bass pattern with 2 changes and then used those changes and various parts to keep the bassline interesting and not always doing the same thing…then I put a sprinkling of keyboards near the mid section and at the end of the track like in many jazz fusion classics and that was Faith born. Bukem loved it a snapped it up. Again this track was a reminder to me about moving on and letting go of the past.

Q: Can you tell me more about the Speed night you were referring to above? What was it like? Who attended it? I've read it became a media spectacle at a certain point but before that it was hard to get going…

[Speed] was just incredibly inspiring. There was so much music that was different and daring and it just made you want to write and write.

Originally started by Kemistry and Storm but for some reason unknown to me it was taken over by Sarah from groove connection DJ agency..it was fare to say when Kemi & Strorm started things it was tough and the numbers were not there but they kept going for a good while until Sarah took over and placed Fabio and Bukem as the residence and it flew into orbit from there—but the fact that Kemi & Strorm had the vision was the reason it happened for sure so they played the crucial role of laying down its foundation 100%.

And yes, I guess as it popularity gained it started to attract the likes of artist like David Bowie, Bjork and many others, and even sports stars like Prince Naseem Hammed who funnily got turned away, which was right as I think [as] it would have been a early death to a great night had that kind of figure be allowed in as it would have opened up a door to that kind of celebrity thinking this was the place to hang. At least with the likes of David Bowie and Bjork and other music stars who attended there roots were in music so I think it was a good thing as there interest spawn chances of remixes and awareness that started to filter out to the other music scenes.

It was such a cool hub as you had the likes of Photek, 4hero, Blame, Dillinja, J Majik, Peshay, Intense, but to name a few. I could go on and on but truth is all those amazing artist who made great music attended at some point…in turn this inspired Goldie to set up his Metalheadz night blue note in Hoxton, which is were I live, I went to [Metal]headz a few times but for me it was speeds intimate almost jazz club feeling atmosphere which inspired most. It was cramped in there…pretty dark and just seriously bass heavy. It was a world of learning and hearing off the chain stuff. For me this is what is missing today, we need club nights were people know things ain't gonna be quite what you expect…the unpredictable in music is what makes way for new things and I feel we need to get back to that…Speed played a massive role on me and I'm grateful to have been part of it.

Q: Can you walk me through Oceans? What was the motivation? What samples did you use? Live instrumentation?

Well this special moment is one I can't forget…Oceans is a mixture on synth and samples working together at there best. I'm a avid collector of old jazz music as you may have guessed and I would go to a record store in kings cross called mole jazz every Saturday…I'd buy a few of the obvious well known jazz artist records but I loved buying a loads of unknown artist records which I've never heard of…I didn't care if some of it might be crap as I knew I could sample something if it wasn't that great for listening. Plus, this way it helped me to see the scope of jazz in all its form, as all genres are built of these same structures with the well knowns with major backing or money already there to have a strong indie label to the middle sector just breaking through and the white label unknowns. Every one of these artist make the scene and its impossible to have a real scene with out these 3 sectors and for me the unknown was always the most exiting. You can also see this same structure in all genres of music.

Anyway left me drift back to Oceans as I can feel as was going of on one.

So I came across this jazz album, which I have no more due to my young nephew lending my records and not returning so I can't even draw on the name of the artist where I took a crucial snippet of some strange flute sounding background collage of noise from which then I tuned in key with some synth strings from the keyboard. I chopped up the sample into about 4 bits at odd parts as that way it comes away from the original sample and just create something sounding very different and unexpected. I then spread the sample across the keys and made a synth chord pattern from the keyboard with a very angelical preset, which I later edited then started playing with the samples till it formed a rhythmic melody that made a incredible vibe and atmosphere, which formed the basis of the main melody to oceans…this mixture I still use today…I don't sample that much now days but I still keep this methods as it works so well…I'll play something on the synth and get loads of odd background noise from my live recorded sound library and get it all I key then chop up into segments and rejoin them at random different parts and form a new melody…it works 60/70% of the time…I'm about 4 tracks way from finishing the new Mr. Lefteye-Subject13 combination album and this recording method is very much part of how this album was built as you'll here soon and I'm very exited a its some of my best work with out doubt,

The rest of oceans than fell into place with odd bits of synths key licks helping to take it away from the main melody at times…Also I remember the break being very tricky point as it wasn't that big heavy bottom structure but more light and not as heavy as most other stuff I would do…so I tried […] a few big breaks, which took away from the ambience of the track so I decided that it is what it is and kept the lighter sounding break, which may have taken away some of its dancefloor appeal but I didn't really care as this was a track I wanted to get across to everyone and not just for the clubs as it was about the atmosphere and the drifting into sound and getting lost in sound were ever you was…

Q: Just to clarify – this ambient sounding pad in the intro that runs through much of the piece is originally a flute with a synthesizer string sample overlaid with it? :) Which sampler were you using at this time?

Yes it was a flute sample with some strange floaty background noise then I added strings from Korg [Trinity] Pro X 88 synth and chopped into segments and rejoined randomly to create a new melody.

Q: Were there other non-venue meeting places for the music (e.g., Music House has come up before)?

Music house was a great place were you'd meet and see everyone…its not far from me so I'd be there a fair bit…it was sad it went as it sure did make a connection and a hub for both established artist and up and coming ones…Black market records had a similar feel in the week days like Wednesday when the store wasn't to packed as everyone popped down there to check out how there tracks and labels etc. were doing so another hub that's sadly not the same…I think people haven't thought deeply enough on the importance of these places as there demise is a paramount part to why the scene is not as vibrant and grounded as it should be today.

Q: Can you tell me about your interest in breakbeats? How do you select them? Do you prefer certain breakbeats over others? why? How many do you have in your collection?

Being a early Turntablist before the advent of hardcore in the UK meant I was collecting rare groove funk and jazz records as influenced by the great hip hop DJs and my love for funk fusion jazz was so immense I would buy records none stop…so I guess I knew most the breaks the hip hop guys were using in there records and I was a general hunter of all kinds of breaks and still have a massive collection today.

I section my breaks into groups of (light medium and heavy) due to the sound and feel, so when I have a structured pattern of say 16 bars of music with enough melody then I flick through these groups of breaks…but by the mood of the music I know which groups fit better so I'll start scratching around there first…I have about over 4,000 funk and jazz break records ranging from all over the globe.

Q: Please rate on a scale of 1:7 (7 being the most often) the amount which you used the following (if you can, please use the entire scale):

- **pitch modification**
- **distortion**
- **resequencing**
- **reverse reordering**
- **multibreak layering**
- **multibreak alternating**
- **timestretching or start point manipulation**
- **filtering**
- **flanging**
- **reverbed**
- **other:_____**

• pitch modification 5/7
• distortion 4/7
• resequencing 5/7
• reverse reordering 4/7
• multibreak layering 4/7
• multibreak alternating 6/7
• timestretching or start point manipulation 4/7
• filtering 6/7
• flanging 5/7
• reverbed 5/7
• other:_____

Q: Where was Music House? What was it? Do you recall who ran it and why it became a focal point for the Drum & Bass community? Which artists went there?

Music house was situated in Eden grove just off Holloway Road London n7. It was a dub cutting and mastering house originally used for reggae artist in the 80s/early 90s in the UK and those from Jamaica who were in the UK on music business trips, but as hardcore/dnb was rising many artist started using music house…I don't know who first from dnb discovered its use or when but were all grateful…word just went round in the hardcore/dnb circles that this was a place to cut cool dubz and meet the scenes players and get your music in the right hands…it had a real buzz.

I know 90% of the artist doing there thing back then were going there…I even recall people like Teebee would fly in from Norway as was such its buzz at the time. I can't recall every person but the ones I remember most were, Grooverider, Fabio, Mampi, Hype, Rebel MC, Kenny Kenn…J Majik, Goldie, Frost, Bryan Gee.

It was owned by Paul, a Jamaican man, and he ran it with his 2 sons Leon the younger one who did my cuts and his older brother Jason also known as Wookie the well known garage producer.

Section 5 on Kings Road had the same buzz for the West London based guys even though I never visited it I knew of it fame. I guess my fond memories of all

those times are just how good it was for the scene to have a hub…a focal point and strong landmarks of establishment.

Q: What was a typical day like there? What would you do?

I would spend the days at Music House sitting down inside or outside waiting to get our cuts done…there were lots of people so it would take ages but that was the whole point as you would speak to so many people…so I guess talking with everyone and the getting your cuts and grabbing some food the heading off home was a day well spent at music house.

Q: Your Discogs page mentions Roy Bleau as part of the group Subject 13. How did you meet Roy? What was his role in the group?

I teamed up with Roy about 96/7, he was more on the business side of things—he wasn't a producer and he never made any music. I knew his cousin from years ago as we lived in the same area and Roy would often come round and see his cousin then pop round to were we all hung out and played football. We got on very well and seemed to have a keen business interest in music so eventually he asked if he could get involved with Subject 13 as he had some good business ideas so we spoke at length and went into business. From time to time, I've often had different business partners but ultimately its myself that has had to passion to continue as music defines who I am regardless of its unpredictable ups and downs, which you have to deal with if you truly want to continue in your love of art.

For others it may not be the case and I fully understand that as we all travel a different road of life.

Q: When you arrange your breakbeat sequences, do you intentionally preserve an ordering that preserves the downbeats in the original sequence? Do these rearrangements typically preserve aspects of the original break (e.g., ordering, timbre)?

I try my hardest to stay true to the original break really as its the original form, which inspired me in the first place. So I guess if I felt the processing had changed the break too much then I couldn't use it as I need most of those elements that made it appealing in the first place.

The fact that the tempo is already faster than normal had taken away a certain amount of groove already so its important I keep as much left to the original source as possible.

Q: How was the US and Canada viewed for artists after the explosion of Jungle in 1994? Can you describe the community's interest in expanding into US/Canada?

For me it was a very positive thing. It was a blessing to be asked to go to a country and play the music. It may have started in the UK but it needed other countries to help it grow and expand and bring in new ideas and outlooks. So much time and effort has been put in by other countries and without this, the music would not have reached were in needed to. Global connection in dnb was one of the most positive things ever.

Q: Can you elaborate on [your pause button mix technique]?

Yes I forgot to mention my old tape deck, which I did pause button edits on. It was a old Casio stand alone tape deck that I'd chop of things with which were on cassette. Planet Rock was a amazing track to learn how to pause button to. In a way, I was editing and splicing like the guys do with tape or reel as its known. So I could chop remix and edit chunks of stuff on tape as you would on the computer these days. Funny how […we] spoke of limitations creating ways of still getting things done…this was certainly the case here.

Q: The first question relates to what some have termed "krust-isms". The term refers to going the extra mile for an additional twist on a sound. For example, a vocal sample might have a short ping-pong loop at the end. Its something that is unique to your music.

Someone's coined a term for it! I'm honored! I think it started out by not having the resources, having samplers that could only do 14 seconds, so it was really about how to use as much of the samplers as possible, and just try to get the most of the machines really. It was that and it was also about being anal about detail as well. For instance, Soul In Motion took maybe 3 or 4 weeks to make that track. It took about 4 days of sampling, 4 days of editing, another 4 days of arranging, and maybe 4 days of mixing. That was typical of the music that I was making back then. A long tiresome process, but because you are going over something so meticulously you're really trying to be as detailed in every aspect of the process as possible. You're really going over the loops, you're not trying to repeat your loops, but also you're trying to put something really detailed on everything you can as well. Like really going into detail about the effects, really going into detail about the loops and the edits and stuff.

To be honest, we were competing with each other as well. I was competing with Die, I was competing with Roni, I was competing with Suv. We were trying to find new techniques that someone else hadn't found, other things that they couldn't do. We were like super geeks in the studio, trying to find what other people weren't interested in. And pushing the boundaries of what the possibilities were on sampling, on editing. We listened to the details; for us we listened to the beat, but for us it was the shuffle, "is there a shuffle in there?", "is there an edit on the snare?", "is there a double kick there?", "has he got reverb on that snare that's hidden behind that delay?" We were like spies, you know, detectives, we were really anal, but it was only making our music better by making us push each other, making us better at being producers to not settle for the norm as well. We'd make a track and we'd listen to it

and we'd pick it apart, "lets do that there, lets do that there, lets do that there". We used to say, "lets go in", and that meant, get a bag of weed, and go in on the track, go in on the edits. When we started making music, we created a lot of the edits—mad edits. If you listen to the Smith & Mighty remixes me and Roni did, and someone played it for me the other day, and if you listen to the edits in that track, it's ridiculous. Editing on top of editing, on top of editing, and its like this collage of edits throughout this track, but that's just typical of what we were doing. We were trying to explore what the possibilities of the music were; we weren't satisfied, we knew there was more and so we were just looking for it.

The simple answer to that question is, there's always more, so look for it. Don't settle because the beat's rolling. What else can it do? It can roll some more. It can roll in an entirely different way. Try rolling it backwards, sideways, upside down. It's just endless. Sometimes, I'd call Roni into the studio and say, "Roni, listen", and he'd sit down and start doing stuff, and you'd let them; Die would pop in or Suv, and Suv would start making a bass or start editing a little vocal or something or pull out a record. It was really a freestyle atmosphere where anyone could come join in, and no one was super anal about "ah no, this is my beat you can't fuck with it", you know you go into someone's studio and listen, and they'll explain to you what they're doing. We were about pushing the boundaries, and I'm still about that now. So this whole teaching thing, this is about me pushing the boundaries, I don't know anyone in the music business that's doing this. I'm looking around the landscape, trying to see who's doing what, and if I don't see it, that's what its about for me. Filling in the gaps, I'm looking for the gaps in the experience, and that's where I'm going to fill it. With the music it's very much about that as well.

Q: Can you tell me about the music scenes you were involved in before Hardcore and Jungle?

It was the Bristol scene. It was pre-Massive Attack, they were called Wild Bunch then, then you've got Smith & Mighty who were early sound system pioneers, I was involved in a crew called Fresh Four.

Q: That was *Wishing On A Star* right?

Yeah. That was me, my brother, Flynn, Suv was in that crew, and another guy called Judge, and we just used to DJ in a warehouse […] in St. Paul's. I went to school with Tricky, so he used to come hang out down there, and we just used to use this spot as our sort of warehouse on our side of town, because we lived quite far from everybody else in Bristol—it was like a five mile walk to get to the other side of town, and that's where you had to go to party every night. We were fed up with that, and we wanted to do a party on our side of town, so all those guys could come over to our side of town and see what's going on over here, so that's what we did. We found a […] in this place, and we made a door in the wall and put tarps on the roofs, spraypainted the walls, and hired a sound system—that's how I met Roni, and started to do our own parties in there. Charge people a fiver, and they could come in. That's kind of how we built our name in Bristol, by doing those parties.

The scene around that time was really just experimental music, it was anything goes; you'd go to a party and they would play the whole spectrum of music, right from Reggae to Punk music, to Pop music, to Rap, Electro, just whatever was in, they played it, and the people were there, and there's a book you can get called [*Art and Sound Of The Bristol Underground*] about the Bristol scene, and the pictures in it really sum up what was going on there. That was the scene back then. Really experimental, you'd have guys scratching, cutting up with two turntables…you just have to imagine *Wild Style* in London, and that's kind of the vibe. *Wild Style* in Bristol. We were just trying to emulate what we were seeing there, that was the whole blueprint. Kind of Hip Hop bass, the early kind of music I started to make was Hip Hop. I was making beats and breaks, I was cutting up two copies of ultimate breakbeats, and just really trying to be a Hip Hop producer, a Hip Hop DJ. Then it all started gradually changing. I'm kind of an open person, my background is Funk, Jazz, Pop music, Electro, 2-Tone Ska, Classical, I don't really have any preference musically, so I'm quite open to anything, and I started to experiment music-wise and it started to go that way, more sort of electronic experimental stuff and the we sort of lost touch of what was going on everywhere else and that's when we started to move away and people started calling it Jungle.

Q: At what point did you start to use samplers?

After the whole Fresh Four thing we got signed to 10 Records to do an album. They threw us in a studio and said go and make an album, and none of us knew how to use any of the equipment. We're 19 year old kids in this studio, massive speakers, big desk and all that, and we're like, "what the fuck are we supposed to do here?" No one had a clue! My brother made Wishing On A Star with Smith & Mighty. They were our producers; we didn't know how to use any of the equipment. But for me, I got the bug. I just looked in this space, and saw all the equipment, and I was like fucking hell man! And my mind just started to wander, I started to tinker with everything, I didn't really know what I was doing for a while, but what happened was that my brother had a sampler, and I lived in his back room for like three years, slept on the floor everything, until I understood how to use a sampler and it was a Casio FZ, so that was the very first sampler I had the use of, and I just mastered it. That's all I did for years, I just sat in that one room, and this kind of sums up part of my character. I'm very hard to move in one direction, but once I'm there, that's it, I'm stuck. It's almost a stubborn thing, I get it from my dad. You couldn't get me out of this room. I would just live there. My brother would come in—I'd have my headphones on—and he'd bring me beans on toast or something and I would just live in this back room learning how to use a sampler, and that's how I learnt really, and then from there I learned to use Cubase. A friend of ours gave us Cubase, and said, "this is going to be the future! Everyone's going to be using this to make music". I was like "what is it!?" He said, "Cubase!", and I said, "Cu-what?" So he showed me and it was mind-blowing. You could move these blocks around the screen with your hands and I was like, "my god! This is so fucking futuristic! It's amazing!" And I went home and started to master that and that was it. I started to just figure out how to use this to make music and never looked back.

Q: What year was this that you got the Casio FZ-1?

1990…1989…1988? My brother got one. If it was technical, he would just have it. He's like that. He's a computer nut. Whatever computer-wise it was, he always had it, and somehow he got his hands on this sampler and it was just so serendipitous; we just came out of the whole studio thing with 10 Records that didn't work out, and he called me and said, "I just got this new sampler", and I was like "really?" It was from one thing [to the next], and that's how it's been. I haven't really given it much thought, what's the next thing for me to do? Ok I'm going to do that.

Q: Do you remember what you were running Cubase on?

Yeah. Atari ST.

Q: What were you sampling when you first started?

Breaks. Breaks and Pop records. When we were DJing, we were cutting up two copies. We started off as scratch DJs cutting up two copies, so we had collections of records with the breaks read to go, so when we started sampling we knew where all the breaks were. We were straight in. Right into the basses. The only problem for us was the basses; we had to look on Techno records and House records for bass sounds, but that was a really good thing for us as well, because that was part of our DJ outfit anyways. We were playing stuff like Adonis, and Confusion Confusion, the old Trax [Records] things, and the Energy Flash Joey Beltram, so we were into the Techno thing as well, like the R&S records, Trax records, so we were using that as our sample base, and we were getting all the weird sounds from that, getting all the breaks, then we had a [Roland TR-]808, and a [Roland TR-]707, a couple [other] drum machines, trying to run them together, but it wasn't really working out. The 808 [bass] boom was big thing for us in early tracks as well, and using that as a bass line. Sampling records, going to second hand shops, sampling really. We got a [Roland] SH-101, and an [Roland] MC-202 and we were sampling a lot of sounds from that as well.

Q: What year was this [that you purchased the SH-101 and MC-202]?

The first time we had our hands on an SH-101 was about 1990.

Q: What was your breakthrough release, either as a group or individually after *Wishing On A Star*?

I think *Jazz Note* kind of signaled something new was happening and then I had a series of kind of buildups to *Warhead* I guess, like *Set Speed*, and *Guess*, and a few other things before then, and when *Warhead* came out, *Warhead* really changed the whole thing. It was a totally unique arrangement, there were no drops in it, it was just a totally relentless bass line that just never quit. I think it took everybody by surprise because it was a different format, but if you knew where we were coming from you could hear the progression. We were really pushing ourselves as producers and pushing the boundaries. That track was inspired by Roni and Die's *Mad Professor* track; when they made that, I was like, "that's a fucking monster" and I have to do something equally as horrible and it inspired me to sit in the studio and I got angry and sat down and made *Warhead*.

Q: When you say angry, what do you mean?

I'm going to take you out, with this tune. It's simple. I'm taking you out. It's very much like that. If you heard a track like that back then and it got you to that point, its like, "nah, I'm not having it, I'm going to take you out". I'm a b-boy. B-boyism is about taking you out. If you have better laces and trainers than me, I have to go out and get a better pair of laces than you. It's that simple. If you cut up better than me, I got to cut up better than you. That is still my thing now. It's a good way for me to stay hungry and competitive. I'm not interested in repeating myself and doing the same thing over and over again. If I've done something, and it's the best that I could have done, and no one is trying to better it, I move on. I'm hungry for competition, I want to learn, that's how I learn, and its how I've kept ahead of what I need to keep ahead of. I'm not interested in being better than you, I'm just interested in being the best I can be. If I can use you as ammunition to strive me to get better than that's

fine. I won't tell you I'm doing that. I'm looking for excellence in everything and everyone around me so I'm just interested in learning, and becoming the best person I can be. I don't need to be better than you, I just need to be the best person I can be. That's what I'm interested in. I'm interested in, how far this thing can go, how far can I take it? That's what *Soul In Motion* was about, that's what *True Stories* was about. Those things are direct translations of films. That's my interpretation of films. I'm heavily influenced by films. Its more than a soundtrack, its the way you tell a story, its a journey.

Q: Your music is heavily influenced by films. How is the original source related to the final product that you create?

It's definitely context-related, for sure. So for instance, *Angles*, "when you can't see the angles no more, you're in trouble". So that's a […] sample from [an undisclosed source], but the way I used it was about how we operate on the street. It's meant the same way. When I heard that, it immediately resonated with the situation I was living in, it was a match. So when people heard that track as well in the dance, it resonated with them as well, as we spoke the same language. Some guy wrote that script, and had some insight into—for lack of better terms—street knowledge, and a black kid in Saint Paul's Bristol watches the film and immediately stops it, samples it, and puts it in a track and it blows up. It depends on where the persons coming from, what their intentions are, what their motivations for using the sound. I could have probably said it myself, but it sounded better the way he did, with the intonation and whatever, and it spoke on many different levels, but when you heard it, it meant what it said. It hit directly to the psyche of what we were experiencing at that time. Would I use that sample today? Not really, I'm not really living that life anymore, but back then, that's exactly where we were, and it fit the program.

Its obvious when you're angry you'll make an angry tune, when you're happy you'll make a happy tune, but if you're indifferent, you don't have any particular intention while you're going in there, I think a natural state will be expressed in your music. A lot of people have said they can hear the Bristol sound in our music. That wasn't intentional. I think one of our things that we always tried to do was to try to

capture the spirit, and the environment before we started in Jungle, because that's where we all came from. Before I knew Roni, and I saw him at these parties, and I used to hang out with Die at some of these parties, and me and my brothers used to go to these parties, we were all sure enough at one point, the whole of Full Cycle, before we even knew each other, we'd probably be in one party, listening to the same DJs cutting it up. I guarantee we'd all be in front watching Wild Bunch at Saint Paul's Festival maybe five or six times before we even met each other. So when we got into the studio and started to talk about music, those things would be coming up. We'd be talking on these issues, and that would be coming through the music. That would certainly be resonating in the music. […]

Q: What was different about *Jazz Note* from other stuff that was around as well as stuff you had done before?

A lot of people were using the *Amen* break then. We weren't not going to use it, but we weren't going to use it as blatantly as everyone going to use it. That was our thing. We made it our passion to build and discover as many breaks as possible, so we went out and bought breaks, sampled breaks, made up breaks, we got into working with drummers, making break. So for us—and what I think *Jazz Note* did—it really showed a different kind of side of Jungle, and the production values, and the arrangement, and it started off with a very different sound. It was very musical, it was a very musical track for that time, especially for what I was doing. It was just different, it just stood out.

Q: Other than members of the Full Cycle crew, were there other DJs or producers that were around at the time that you looked to for inspiration?

We were into Bukem a lot. He was really out there doing some creative stuff. I think we looked a lot at Hip Hop. We were listening to the production values of Hip Hop. We all had a kind of similar background. Die is from sort of a rock, folk, live band background, so he would always bring loads of samples in from that perspective, Roni was like sort of Lover's Rock, R & B, and Hip Hop as well, so his

samples were around that thing. My thing was Hip Hop, sort of House, sort of Electro as well, so my samples came from there, SUV was kind of Reggae and Hip Hop, and everything else in between. So between us we kind of had the whole spectrum covered. The thing about sampling is that you would have to listen to a whole record so you could find that one break, that one sample. I think that was my education in music, really to sit down for days, listening to records and just enjoying them, even Thrash Metal and Rock and stuff that I normally wouldn't go and buy, I'd be listening to it for the breaks, and I would get an appreciation for the music, for the arrangement, production. That was an intense schooling period for me, understanding how people were making music and how chords and strings and breaks [were used].

There were a few other people, Rob Playford and Goldie were doing some interesting things, 4hero were doing some interesting things. Everybody was pushing the boundaries, the whole Oxford Crew, the Ganja Kru. There were lots of interesting things happening. And the battle thing of course. We were inspired by the movement and how it was going forward, and also we definitely had ideas of our own about what we wanted to pioneer our sound. We didn't want it to be like anyone else, and we didn't want to listen to somebody and do what they do. We wanted our music to sound as fat as Hip Hop, we wanted it to have that feel of Hip Hop, that big sub bass of Hip Hop, but also we wonted it to have that Funk, that Bristol Funk sound, that laid back party vibe, and we wanted it to be complicated simple.

Q: I think I know what you mean, but to get it on record I'll ask. What do you mean by complicated simple?

Breaks being really chopped up and edited, but effortlessly at the same time as well. Something that you would do that would be complicated to accomplish, but it sounds simple, or it makes the music sound simple. Intros that are just woven in and out but to listen to them, it sounds quite simple, but it's quite a difficult process. You're really pushing the equipment, sitting there for hours trying to do something, and it's complicated to do but sounds quite simple. If you listen to a lot of the early

Full Cycle, listen to the drum edits, especially when it comes to the end of the bar. You'll hear all these intricate loops and it sounds elegant, it doesn't sound cluttered. You'd be there for hours making sure it was smooth and it didn't distract your ear from the overall experience. The point was trying to make it elegant so it's still a part of the music. It's not supposed to take your ear away from the experience. You're watching a film, like a classic 1940s Humphrey Bogart film, and it's about not seeing the acting. Today its totally different, its all about explosions. We didn't want you to hear the edits, though they are quite intentional.

Q: After the FZ-1 and Cubase, when did you move on, and what did you move on to?

From the FZ we moved on to the Roland S-760 samplers, and the S-550, and S-330. That was really Roni, he was really into the Rolands. When the 760 came out he really flipped out, and said, "we've got to get it!" So we got that one with the monitor, and it was amazing, it would go backwards and forwards, sideways, and crazy shit man. It was amazing, and that's where all the loops came from, all the loops on the end of the samples, you could do that with the 760, you could add the release on it as well, so you would put your finger on it, you play the sample, you let it go, and it would do something else. So we got into that, and loops into LFOs, and loops into high-pass filters, it was just an incredible piece of machinery. I've still got it, I don't use it as much, but I've still got it.

So we moved onto those samplers, and then eventually onto the E-mu 64s, and then really it was just buying synths and drum machines. Different sounds, different textures, we started to understand how to use the synths and drum machines, and just started buying them really. [We] spent a lot of time in New York, and LA, in old vintage stores, sifting through stuff, buying drum machines, buying keyboards, old keyboards, shipping old keyboards back. We had a D-series Moog as well, an Arp Odyssey, an Arp Solina, a Roland O-R—or is it O-8—a Novation, just loads of things, Basstations, we had so much equipment at one time it was ridiculous.

Q: At what point did you reduce you gear? Or do you still have a lot of it?

I still have a lot of my old stuff. I sampled a lot of it at various different stages. I think for me, I started to streamline the studio, and especially when things went digital, sort of towards the middle of the 1990s or 2000s. I think sampling was just our thing. What we grew up doing…even when we had all these synthesizers and all that, we'd sample the sound. Even later when we had Pro Tools and we'd play it all line in, we'd still sample the sound. I think equipment gets moved around, and you figure out what's important, and what you actually need, what you actually use. I think for me, I get the Arp out every now and then, the Moog really is a team player, doesn't really go; it stays out. I use that a lot, though I haven't used it for about a year. Whenever I start a project, I get everything out and start building the soundscapes and all that. I think for just portability, and just for making music the way it sounds now, you just strip it down to make it sound simple, but a lot of old analog stuff is coming back, and people prefer the sound of analog now and I was never convinced of the digital thing. Half of my last album was digital and half was analog and I didn't enjoy the experience of the digital stuff. Now, I think digital stuff is a lot better, especially Native Instruments stuff is incredible, a lot of the plugins are a lot better now, but personally I still use my sampler. I have a Roland V-Synth now, and I use that for everything. Anything you put in there, it stretches it across the keyboard, seamlessly. I've had it almost 10 years now.

Q: So you prefer hardware samplers to software samplers?

Yeah. I do use Kontakt for whatever is in my computer, but the V-Synth has got my library in it as well, so I'll use the V-Synth more.

Q: So why did you switch from the E-Mu?

It was new [laughs]. I was making my album, and I wanted the S760 to be like Mach Five or Kontakt, so I wrote to Roland, asking why they don't make a soft-synth version of the 760 for the computer. They said, "we're not going to do that, but we've got this and you can borrow it for a while if you want". I was like, "no shit!"

So they brought this Roland sampler around to the studio, and the guy sat down and he talked me through it and I was like wow! What it could actually do blew my mind. It made the sampling experience hands on again, and also it enabled me to put my sounds in there and manipulate them and still do some crazy shit I'd never heard before, so it was a totally amazing experience. All the new stuff that you'll be hearing in the next year is all from that.

Q: How do you see yourself and the musical output?

I see myself as a creative. I really see myself as someone who makes music. Although I'm known for making music, I try to be as creative as possible in everything I do. You know, I come from a background of DIY expression. When we were doing the whole Full Cycle thing, we were making the flyers, we were making the t-shirts ourselves, we'd go and clean up the venue. It was always about doing everything you could yourself, until you couldn't do it and you had to go and get someone else who could do it. I've kind of been doing that ever since really. Full Cycle is the same thing. We just did it all ourselves. We tried to get signed to other labels, and we couldn't, so we ended up starting our own label ourselves, so that was essentially the same kind of DIY ethics as Fresh 4, and the same thing—we did our own club, we did our own radio. It was really about just doing things yourself and I just see myself as a person that is creative and who's interested in creativity, who's interested in culture. I'm interested in breaking the rules but not for the sake of breaking the rules, but because they can be broken. And I'm interested in doing things my way and seeing how far I can push them.

In Full Cycle, we did a Dope Dragon comic. No one was doing that. So for us to do that, it was a bit of a creative idea. I was like, "Why don't we do something that no one is thinking about?" No one has done this since, this is something we did 10 years ago. For us to do that, it was a pioneering move forward. We did our merchandise and that was the same thing. We tried to release records the same way, we tried to do interesting concepts the same way, we tried new pseudo-names—just play with it and have fun. For me, it was about having fun with the format. There were no rules so lets just have fun, lets enjoy ourselves, and that's kind of what I am

still trying to do now. Just push forward, just see what's out there, just see where you can fit in, see where you can make a difference, see what value you can add to the culture. It's about really expanding minds and horizons while expanding the people around you in the community and you show the look: If you love music, then you love the culture. If you love the culture then you love creativity. If you love creativity then you might like this. Or you might like that. Most people might not know what they like until people show them it. Or they read a book on it. Or they see a video on it, and that's what the beauty of social networking is about now. You can expose people to your way of thinking. Generally, if people like your music, they'll come along for your other things that you're interested in as well.

So, me personally, I'm interested in expanding the culture, and seeing how far it can go and seeing how far I can go. I wouldn't say I'm a futurist but I'm definitely interested in the future. I'm definitely interested in pioneering, I'm definitely into going forward, I'm definitely into doing what other people aren't doing, I'm definitely into exploring, I'm comfortable with sitting on the horizon, I'm comfortable sitting out there in no man's land, experimenting, and bringing stuff back for everyone to consume. I'm happy to do that. I don't have a problem with being a loner or the guy out there, who sometimes makes some out-there crazy music. I don't mind that, because for me, I'm comfortable being there. For me, that's part of my journey as well. I see that the job of the creative artist is to be out there, is to be doing [that] stuff.

Q: How do you select breakbeats? Do you prefer certain breakbeats over others? How many would you say you have?

Oh man. I'm into making them myself now.

Q: Do you use bits of some [breakbeats] to create new ones?

Yeah. I'll be inspired by some, and then I'll make some. I'll use that pattern and make them up myself. Maybe take some apart then put them back together in different ways. Thousands and thousands and thousands is the answer to that for breakbeats. I

did a breakbeat album for Loopmasters and that's got—maybe I did over a thousand breaks for that. Some ridiculous amount of variations on variations. On one break, maybe there's about 20 variations of it. Like a kick out, a kick in, a snare here and snare there, high hats in high hats out.

Q: Did you automate that in any way?

No, that's all manual. Its fun! I spent three months doing that. It was fucking fun. You don't have to finish a track! [laughs] It was great, just sitting there making noise, every day, it was amazing. I envy people that make soundscapes it's amazing. That was a great experience being able to do that. I had the opportunity to do it as well for a library sampler called Standard Music, and that was good fun as well doing that. How do I select the breaks? Just vibe. It's just got to feel right. When I'm making tunes, the sounds have colors to me. I'm trying to match the colors to each other.

Q: Would you say you have synesthesia? You see colors when you hear music?

Yeah. Actually I don't see it, I feel it. I feel the color. It has a definite texture and a definite tone, and I'm trying to match them up. If I hear a beat that I really like, everything else around it I'm trying to get to sit with it. It's got to feel the same way, the same feel and the same colors. A dull or a light color, or an orange or blue or a green and certain colors will go better with each other and certain colors will not match if you know what I mean. So that's kind of what I'm doing, and the beats and the kicks and the snares, I'm feeling it, I'm feeling the tone, I'm feeling the pitch, the shininess, the dullness, I'm trying to get that right feeling. When it comes together, you know it comes together, it just fits like a jigsaw puzzle, its in place.

Q: Do you have any favorite breakbeats? What about the *Amen*?

It's been killed man, but its still a fantastic break. You can hear how versatile it is everyone's used it from Pop to Rock to Hip Hop to Jungle to Soul. I haven't got anything against it. I don't think it's my favorite break, its a versatile break. I don't

know what my favorite break is to be honest, and even if I told you the name it would be a different name to the actual name of the original anyways. We used to make up our own names for them anyways, based on the Hip Hop record that they came from…*Soul Pride* is an amazing break, James Brown's *Soul Pride*, the *NT* breaks they're amazing as well. What else…there's this break we called the *Steezo* [?] break, but that's not its proper name. A lot of people have used that in Jungle now. There's another break called the *Goat* [?] break, a lot of people have used that in Jungle now as well. *Hot Pants* is a great break—very versatile. *Think* break is amazing as well, a very versatile break. Then there's all the obscure breaks as well that never really had the names we were using. We call those the commercial breaks. The whole Dope Dragon idea was built around using commercial breaks.

Q: That was part of the ethos?

Yeah. It was easy, quick music. Full Cycle music was about taking time, get the breaks right, it was fucking long man. We'd spend a week on a tune and it would sound amazing, but we wanted to make some music fast and quick for the weekend. That's what Dope Dragon was about. Commercial breaks, having fun. Most of those tunes were done once, we didn't go back to them, first time mix, gone, like hopscotch. Hopscotch was like an afternoon. Me and Roni sat in the studio and just did it, first time, that was it. Gone. Mixed it, that was it. *Set Speed* was done in like two hours. Three hours. Literally, we didn't even go back to it. Certain tracks were like boom, you just hit it. But you build up energy. You build that energy up. Sounds nice, like you just made it in two hours, but we were in the studio for three months before that. Constantly in the studio everyday, all day, every day, making beats, making beats, making beats, bam! You just make a tune in an afternoon. And once you start getting on a roll, they just start coming out.

Q: So it's not just the two or three hours…

Oh no…it's a great headline or quote, "Yeah, I made a tune in two hours." It sounds great, it gets people's attention, but really you're right. It took three weeks to build up

to that level. People say about *Soul In Motion* or *Warhead*, and although *Warhead* took two days to make, it was like the 50th tune I made in a row.

Q: So all these other iterations of things you were working on played into it.

Exactly. I was simplifying it and simplifying it, so by the time it came to *Warhead*, it was perfect. I was exactly how I wanted it to be. So you go over it and over it, and it was like, boom.

Q: What was it like to win the Mercury Award?

Fucking hell. It was like a shock. It was definitely a totally another level above what we were doing, and to be nominated was incredible. For the music we were doing, to be recognized on that level, it was unbelievable, really taking the music somewhere we never even thought it would go.

You've got to imagine, we were a couple of guys from Bristol that couldn't get signed to a label, so we started our own and then, we get signed to a major record label, and we're making the videos, we're in the studio with Redman and Method Man, and then we fucking win the Mercury Music Prize. Its like, "did we just wake up in a totally different universe?" Do you know what I mean? It's just so surreal. We're hanging out in the studio, you know, Busta Rhymes is over there, Redman's over there, Method Man's over there. We're in the middle of the room with these cats, and we're like…you couldn't dream about that. And the next day, we're in Def Jam's office talking to Lyor Cohen. We're trying to be cool and all that, but inside we're like freaking out! This is happening! For us, you know, we're living our dream, you know, like really in the midst of the whole thing. This is like the epicenter of Hip Hop, and we just got signed to Def Jam fucking Records. You know what I mean? It can't get any better than this. Winning the Mercury Music Prize was like, wow. Nuts. Totally off the chain.

It was very surreal. It was a very surreal moment. I remember being interviewed after it, and the woman says, "so how did you feel about winning the Mercury Music Prize?" I'm like, [looks around], "Roni, how do you feel about

winning the Mercury Music Prize?" It's an honor to have our music recognized, by our so-called peers. We did our best to live up to it and tour and represent the music around the world the best we could and I think for us, it was kind of we were doing anyway.

In the beginning, when we were DJing, we were ambassadors of the music, we were being sent into countries where they had never heard of Jungle before. I remember back in the early 90s and we were DJing, they'd send me and Roni to Germany and it was like going to Afghanistan; nobody there had heard of Jungle and the club would be filled with like 10 or 20 people, maybe like 100 people not really knowing what's going on. We used to go to all these backwater places in Europe, now I know they would send us in there, but they hadn't heard of the music. A very small little scene, and it just grew out of that. We just saw ourselves having to represent and explain to people what the music is, and that's what the beauty of [MC] Dynamite was so amazing at. He would be there talking to people, telling them about the music and about the experience, but with the right rhymes and such. So if you listen to a lot of Dynamite's early stuff, its stories. He's telling you about how we got there, and what we were doing, and how the journey was. He'd have it down, what he would do.

I remember when we toured America for the first time and we met a friend of mine […] from Soul Pocket, and he was in this rock band and he invited me to tour with his band and open up, so we were opening up for this rock band in America and they haven't got a clue what Jungle music is, they haven't got a clue who we are, and we're opening up. People would come up, you know, middle aged men and women, like, "what's this music? What is it?" And they didn't have a clue what it was. You could see them try to dance and try to understand what was going on and slowly but surely, you'd win them over. We had a two-hour slot, so you'd see them all coming in and slowing winning them over. Eventually, getting this dance and it was quite something to witness, it was quite amazing and you'd see this transformation it was quite something. I think we were quite fortunate to be around in that time, to have that experience and to watch this format grow into something. I don't think we still know what it is but it grew into something that people's imaginations started to be captured and it's become what it is now.

Q: Where do you see that Hardcore, then Jungle, then Drum & Bass came from? Are there specific social, musical, or technological influences or movements that you see as driving the development of the music?

Yeah. All three. Definitely. Socio-economically, because of the environment. You've got the late 1980s, so you've got conservatives in power, a lot of unemployment, pure escapism, you've got people just being left out, you know, marginalized, not being educated, there's no provisions for them, then they are just pushed to the wayside, hoping that they'll just go away. So you get this group of people, and they want to contribute to society, they want their voices heard, they want to say something. It's anger at this point. It's just anger, because they've been left out. There's nothing there for them to use to express themselves. Society has said to them, you don't matter, you don't fit the grade, so we're not interested in what you want, and we're not even going to provide anything for you. That's what we were about. We were angry young guys. We were 20 year olds, and we were angry that we were left out, we were angry we were marginalized, racism as at a high, we just wanted to say what we wanted to say. We learned how to make music and put on parties to express how we were feeling, and we needed an outlet, and the parties were an outlet for that.

Making music was an extension of the parties because the parties, and the music that we were playing wasn't saying exactly what we wanted it to say. It got close, because it was coming from the same type of rebellious mind state, most of it was coming from America in the late 80s, early 90s. You couldn't play a whole set of British music. You couldn't do that for a long time. So, we were listening to a lot of American music. They were saying the same thing, but we felt like we wanted to find the medium or the way to express ourselves that said exactly what we wanted to say, and that's when we started experimenting with the music, started to tinker with the electronics, and started to use the technology that was around and available for us to start to express ourselves. As the music progressed, the technology gave us a better understanding of how to exactly get that feeling out.

Sampling was the preferred method. We weren't able to play music. None of us were accomplished musicians, so we couldn't play what we wanted to say. So we sampled it, we sampled other records; we used them in collages. It was a bit like how Public Enemy was making their music. It was very much like that. Our thing just started to speed up. I think we were listening to a lot of the music when it was called Hardcore, and I remember being in fields listening to Hardcore and just listening to the flat beat and it had this exciting stuff on top, but it wasn't until I heard a break and the house flat beat the four-to-the-floor at the same time that it really piqued my attention, and I was like "what the fuck is that?" and that for me was Jungle Techno when it was the Jungle breaks and the techno 4 to the floor. We had a DJ around our way called Easy Groove and he was pioneering a lot of that. We started to tune into that side of it. Whenever there was a rave with the term Jungle Techno on it, we went. We started to follow that side of it, it was from where we were coming from, the Hip Hop the breaks, and they were using *Amen* a lot, and *Hot Pants*, all the commercial breaks that we recognized and it had that message in it was very, the sounds and the vocals were talking about freedom, talking about revolution, talking about being able to take drugs, talking about anti-government stuff, the police abuse. Shut up and Dance were at the forefront of that with a lot of their messages where they were talking about the abuse of the police and especially the Ragga Twins talking about the stuff that was going on in the streets and a lot of the early Hip Hop as well was doing that.

How I assess it, it was becoming more simple. You had this Rave music, which essentially was a lot of stabs, bass sounds, strings, high-pitched vocals and breaks thrown in, thrown together, and it was interesting. There was something definitely going on there. Jungle Techno simplified the process, it used one kick drum, one break, bass sound, one vocal, maybe a string, and it was about the arrangement. Jungle itself, took out the flat [four-on-the-floor] beat totally, […] took out the Techno-y [*sic*] bassline, and put a sub bass in its place, and then replaced the vocal with more of a Ragga vocal, or a Hip Hop vocal. That specifically at that point is when it became Jungle. We had the big rave in the Edge, by Jungle Fever, and that was the turning point, with DJ Ron, the four MCs, Navigator, Five-0, Moose, and Det. That was it. That confirmed that there was this new movement, and at the same

time that you had this movement, you had Intelligent as well by Bukem. Danny Bukem came with *Music*. When Bukem did *Music*, that was it. The whole thing exploded. Because you had this whole Jungle thing, but also you had Fabio and Grooverider, and Bukem, playing this next type of music that would sit alongside the Jungle and the Ragga thing. And we loved both of [them]. So Full Cycle is a combination of both those things. The scene kind of evolved. It split from this again. From the Rave, it split to the Jungle Techno, from the Jungle Techno it split again to the Jungle, so the Jungle Techno became sort of […] Happy Hardcore because the flat beat was still in it, and it sort of when that way. Jungle kind of went this way and it became a bit more…I would say interesting, but then, interesting to who? It just became different. It became more Hip Hop-oriented, a bit more Ragga-oriented, a bit more Soul-oriented. It took more elements from Soul music, Rap music, Hip Hop music, Reggae, and it morphed into this scene that was all about the groove, you know, the vibe.

It evolved again quite later on, but it had the whole Bukem Intelligent thing as well. Then you had Goldie's thing that came in and that had his vibe, which was a lot darker, but still musical. Goldie bought that in *Terminator*. It was this musical tune, and 4hero were doing their stuff. It was a very musical music. You know, *Mr. Kirk's Nightmare*, and stuff like that. It's very musical stuff, but very dark as well. You had all these things, and that was Jungle, all those things were called Jungle. And all those things started to mould into this one form because of technology, and also, every four years, you have a new generation of people who are coming into the music with their own ideas of what they want to do as well.

It took a while because the entry level was still quite high financially to buy a studio. Laptop music wasn't very good, Cubase was still being used, Logic hadn't come out yet and to buy a studio you had to have two to three grand. A lot of the people coming in didn't have that. It wasn't until Propellerhead came out and Logic came out that the new breed started to get hold of this equipment and start making it for themselves. When Logic came out, it was a whole new era, so you had people using Logic that totally bypassed the [hardware] sampler and the sequencer. When that happened, the floodgates had opened. Totally different way of making music, totally different outlook on making music. A lot of people got in because the music

wasn't about making musical music, it started to become about a technique of making music. When you had that dark sound coming in, it wasn't musical at all, it was just lots of noise, and it was loud and it was technical. So you had a lot of people coming in who didn't necessarily have any musical skills, who could actually come in and make a couple dark noises. When the Reese basses started to come out for instance, everybody started using the Reese bass, it wasn't a musical note, it was just a sound [imitates a Reese bass]. It was different, and people had it. It was still Jungle, it was still in that rebellious "fuck you, I'm not going to learn to play music, I'm going to play this one fucking note and put *Amen* underneath it, and put some sub bass around it and its still going to tear the dance apart," and it did! So that was still Jungle, it was still Punk, it was still Jazz, it was still a new way of doing stuff. And then, what that did, was that more and more people got into the music because it was easier to make from that point of view. So, what that did was it changed the dynamics of the dance because up until that point, the dance was predominantly bass heavy, female oriented, sub bass, shaking your bottom type music, and all of a sudden it switched around to this mid-range male-oriented take your top off looking angry type of music and the scene split again. You had the bass heavy part of the scene that wanted more bass, so that became Speed Garage or UK Bass. They went that way and the [rest of the] music became this man-oriented mid-range noisy type of angry music and that prevailed for a while.

Q: Where do you see yourself now?

So where I'm going now is really back to what I feel comfortable doing, and that's just really experimenting again and pushing my own boundaries, and my own ideas about where I fit in, in the culture, rather than scene. I think I'm interested in pioneering a new sound again. I've got a new name, a new project called George Kurtz where the sound of it is different. Different sound, different textures, different arrangements. It's just different again. I see myself in exactly the same position, doing the exact same thing: still pioneering, still going forward. I took some time out to learn and study to become this coach and mentor and stuff, and now I've been back in the studio for the last four years, just tinkering away, just producing a new sound,

and I've got something out, I'm really interested in and I'm looking forward to releasing to the world now, and its exciting.

Q: Where do you see the influence of Jungle and Drum & Bass outside of the genres themselves? What's important about the music that is important to retain, so that it doesn't get lost with time?

I think what you're doing is great. It's preserving the true voice of where the actual music has come from, which is important for future generations to understand. Without James Brown's interviews of why he did what he was doing, that wouldn't have necessarily the same effect on me for making music now, or listening to Miles Davis talk about his vibe about music, wouldn't necessarily driven me to listen to more of his stuff to understand where he was coming from. I think what's important is when people listen to some of these interviews, they'll have a bit of a better idea what the music is, and where it came from, who actually influenced them to try and do the same thing. For instance, when I listen to Miles talk, or James talk, they were talking about being pioneers and being creatives, and pushing the boundaries, and doing new things.

I just watched this Jean Michel Basquiat film, the documentary, *The Radiant Child*. I've been watching these documentaries for a while now, and every one says the same thing. You watch the Clash documentary, you watch this thing called *Punk Britain*, every one's saying the same thing. Its the same thing or three things. They're interested in breaking the mould. They're interested in being pioneers. They're interested in doing things other people aren't doing. And the way they talk about it, its important that they do that. So when I started making music, I had to go back to that way of thinking because it's important that you keep on doing that. And you don't do it because you want to get fame, you want to get rich, you want to get money. You do it because it's important to keep pushing the boundaries and to keep growing as an artist, as a producer, and as a human being. You don't learn when you're comfortable, you only learn when you are doing things you haven't done before. Listening back to these great pioneers, it gives you the sense that it is possible and achievable for you to be able to do something on any level, whether its going to

be great, noticed or not, its important that you at least try to do that, and have that same mind set as these guys did when they were doing what they were doing. So in the future when someone listens back, because at the moment we are going through these few weird revolutions in this music, where everybody's listening to electronic music from the last 10 years, and making music from that point of view. Some of its great, but some of it is missing the point. A lot of those people now are starting to dig in the crates and start to figure out where these guys that they got their sound from got their sound from. This will make it more easy for them to understand that. We've talked about breakbeats, we've talked about pioneers and about original sounds. You can create great stuff with all this equipment. Just with a bit more knowledge and a bit more hindsight, you can create some amazing things. In my workshops, I say to people, if you know more than anyone else, then you've got more to drawn from in your music. I site The Doors with *Light My Fire*, and the track starts off with some Mozart riff or Mozart-inspired riff and goes into this Pop/Funk/Classic Rock whatever you want to call it, and its this eight bar verse and a two bar chorus. The total song is completely out there, but it works. It's a massive track. So, one of those guys is classically trained and you can hear it in the music. Now, would that have been the same experience if the guys had listened to someone else in the same genre making some music, and though, "oh, we should just copy them because they're doing it". No, it would be totally different.

When people look back on any era, and understand that the roots of that genre aren't in that genre at all, they're in music 30, 40 years before, and that should given them some idea about how to pioneer something themselves, and where to start looking for ideas. There aren't any new ideas, we just re-appropriate everything. This is how we do it. I was inspired by *Mad Professor* to make *Warhead*. I didn't sit down and copy *Mad Professor*, I used the energy of it, I was inspired by it. I got angry. I wanted to make a better piece of music, and it worked. That's what we do.

My album, *Coded Language*, is heavily influenced by Miles Davis' *Bitches Brew*. I listened to that album constantly when I making that album. That's all I listened to, over and over again. I would listen to it and listen to it, to the point where I did sessions with musicians and a drummer, and we just freestyled. I let the thing record and I sampled phrases back, and that's where the riff came from in *Coded Language*

with Saul Williams on it. It came from one of those jam sessions. So for me, when you really break it down, that's how my mind works. I'm really inspired by the whole thing, so I try to recreate it. When I come into a project, that's the same thing I try and do again; I get all my stuff out, and I try and recreate something that was going on back then, or I try and have an idea about it. I put myself into a state, where I'm going to jam out what these cats were doing or I'm going to think about how I'm going to do what I'm going to do, or what does it mean to me. As deep into it as possible. I get my books out and my pictures out, all my stuff out, and I [modify my] environment because I want to know what else is out there. This is not the limit of our creativity. Jungle music, Drum & Bass is not the limit to our creativity of even this genre. There is no limit to it. We can go further, we can go more far out, and that's what I'm interested in. My new George Kurtz project, that's what I've done. I've created a whole new sound. You know, some people are going to say, "what's that?" That's the point. You're supposed to say, "what the fuck is that?" That's what we did in the beginning when we started Jungle. When we started Jungle, people were saying "What's that?" That's right! What is that? So that's what I'm interested in doing again.

Q: Here are some fill in the blank questions. Were you born in Bristol?

Yes.

Q: Were you born in a musical household?

Yes.

Q: You mentioned your brother, Flynn. This is Flynn from Flynn and Flora, yes?

Yes. My older brother.

Q: Was he doing music before you guys started?

Yeah, he was into music. He had a big record collection. He was into everything really. He's a computer nut. He's a photographer. He's into the whole culture. He introduced us to *Wild Style*, the whole breakdancing thing. He was our conduit to the rest of the world; he was venturing out. We were quite young and he'd come back with some video and he'd say, "watch this! You kids have got to watch this!" And I was like "wow!" He'd always have loads of records, so he'd introduce me to all the music that I learned about when I was at home; it was because of him. He introduced us to the Specials, the whole 2-tone thing, the whole Funkadelic thing, a lot of the whole Human League, and the Electro thing, the whole George Benson, Donna Summers, that was him and my mum, so they were very influential back then. That was the stable diet that we grew up on.

Q: What's been missing in these questions?

Culture. The whole thing is about culture, and how culture progresses, and what people do in culture. Drum and Bass was a cultural movement. It was an ideology borne out of the frustration of young people, displaces ethnics, mixing with the Anglo-Saxons and coming together to share a message. We created a culture from that, we created a language, we created a blueprint. We created an ideology.

Our movement in the beginning was very much about the code and conduct. It was a very civilized; music was respectable. To be a DJ was a respectable thing. It was a very high level of respect to be privileged to play in front of people and to looked on by your peers Grooverider and Frost, and Bryan G. Those guys brought us in, they were our peers. We started making music and those guys brought it in as well. We also brought in a look as well. We dressed different, we purposely tried to have a look that represented where we were coming from and it was very futuristic at the time but also very classical. We went to New York, not just to buy records, but to create a look as well. We had a language that we created. Like "lashin", "tearin", and various other terms that describe music.

We went to NAMM music conference for our first year and they didn't know what to make of us. There's these guys from London from Bristol on this Jungle

thing. People had heard about it, but we brought the culture there. We took a whole vibe and energy to America seven or eight years in a row, just stepping it up every year; fine tuning the way we dressed…We were influenced by Hip Hop, but we weren't Hip Hop though. That was our thing. We knew we weren't Hip Hop, so we wanted to have something that represented what we were about. The music was a soundtrack to our culture, or to our movement. We were about expressing ourselves just the same way as RUN DMC and Rakim were expressing themselves, and we wanted to have a voice. And the people around us, we were that voice for them as well. Radio sprouted up because of it. Magazines, clothing companies, you know, Drum & Bass Arena. Not Dance Arena. Not Happy Hardcore Arena. Drum & Bass Arena. Dogs on Acid. Those things sprouted up because of Jungle music, because of that culture. Pirate radio stations, it was a whole movement. If you listen to the tapes from back then that were coming out the pirates, listen to the language of the MCs. Listen to how they spoke. That was something that we created, with a very succinct ideology […] a lot of it was about peace and love and harmony, about unity, and a lot of the dances were about that as well. Sure we were smoking weed and using ecstasy, but that's where we were at that time. It was about unification, it was about all these cultural people from different backgrounds coming together and sharing this similar idea. That's what it was in the beginning. It was very much about bringing all these people from diverse backgrounds together under this one roof sharing this common idea, and we dressed to impress. We dressed up because we were celebrating that we finally created something that was ours. No one gave it to us, we didn't take it from anybody else. We were comfortable, we weren't going to lose it, no one was going to take it away, we were happy in this scene we created and we developed an ecosystem around it.

The only thing we didn't do is build a TV station to really take advantage of it. That just showed where we were and ideas we were about then. We were quite forward thinking, we were thinking about clothes, we were thinking about labels and offices and buildings, and building companies and stuff. We were interested in pushing this thing forward, the culture forward, the ideology of what Jungle and Drum & Bass meant to us. We'd sit around in our houses in different flats in Bristol and we were talking about how Hip Hop had influenced us, how Bristol had

influenced us and how we were going to use that in our message in Jungle. What specifically did we want to say in our music. What specifically were we talking about in our music. What specific effect do we want to have in our music that could be reverberated through the rest of the universe. It was quite a thought-out thing. We wanted to be positive people. We wanted to leave a positive impact on our music. We weren't going to just talk about rubbish things like sex or taking drugs or making loads of money. That's not what we were about. We were about talking about peace, harmony—we were talking a little about the struggle, but we weren't going to live off that. We also wanted to make people aware of that struggle, and what you can actually do once you overcome that struggle. We were ambassadors on a few different levels, because we'd actually set out to do something, not only achieved it, we actually spawned the whole industry around it that's still huge today, so other people have been able to come through and benefit from as well. So, for us, that was amazing.

This is the first time I'm actually—thank you for this—because some of the things I'm talking about, I'm actually realizing myself talking about it. Just saying it, and going over it again, it makes me understand that we actually really created a legacy that most of us don't really think about today. It's quite an interesting journey. My thing now, is culture, and how culture moves and what moves culture, and how to recognize it and what it is. When I've looked back at Jungle, it's definitely a cultural movement. It's definitely a cultural movement. You had this whole energy moving through that was unstoppable. I think that's powerful. What's happening now is that the internet has made that easy and accessible. It's almost like taking out of the box now, culture on order, you just do it. All these different movements that can happen now, that's cool, its working, its bringing people together.

The internet is making things more accessible, but when people try and find something and they don't that's a problem as well. Before we had the internet, it wasn't a problem because you just wouldn't know it, you just left that to your imagination or wondered what it was like and go about your day. With the internet now, we have so much information and we're so used to getting it when we want it, the minute we don't get it, its a problem. […]

Q: Is there anything different about making music now that Jungle and Drum & Bass have been made?

Yeah. Definitely. No one was using the samplers the way we were. No one was doing that. No one was getting into the LFOs and twisting out bass or timestretching breaks. No one was doing that. The few experimental people might have been messing around with it but no one was dropping *Amen* like we were dropping it. *Hot Pants*, and other breaks. Another break, and another break, and another break. Drop a nasty bass line, and nothing was as heavy as Jungle when it came out. Nothing like that. When you have a heavy Dillinja tune drop, there's nothing on this planet that's as heavy or disgusting as that. No one was doing that.

Even now, you play whatever you're going to play. You play some House, you play some Dubstep, you play some Electro, and the minute you play Jungle, the place goes fucking through the roof. It's just this energy. It's a type of music that's always going to be here. That's just what it is. It's just that full of energy. The basses, for instance, the way we went about making basses. No one was layering the basses, with a tone and the sub bass together. No one was doing that. Now, that's normal, standard. No one was chopping up breaks the way we were, when speeding them up to make them sound normal. That's something we had to work out. When we started making the beats—Jungle—we had to speed them up. It got to about 160 [BPM] and then it got to 170. But when you play it, it got pitched up again so we were realizing that the music sounded [tinny] so we had to figure out how to speed up the beats without the pitch changing. That was quite a mission as well, and we had to figure that out. That took years of experimenting, and then we needed to learn how to make the beats roll, and the best way to use breakbeats, so we had to learn how to edit the breaks—taking kicks out, taking snares out. The break was more simplified and rolled better everything else in the track. That took years of experimenting to get right. Now that's normal.

We were the first ones to use Recycle like that, no one else had a reason to really use Recycle. We were the ones that took it to the next level and started to push the boundaries with it. No one was using samplers like we were using them. Samplers at the time were just used but live bands to trigger guitar sounds and drum sounds.

We took samplers and put basses through it, vocals through it, timestretched it, backwards and forwards. We put the sampler through its paces. The whole industry was built out of what we were doing back then. All the technology now that you hear—that freaky sounding shit—that's from us. We are the ones that pioneered that stuff. Dubstep's come out of what we were doing. They all cite Jungle as their influence. Not one of them says it isn't. All the Electronic Experimental stuff, a lot of that stuff you could compare with Jungle. All the Brainfeeder stuff, the Flying Lotus, I love that stuff, I love it because to me it sounds like Jungle. It sounds like it's a natural progression from Jungle. You can hear a lot of influences. A lot of layering in Pop music now, because of Jungle and Hip Hop.

A lot of the techniques we were doing came from Hip Hop as well; we appropriated it. Using the sub bass the way we did, that's Hip Hop. Listen to a lot of early Hip Hop, that's all 808s under the kick drums, kick drums on snares. We started to do that. Mixing and matching. We were fortunate enough to work with […] Redman's producer at the time, and he broke it down to us. He showed us mixing techniques of how to layer kicks and snares and basses, to get the frequencies right. We brought that back. What we didn't realize was that we weren't getting the same effects because the beat was too fast. If the beat's moving at a certain pace, and Hip Hop is very slow, so between the kick hat and snare, you can get maximum fatness in it. In Jungle, its moving too fast, so you can't have a big fat kick and snare, or you couldn't do it at the time because we didn't know how to do it. That's when we started tweaking our own breaks because we had to figure out how to get the big kick and snare in and do rolls as well. Using a break that already exists, trying to get it to sound as fat as Hip Hop, we weren't doing it. So we realized, you get the break, you have to deconstruct it, chop it all up, and then put it together it its simplest form. Now in Jungle, which is a simplified beat [voices a 2-step beat], those beats were borne out of simplifying the beat so that you could get it to sound as fat as possible on your kick, high-hat and snare. That was the idea behind it. We wanted it to sound big, so if you listen to some the early tracks, some of the Full Cycle things, a lot of Ed Rush and Optical was doing it, and the Valve boys [Dillinja and Lemon D], its really stripped down, simple beats so you could get the maximum fatness out of it. Big fucking snares. Big fucking kick drums, and that's what we directly took from

Hip Hop. You listen to a lot of the early Hip Hop stuff, especially Premiere, he was doing it a lot. Just a big kick, just a big fat slap in your face snare, you know what I mean? [Dr.] Dre took it to a whole other level.

Really for us, we wanted the music to be simple and elegant as well. We wanted it to sound really beautiful. We were using loads of breaks. Sometimes we could be using ten breaks in one tune to try and get this effect. […] Layering, layering and layering and layering. Different rolls, different shuffles…that was great but then you'd get into mixing problems. Maybe too many kicks going on at the same time, snares not landing on each other properly, and high hats going all over the place. Eventually, take a model of what its doing and try to chop it up and simplify it and make it work as a whole, move that over there, ok that's working, do that again. Then its like, loop, loop, loop, and every time we do a loop, simplify the loop, simplify the loop, simplify the loop. By the time we got to the end of the tune, we'd simplify the loop, then we'd start the tune again, with the end. And then what we used to do was take the best part of the break, sample it, and that would be our break. And that's how we started to make our own breaks. Then we used to have these piles and piles of breaks, and whenever you make a tune, you start with one of your own breaks. And start the same process again. Kick, snares, simplify, simplify, simplify, end break, back to the beginning. Then we realized that we were actually doing at the end, and then we started to start tunes from that point of view. "OK lets simplify, lets make a simple beat, lets make it fat, blah blah blah." It was a rhythm that you would get, and to try to explain it is kind of hard, but its a simple rhythm and it would be a slight shuffle—it would be a16th, or an 8th, or [others]. It was a slight shuffle, Cubase was amazing at doing it. A slight shuffle that gave the beat a little groove, and you would just move the snare just so it was out and it would put the kick drum slightly out, and it would give the [rhythm] a little shuffle. It gives it a little groove and a little […] movement and that was the groove. Trying to make it as human as possible.

Q: So you actually shuffle the positions of snares, all the elements?

Yeah, everything. […] The minute you quantize, you've got to quantize everything. Leave it loose. The idea is, listen to what everyone is doing and do the complete opposite. Listen to what everyone's doing and create your own thing. So everyone's super tight, how are you going to get known if you're even more tight then they are. Do it the opposite way. Everyone goes white, you go black. It's a bit of psychology there as well. It has to do with being comfortable, like I said. We were comfortable being uncomfortable. We were comfortable being in Bristol out of the way be couldn't hear what everyone else was doing. So we were doing our own thing, creating our own vibe, creating our own music, and eventually, everyone's like, "oh, what is that?"

Q: Who outside of the Full Cycle crew were you… [in competition with? Thompson anticipates the question and responds]

Dillinja, Lemon D. Yeah. Sometimes, Ed Rush and Optical, but most of the times Dillinja and Lemon D.

Q: What about them?

Just listen to the sound, you can tell. No one was doing what they were doing. The beats the basses, the mixes, the arrangements, the loudness, the rhythms. Then Dillinja started playing the drums on his own tracks. It was like, you couldn't beat him then. Its like, he's gone to that level now. He's gone that deep that he's learned to play the drums now. Right. Just makes you work even harder. Pushing it and pushing it and pushing it. It's pure creativity. If you had went to his studio, you'd be amazed, inside he's hardly got anything there. He's a typical example of using every thing he's got in his room to make a beat. It's phenomenal. His exceptional level of detail to mixing and analyzing what needs to be done mixing—just relentless. Not stopping until you've got a perfect sound. For us, listening to what they were doing was really inspiring. This is what they're doing with Jungle.

Q: One of the concepts I've been asking about is track economy. So you have an economy when you go out at night—so much time or so much money. You only have so much space within the bandwidth of a track. One of the things I think Jungle has brought to the world, and especially Drum & Bass is that you have so much space, and you have this ever-expanding kind of sonic presence of sounds. Of drums, of bass, of pads. Chorusing them, etc. and spreading them so they are as big as possible. Is this [track economy] a real thing?

Well yeah. You've got it bang on. What we realized was that we wanted the music as loud as possible. Breaks loud, and bass loud, and basslines loud, something has got to give. So you've got to work it out. What's going to be loud, and it helps you understand how to mix, because you've got to get the kick to sit somewhere, the bass and the bass tone to sit somewhere, and the breaks. It's a lot of work! It's quite an achievement that Jungle does what it does, and at the rate it does as well. Its one of the fastest musics out there and its still one of the loudest out there as well, so its quite an achievement for it to do that and still make it work on the dance floor, on the radio, on TV, in the car, in the headphones. I think your explanation of it is bang on. Track economy, I like that.

C.20 Wilson, A. (Villem)

Q: Please tell me about the music scenes you were involved in before Jungle and Drum & Bass. How did you find yourself involved in these genres?

Jungle/drum & bass was my first music scene that I was fully immersed into. It wasn't about buying individual records, it was tape packs and cars. The importance of One in the Jungle was immense, listening to those shows whilst getting high was integral to what I listen to today.

Before that I was into NWA, in a big way, and felt this connection to something that was outside of the loop, something gritty, something no one else was into. That's what excites me still, that feeling of finding something that's out there, that I've not come across before, that's raw and uncontrived. I don't see NWA as a scene thou, that was just me on my own finding new music.

Q: How old were you when you started to listen to One in the Jungle? When did you buy your first records? Were your friends or relatives also into Jungle? Were any of them DJs or producers before you got involved in the music? Were you listening to Hardcore before Jungle at all or was Jungle your entry point to the music?

I would guess around 17, when we started to get cars, was the time I listened to One In The Jungle. Living in the middle of the countryside gave the show a other worldly feel, like an urban culture I hadn't experience, I was fascinated by it.

Tape packs came first and my first one was LTJ Bukem/GE Real from Andy's Records in Bury St Edmunds. I also remember the Kaos Theory 3 compilation that a friend of the family gave me. Still love it to this day. The arrangements of old hardcore tracks are mind blowing. Listen to Terminator By Goldie, it has so many different sections, love it. Also a Slipmatt Dreamscape 10 tape was huge, rinsed that hard.

Records came later and that was popping into Redeye Records on a Saturday in Ipswich. All my friends were into Jungle/Drum & Bass, we had a big crew that would go out raving, singing along to Stevie Hyper D lyrics. Some of us got into DJing, and a lot of us got good, fast. I remember going to university and some people had decks, and I jumped on and they were like 'wow, you're really good!', I just thought that's how everyone mixed, as all of us could mix to this standard. I guess we got better than we had realised.

Q: What year was it when you were 17? What year did you get your first tape packs?

I was 17 in 1997, but was buying tape packs since 13.

Q: Did any of your friends continue on with DJing or making tunes?

Sure, Mcleod I write with on a regular basis, look out for some tracks already signed waiting to be released. Russel & Garp - Savage Rehab, they live just down the road, look for an EP on Dread that I'm involved with.

Q: What DJs did you look up to when you were starting?

So many diff tapes that were favs, Slipmatt, Sy, Colin Favor, these were hardcore, 4/4 [meaning four kick drums on each beat] with breakbeats, kinda chipmunk vocals and piano chops, still love those vibes. But later it got darker and Jumping Jack Frost, Grooverider, Randall were all playing darker around 96/97, I guess the big sound was tech step that was coming through. This sound is what I went out raving to and damn it was dark as fuck, but that was the appeal, being young and thrust into this other world. I guess I prefer the head down stomper raves to the happy bouncy ones.

Q: When did you get involved with production?

Production came later, we all stopped raving, got a bit older or burnt out, got jobs and began to settle. I got bored of that after a few years and decided to go to university with no real plan other than just to move somewhere else and see what life brings.

I chose music as that was and still is my biggest passion. So went to Bristol in 2001, and began studying Music Systems Engineering, which was more toward building synths rather than playing them. I didn't feel that was what I wanted, so I bought a piano, took some lessons, and blagged my way into a full on Music BSc at Kingston.

Looking back I was horribly out of my depth compared to people who had leant music since they were 6 years old. Music lessons when I was younger was the biggest joke lesson, and as I was totally uninterested in school it become one of the lessons which we used to run amok and cause havok. I learnt a lot at Kingston Uni, it gave me some time to get better at writing music.

Q: What was your first gear that you used/purchased? How did you choose this gear?

First synth was a Waldorf Micro Q, I bought cause I thought you needed a synth to make music. I was fiddling with Cubase and didn't have much of a clue, just making noises, working things out on my own. I remember listening to Aphex Twin - Drukqs and trying to break down what was going on, as you can imagine its so overwhelmingly complex and I hadn't the foggiest idea how he was doing it.

Q: What was your breakthrough tune? Could you walk us through how you constructed it (i.e., motivations, sample finding, sample prep, arrangement, and so forth)? What other gear/software were you using?

Well the one that I felt really brought some attention was Do You? I Wanna. It's got an oldschool ravey feel with the piano and vox, and it's got that Bristol b-line bounce from the mid 90s. There was no motivation or pre-planned idea, it just came out that way. I like simple tunes that just have that key groove and shuffle that make you

want to dance, this was one of those. Who knows where it all comes from? The subconscious mind is ticking away storing up information, and it decides to bring together those sounds at that time.

[I] was using logic 9 maybe logic 7, mostly standard plug ins that came with logic. I may have mixed it down across my Mackie desk, [To be honest] it was a while ago and I can't fully remember! As you can see my memory is not the best. I work quite differently a lot of time, testing out new plugins or ideas, so not a fixed way for me to remember.

Q: For people that aren't familiar with it, how do you describe the Bristol sound?

Bristol sound is centred around Roni Size/Die/Krust, those guys brought a heavyweight funk that I liked. It's the big rolling [basslines] of say DJ Die - Special Treat or Slide Away, those tunes I play in my sets today. It's the warm musical vibes with a bounce to it.

Q: How did this Symmetry 12" come about?

I met Charlie Break in Bristol via one of my oldest friends Mako, I gave him some tunes and he started playing Do You in his sets and he was saying it was going off and thought it would be great to bring some other artists onto Symmetry. Charlie was one of the reasons I started making drum & bass again, after hearing his output on DNAudio and Quarantine, it was rolling and funky, and just killer grooves. That's really big for me, the groove. A lot of drum & bass now has no groove, just robotic, inhuman, its probably because everyone's got so precise in the computer and using single hits and not sampling funk records.

Q: So you mentioned plugins and such. Do you have any other outboard gear other than your Q, or do you no longer use that? Have you ever used a hardware sampler for a tune? What's in your studio now?

I've got Juno 106, Novation Supernova 2, Mackie desk, Emu E5000 Ultra, UAD2 Quad Satellite…Q went along time ago.

Q: Can you tell me about your interest in breakbeats? How do you select them? How many do you have in your collection?

Got […] too many breakbeats to mention, the good people of various forums do a great job of collating them for us to download. I haven't heard half of them. I tend to use breaks I've made now with extra bits of top. Honorable mention to Mcleod who digs like no other and helps us out with the sample flavours. Also the king of the sample diggers goes to Hydro.

Q: Do you prefer certain breakbeats over others? why? What would you say makes some breakbeats easier to use than others?

I like breakbeats that are clean and tidy already, after a few years you know which ones could work and can quickly identify which ones are worth chopping up

Q: How do you prepare breakbeats for use with a sampler? (e.g., when I started I was cutting the front drums off the breakbeat and resampling, but more recently was using a slicing program like Recycle where they are all individually cut)

[I] used to use recycle but when I got my new mac it didn't work so I've just been using the transient thingy in logic 9.

Q: When you arrange your breakbeat sequences, do you intentionally preserve an ordering that preserves the downbeats in the original sequence? Do these rearrangements typically preserve aspects of the original break (e.g., ordering, timbre)?

Almost always rearrange the breakbeat, take ghost kicks out a lot.

Q: Please rate on a scale of 1:7 (7 being the max) the amount which you used the following (if you can, please use the entire scale):

• pitch modification
• distortion
• resequencing
• reversed
• multibreak layering
• multibreak alternating
• timestretching or start point manipulation
• filtering
• flanging
• reverbed
• other:_____

• pitch modification 6
• distortion 4
• resequencing 6
• reversed 3
• multibreak layering 7
• multibreak alternating 4
• timestretching or start point manipulation 2
• filtering 4
• flanging 4
• reverbed 6
• other:_____

Q: Even with software samplers available, do you still find the E-mu useful for breakbeats?

Use the E-mu for effects and filtering, she needs dusting off, been a while.

Q: Could you explain what you mean by clean and tidy as it relates to breakbeats you end up using?

Clean and tidy with gating/transient shaping, EQing, lots and lots of EQ, taking out frequencies that are boomy/ear piercing, so when you compress/distort/limit those problem frequencies don't get exaggerated.

Q: What are your favorite breakbeats? Can you list them and name a track that has used it?

I like ones which are not obvious, I like a break from the Beta Band, can't remember which Beta Band song but its been used in a few of my tunes.

Q: Can you tell me about your track sequencing procedure? Do you have a lot of sections? How do they differ?

There's no set procedure, sometimes I have a plan, other times I'm just throwing samples at logic, seeing what sticks, other times I'll start with a synth [and] play some chords.

C.21 Wright, A. (The Moog)

Q: Please tell me about the music scenes you were involved in before Hardcore and Jungle. How did you find yourself involved in these genres? How did you come to be involved in Hardcore, then Jungle?

The first music I ever wrote was for the Commodore Amiga demo-scene in the 1980s. In the hacking/cracking scene at the time, the different groups would release demos of music, graphics and scrolling greetings, and it was kind of a friendly competition to see who could push the hardware to the limit. I discovered various tricks to make the old 4-channel 8-bit sampler sound better, including re-sampling layers on top of each other, and rapidly alternating between tracks etc. The music itself was inspired by my musical favourites of the time, Kraftwerk, Tangerine Dream, Jean Michel Jarre, and just about every 80s UK synth-pop act of the era.

My crossover into house happened in the summer of 1989. By chance, an illegal acid-house party took place in the field next to my house in Dunstable, England. I sat on my bedroom window ledge all night listening to this new sound. To me it was the logical progression on from everything I'd heard before. Todd Terry's "Dreams of Santa Anna" and Corporation of One "The Real Life" stuck in my head for months afterwards.

My Amiga demo-scene music then immediately became heavily house and techno influenced, and eventually fully-blown tracks in their own right. A chance meeting with Tim Raidl (Hardcore Rhythm Team, Sykosis 451) in a local record shop, lead me to Damon D'Cruz of Chill Records in Luton, England, who was looking for UK underground house/techno to follow on from his successes importing the US "Jack Trax".

My first two releases on Chill (as Rotor) were primarily techno tracks, but feature breakbeat loops that I'd sampled from various old records and tapes. On my second release "Kaleidoscope", I was not content with just playing breakbeats in a loop, so I experimented with chopping them up and playing sections in reverse, and

layered etc. Even though I thought I was being original, I was not alone doing this, as it was a technique that obviously became pretty common across the board!

I realized pretty quickly that the breakbeat sound seemed to be getting more appreciation that the regular "four-on-the-floor" beat at the time, so I kept going with that. The terms "hardcore-techno" and "jungle-techno" were only just starting to be used to describe this sound, and like most new genres, the definition was pretty loose. I released a couple more EPs with Chill/Uproar and purchased a new Ensoniq EPS 16+ sampler workstation keyboard. This 16 bit beast was a big step up from the Amiga's 8 bit sampler, so the sound got a lot cleaner and less grainy, even though it could still only sample in mono. Through Damon, I'd met up with Tony Bowes (Justice), and we decided to put out our own EP. Tony had a great collection of hip-hop vinyl, so we had a ton of great samples to hand. Our "Concrete Jungle EP" as Justice & Mercy was a huge hit. We took some pretty big liberties with sampling other work, but everyone was doing it.

Seeing how easy an independent underground release was, my friend Neil Baker and I, decided we should also give it a go, and we created "Delirious Recordings". Our first release "Blitz EP" was a pretty basic sample-fest, sampling "The Tape" by Frank De Wulf. A liberal dosage of samples from the 1980s TV show "Battlestar Galactica" added to the mix, as they did in a lot of my tracks. We got 1000 pressed, and foolishly decided to try and distribute them to local record shops ourselves. We soon discovered that was a nightmare, and followed Tony's recommendation to give them to a distributor, Mo's Music Machine, based out of Waltham Forest, England (I think!) To my surprise, they easily shifted all 1000 copies within a week or two.

Following the success of our first release, I decided to take this more seriously. I quit my university degree at Luton University, much to my parents' dismay, so I could focus on our record label. Even though techno was still my big love, I decided to write a ragga-influenced breakbeat track called "Jungle Muffin", based around a shot vocal clip from a Dreamscape live tape of MC Conrad. I didn't even like the track myself at the time, but everyone I played it to loved it, so I threw it on an EP along with a few other tracks I'd been playing around with. I was amazed at the

reaction. 5000 copies flew off the shelves and at every club or rave I attended, DJs were playing it. From that point on breakbeat-hardcore and jungle seemed the way to go.

For our next few releases we switched distributor to Jack in the Box, who partially funded the Micky Finn remix of "Jungle Muffin". I think they sold around 10,000 copies, but then went bust, taking some of our profit with them! A year or so after that we decided to quit while we were ahead, and get "real" jobs! We'd had a good run for three years, but sales of underground vinyl were dropping, and the distributors were struggling more and more.

Q: I'd love to hear more about your experiences [in the demo scene]! How old were you? Have you always been a tracker user then? Which others have you used? Have you seen the attached flowchart of trackers? Why trackers vs. sequencers?

My memory is a little hazy, but I think it was 1988, so I was 16. I was using Soundtracker, but I don't recall which version. I loved how visual the trackers were. It felt so hands on. I'd never used any other kind of sequencer at that point, and when I did, I remember wanting to go back to a tracker! Being able to see and edit note for note was a big advantage compared to some of the "blind" MIDI sequencers that simply recorded MIDI events and played them back with a bit of quantization. Also the popularity of the trackers meant there were a lot of instrument disks out there, as well as other tracker tunes that you could easily rip the instruments out of, even if the module had been compiled into a demo. I also loved that it was a simple complete system. The hardware and tracker was one piece of equipment, with no mass of cables and other hardware to worry about. It all saved as one mod file.

Q: So the success of Jack Trax brought about an interest for more in this/similar style in the UK. How did breakbeats enter into the music? What genres (or even releases) most directly brought about this integration?

It's impossible to say how and when the breakbeats appeared. I'd really starting using them because they added an instant fuller sound to the track, and it took just one of the four channels in the tracker. I was never really into funk or hip-hop back then, so my decision to use the loops was really only technical rather than a love of breakbeats. I learned to love the sound more later on. Guys like Renegade Soundwave had been writing great stuff with breakbeats for a while, but I think I really personally noticed the use of breakbeats getting more and more popular from the days at the Camden Palace nightclub around 1990/1991. Tracks from 4-Hero, "The Gonzo" by Lost and Under Cover Movement's "Moonstompin" come to mind, but there were many more.

Q: Do you remember who else at the time was using breakbeats in techno? and using chopped up breakbeats? Also, do you recall when this was? Also, why? was it related to the speed of the tunes increasing, or were the breakbeats first?

By late 1991, in the UK rave scene at least, almost everyone seemed to be using breakbeats. I'm not totally sure why it caught on more in the UK, compared to the Belgian scene etc., but I suspect it was because of the crossover appeal for people who were into late 80s hip-hop. Chopping up the beats just added variety. Most tracks were still around 120–125bpm at that point. Things started to speed up a lot the year after.

Q: Do you recall why you chose the Ensoniq over others?

I'm not totally sure. I think it was the best value at the time for a 16 bit workstation. Damon at Chill organized for both me and Neil Rumney (NRG) to get one at the same time, using an advance on royalties. I remember being really excited waiting for the thing to get delivered.

Q: This was under the thrillseekers alias, right? How fast was the Blitz EP in relation to other techno at the time?

That's right. I think the tempo was comparable to other releases around that time, however when we did the Blitz remix EP for the German market, we sped things up considerably, as the German scene had some pretty insane tempos!

Q: Do you see a division between Breakbeat-Hardcore and Jungle?

I've always hated sub-genre definitions. People get so hung up on it all. We were just writing music for ecstasy-fuelled clubbers and it was getting labeled as "hardcore", "jungle" etc. by DJs, magazines, and marketing folks. I guess the only difference in my mind at the time was that jungle was using more Ragga influenced sounds, but again, the definitions were pretty loose. I didn't really care what people called it, as long as they liked the music and bought the vinyl! Saying that, I guess I was guilty of jumping on the genre bandwagon with "Jungle Muffin". The term was being used so much by 1992 that I just went with it.

Q: So far you've mentioned tracks on the Blitz EP and Jungle Muffin. Would you say these were your breakthrough tunes?

Before those, I guess the first big one for me was Rotor - "Kaleidoscope". Along with the chopped up breakbeats, I also used a manually keyed amplitude tremolo effect, cutting the volume from zero to maximum while the string was playing. I'd used the technique before, but it sounded perfect this time with the lead string sound sample. I also used an Amiga speech synthesizer to create the "Kaleidoscope" sample, as well as some random garbled phrases. This was the first track I'd written that I was totally pleased with. To my amazement, it even made the UK Top 40 Dance Chart. My first Chill Records release, "Purely Rhythm" had also charted, but I felt like this one had more underground appeal, which was important to me.

Q: Do you remember your workflow from those days? What types of sample manipulations did you use? Did your experience with these tunes change how you approached making subsequent ones?

Every track led to new ideas for subsequent ones. My big favourites on the Amiga were the volume tremolo on strings, as described above, as well using sampled chords to give the illusion of more sound channel s. Being a huge fan of Commodore 64 SID tunes by Martin Galway and Rob Hubbard etc., I also liked to use rapid arpeggios to simulate chords from a single channel. I always admired the genius solutions those guys came up with on that old hardware.

On the EPS 16, I liked using a technique of sampling an evolving waveform, and using a controller wheel to move the start point on the sample playback. This enabled the sampler to sound like it was producing a resonant acid-type sound, although it was really cheating.

Workflow started with lot of time spent looking for samples, from any sources. Tapes, vinyl, movies, TV shows, news broadcasts etc. The ITV News samples about ecstasy on "Rush Hour" were a huge hit with people. I even got my mom to do the "Holy Shit" sample in "Kaleidoscope". After sampling everything, came trimming, and editing. The inbuilt sequencer on the EPS was nowhere near as visual as the Trackers, so there was a lot of blind experimentation. I was more track- based with the EPS, and would write a one pattern section of a track at a time, and then see what went with it. On the Tracker I would think in whole patterns at a time, as you could see it all on the screen. To record the end results, I used to hook up an old reel-to-reel tape machine, and then we moved onto DAT, which was a big improvement.

Q: After you purchased the Ensoniq, did you start to collect more gear? Did synthesizers play into your workflow at all or did you continue to do mostly everything from within the tracker and/or sampler?

The sampler was king. Rather than hook up MIDI equipment, I would just borrow synths and drum machines off friends, and sample the sounds I liked. It wasn't as flexible as having the real equipment, but it was a lot less hassle. I'd do anything to avoid having a tangled mess of cables everywhere. I can't remember exactly what I'd sampled, but there was definitely a Roland SH-101 in there somewhere.

Q: Since you began writing music, do you think technological development has affected your music over the years? What about in relation to production techniques?

I think some of the technological advancements made me lazier! When you had to squeeze every last bit out of old hardware, it felt more inventive, and I would approach things in different ways. I still think my most creative work was on the Amiga. As sampler memory got bigger, it just became too easy to sample huge sections and loop them. I stopped writing tunes around 1994, but then had another surge back in 2005-2006, when we released the Moog album "Dials to Maximum", and "Saw Jaw" by Obviously High. A lot of that was done with Reason. That was a great piece of software, as it had that hands-on experimentation, but without all the tangled wires and patching issues of real analogue studio.

I haven't written anything since, so I can't really comment on current software, but judging by the hundreds of new tracks on Beatport each week, I'm guessing there's a lot of easy to use software out there now, that can be run on affordable hardware. Great for creativity, but it's hard to stand out when there are so many new releases each week. It was much easier for us back in 1992!

Q: Using a limited setup also might end up creating an edgier sound, since it might not be exactly perfect, which somehow can add to the mood of the track.

Like anything, a bit of random imperfection can add to the character, and stop things being too clinical.

Q: When you say sample huge sections and loop them, do you mean of other tracks?

Yeah, as soon as you could record several minutes of 44.1 kHz stereo, ripping the heck out of other people's work was just too easy. When you were limited by short mono samples, you had to put much more thought into it.

Q: So your last piece of gear was the EPS 16+, then you used Reason?

I also wrote some patterns using an AKAI SG01v module, but I never released anything. I then moved to Reason, running on a standard PC.

Q: We touched on some of your collaborations earlier. Were you ever in a teaching role during your career? Were you self-taught completely, or did someone show you the ropes (e.g., even during your demoscene days was there someone that you looked up to and learned from)?

I've always liked taking things apart, so I taught myself everything. I would hack the music out of demos on the C64 and the Amiga, using a disassembler, and see how it was written. I also got a lot of ideas from listening to the underground anthems of the time, and guessing how they created sounds. When I did work as a co-producer with the guys from Obviously High, Stop Press, Justice etc., I'd like to think some of the things I learned were passed on, but I've never really tried to sit down and teach anyone the ropes.

Q: Apart from the downside to the increase in possible sound sources/samplers/modulations—that is, too much to choose from—do you see any drawbacks to an all software environment?

The software environment is great. It's neat and tidy, simple to load and save patches, and backup work. If I were to write music again, it would be all software based, with some external controllers. My love these days is screenwriting though. I've gone off on another creative tangent, but the screenplay I'm writing is still very much about the rave scene.

Q: Was there a major change that caused the shift (musically) from Breakbeat Hardcore to Jungle? Was it related to technology? Earlier you mentioned that you and some hardcore producers were already cutting up and rearranging breakbeats (e.g., Kaleidoscope), but it wasn't the norm. Was this enough for people to start using a different genre name?

I don't think there were any defining moments in many of the subtle changes in sound. It happened over a longer period, in the background, until standout tracks appeared. I think the ragga sound sneaked in more and more. I threw in some ragga-style samples in Jungle Muffin, as I love the laser-shots effects in ragga. I made my own by sampling the Cylon's guns from Battlestar Galactica, and also the game Green Beret from the Commodore 64.

Q: Was there a specific context in which people used the term Jungle as opposed to Hardcore (or Breakbeat Hardcore)? To your recollection, what were some of the earliest "jungle-techno" and "jungle" tracks? To that end, what about the term and musical characteristics of Hardcore, vs. Acid House?

I'm not opposed to new genres when they're warranted. To my mind, the only electronic dance music styles that deserve their own genre names are house, acid house, and maybe techno and drum & bass. Everything else is just a slight variation.

Acid house is probably the most deserving. It's the punk rock of the electronic music world. The TB-303 being used so heavily, along with the TR-909 and TR-808s and spoken-word vocals really were a new phenomenon, musically and culturally.

As much as the term EDM is overused now, I agree with its overall view of everything as electronic dance music. Sub-genres form cliques, and it's also fodder for marketing. For me, it's about the music first. I hate it when the "new" sound just turns out to be the "old" sound, with a new name. For someone like yourself who's analysing the music, it's interesting to pick out differences, but to the wider audience, I'd say just appreciate the music! Anyway, that's just my view. Each to his own though eh!

To actually answer your question, I think the first time I ever heard the word "jungle" was when my pilled-up friend was yelling it on the dancefloor at a club called Milwaukees in the appropriately named town of Rushden in England, around 1991. I suspect he'd just heard the term on a Top Buzz tape or something. It was termed "jungle-techno" back then though.

The boundaries were blurred so much between breakbeat hardcore and jungle-techno around that time that I couldn't really tell you when they terms were being used more exclusively. I think they were pretty much the same thing for a while. I don't even recall what tracks first used the terms. I think a lot of the classification is actually retrospective.

Q: Can you tell me about your live PAs? What were they and how did they originate? How were they done (equipment, sequence triggering)? How does a live PA compare with DJing? with in-studio mixdowns? Do they occupy the same sort of performance space as a DJ set? How has this form of performance changed over the years?

I only ever did one live PA, and it wasn't exactly "live". Everything was pre-sequenced on the EPS, and I just triggered patterns. I came on for about 30 minutes in between DJs at a small rave event of about 500 people, and played a few unreleased tunes. I was never a fan of live PAs for that kind of music. A guy pressing buttons on stage didn't really seem to go with the rave vibe in my mind.

Q: Also, in the course of these interviews, I've heard the club name Milwaukees mentioned a few times now. It seems to be an important cultural reference point. Can you tell me more about this place? What nights were held there, and who attended? What music was played?

Milwaukees was a club in an old converted truck stop in the middle of nowhere, that became a rave legend. It was my first experience of a real rave drug-den. As you walked into the place, you'd be hit by the smell of Vicks Vaporub, as it was customary at the time for Ecstasy users to smear themselves in the stuff. The music

was full-on hardcore, with DJs such as Fabio, Grooverider, Carl Cox, Clarkee, Ratty, and almost all of the big names from back then. I think the promoters were Helter Skelter, ESP and Equinox. The capacity can't have been much more than 500 people, so it had an amazing intimate atmosphere, with a low ceiling, fog machines, thumping sound system, and decent lights. The central dance floor was surrounded by chill out booths, strewn with "gurning" ravers who could no longer co-ordinate themselves. Everybody has their special nostalgic venue, and that is ours. When you were there, you just knew that nowhere else in the future would ever come close to matching that whole experience. Good times.

Q: So Helter Skelter, ESP, and Equinox would host nights at Milwaukees then? How was this different than raving in fields? What caused the shift from outdoor raves to indoor parties?

Yes, they promoted Friday nights at Milwaukees, between 1991 and 1993 I believe. I don't remember there being a shift from outdoor to indoor as such, as they both happened in parallel, but I do recall that illegal raves in fields and warehouses became increasingly more difficult due to the government crackdown. More regular clubs started doing underground nights. Nothing beat raving outside though, as long as the temperamental British weather co-operated! My favourite ever event was Fantazia: One Step Beyond in Donnington, back in 1992. I think there were more than 25,000 people dancing in a field, and this one was actually legally organized. The atmosphere was electric, and to top it off, the second from last tune of the night played was one of ours, "Soothe My Soul" by Justice & Mercy. I was right as the back, on a small hill, watching 25,000+ people going crazy to one of my tunes. You can't beat that!

Q: Was Milwaukees one of the first venues to hold indoor parties? What others were notable? Did you ever play at these venues?

There were many more in London before Milwaukees, but that was the first place I remember that was closer to where we lived. Others of note in London were Camden Palace, Orange @ The Rocket, Labyrinth, and a whole bunch that I can't

even remember the names of. Outside of London, the most popular illegal raves were Proper Stuff (Cambridge) and Exodus (Luton). Milwaukees and a small club in Luton called The Grid were the main weekly indoor clubs we went to. The early Dreamscape warehouse events in Milton Keynes were also an awesome time.

Q: Can you tell me about how [Soothe My Soul] was made?

I initially had mixed feelings about Soothe My Soul. It's a great track, one of my all time favourites, but like Blitz, it was very sampled loop heavy, which is something I'd usually tried to avoid. It was all written on the EPS, and it really came around because Tony (Justice) found the amazing synth and vocal break from [source removed]. Adding the "Soothe My Soul" sample from [source removed] just finished it off nicely! It still sends tingles down my spine 21 years later, and I consider it the best track Tony and I did together. It was one of those tracks that just fell into place. It's always nice when that happens!

One of the interesting things in the track is that a bug in the EPS sequencer timing produced an interesting side effect. The bug affected the duration of notes randomly, as the EPS was not very precise. The lead instrument had a bit of noise after it, that should have been truncated off, but on some of the notes, it played a fraction of the noise, creating what sounds like another deliberately played instrument behind the lead sound.

Q: When I started making music, I would take a breakbeat, then make a copy of it, and cut off the first note of the copy. Then I would copy this copy, and cut off the first note of the copied copy. I'd continue with this until the end, and this way I could access any point of the break and connect and parts of the break (by adjusting the release time of the held note and triggering a different note) while preserving the original feel of the break. Later on, I started to use recycle, which outputs individual slices and a midi file.

How did you go about this? Why? Were there constraints due to the gear?

I did very basic breakbeat slicing, mainly due to the fact that it was pretty laborious, especially on the EPS, with its non-visual sample editing. On the Amiga it was much easier, but rather than isolate individual sounds within the break, I would generally just have the standard break, then the break starting at its first snare, and maybe a reversed copy. I would then sometimes add my own bass drums to the mix. I would also layer the break over itself at half volume and at a 1/16th note displacement, to produce pseudo drum-rolls.

Q: Do you recall where this kind of technique came from? Did you do that from the moment you started working with breakbeats? Or did you learn it from watching/listening to someone else?

It was self-taught, as I didn't want to be playing a standard loop that sounded identical to others. I didn't want it to just sound ripped from another track. I think I used it on Kaleidoscope first, as the breakbeat was distinctive. I wanted people to think that others had sampled it from me, and not the other way around. I doubt that was ever the case though!

References

Akai Electric Company. 1985. *Akai S612 MIDI Digital Sampler*. Operator's manual.

Akai Professional. 1985. "Would You Like a Sampler for Less Than $1000?" Magazine advertisement.

Akai Professional. 1986. *Akai S900 MIDI Digital Sampler Operator's Manual.* Operator's manual.

Akai Professional. 1988. *Akai S950 MIDI Digital Sampler*. Operator's manual.

Akai Professional. 1989. *Akai S1000 Series Stereo Digital Sampler (version 2.0)*. Operator's manual.

Akai Professional. 1996. *Akai S3000XL Stereo Digital Sampler*. Operator's manual.

Akai Professional. 1997. *Akai MPC2000 Midi Production Center (version 1.0)*. Operator's manual.

Akai Professional. 2000. *Akai S5000/S6000 Stereo Digital Sampler (version 1.21)*. Operator's manual.

Allen, P. E., and R. B. Dannenberg. 1990. Tracking musical beats in real time. In *Proceedings of the 1990 International Computer Music Conference*, 140–3.

Allen, R. V. 1978. Automatic earthquake recognition and timing from signal traces. *Bulletin of the Seismological Society of America* 68 (5): 1521–32.

Alonso, M., B. David, and G. Richard. 2007. Tempo estimation for audio recordings. *Journal of New Music Research* 36 (1): 17–25.

Alpert, M., and D. Rossum. 1982. *E-mu Emulator Operating Instructions (version 3.6 ed.)*. Operator's manual.

Amiga Format. 1992. "Hitting The Big Time or: 'How Your Amiga Can Make You Rich and Famous'." *Amiga Format*, August, 24–6.

Anderton, C. 1985. *SP-12 Sampling Percussion System Owners Manual (version 2.3)*. Operator's manual.

Anderton, C. 1987a. *Emulator II+ Owner's Manual (OS version 3.1 and 3.1 HD)*. Operator's manual.

Anderton, C. 1987b. *SP-1200 Owners Manual*. Operator's manual.

Anderton, C., N. Enge, and R. Smith. 1988. *E-mu Emulator Three Digital Sound Production System Reference Manual*. Operator's manual.

Andre-Obrecht, R. 1988. A new statistical approach for the automatic segmentation of continuous speech signals. *IEEE Transactions on Acoustics, Speech, and Signal Processing* 36 (1): 29–40.

Atmosphere Magazine. 1995a. "Andy C and Ant Miles." *Atmosphere Magazine*, October, 35.

Atmosphere Magazine. 1995b. "Foul Play." *Atmosphere Magazine*, October, 52.

Atmosphere Magazine. 1995c. "Pascal and Frontline Records Profile." *Atmosphere Magazine*, June, 10–1.

Atmosphere Magazine. 1996a. "DJ Rap." *Atmosphere Magazine*, August, 60–1.

Atmosphere Magazine. 1996b "No U Turn." *Atmosphere Magazine*, March, 6.

Atmosphere Magazine. 1996c. "Shy FX." *Atmosphere Magazine*, April, 65.

Atmosphere Magazine. 1996d. "Techstep." *Atmosphere Magazine*, July, 77.

Aucouturier, J.-J., and F. Pachet. 2007. The influence of polyphony on the dynamical modeling of musical timbre. *Pattern Recognition Letters*, 28 (5): 654–61.

Awad, G. 1995. "Photek." *Generator Magazine*, October, 32–4.

Barcode Magazine. 2008. "Photek interview." *Barcode Magazine*. http://www.barcodezine.com/Photek%20Interview.htm (accessed 24 April 2013).

Barnes, M. 1994. "E-mu EIIIX Roundup: v2.1 System Software; Remote Editor/Librarian; Sample CD-ROM." *Sound on Sound*, October. http://www.soundonsound.com/sos/1994_articles/oct94/emue111x.html (accessed 1 July 2012).

Battenberg, E. 2012. Techniques for machine understanding of live drum performances. PhD dissertation, University of California, Berkeley.

Bauer, A. 2013. Personal communication.

BBC. 2012. "The Story of Fabio and Grooverider" (documentary). MP3 format from BBC 1Xtra, "BBC Radio 1Xtra's Stories." http://www.bbc.co.uk/programmes/b01dpyk5 (accessed 12 February 2013).

Beadle, J. 1993. *Will Pop Eat Itself?* Boston, MA: Faber and Faber.

Belle-Fortune, B. 2004. *All Crews: Journeys Through Jungle/Drum & Bass Culture.* London, UK: Vision Publishing.

Bello, J. P., and M. Sandler. 2003. Phase-based note onset detection for music signals. In *Proceedings of the 2003 IEEE International Conference on Acoustics, Speech, and Signal Processing*, 49–52.

Bello, J. P., C. Duxbury, M. Davies, and M. Sandler. 2004. On the use of phase and energy for musical onset detection in the complex domain. *IEEE Signal Processing Letters* 11 (6): 553–6.

Bello, J. P., L. Daudet, S. Adballah, C. Duxbury, M. Davies, and M. Sandler. 2005. A tutorial on onset detection in music signals. *IEEE Signal Processing Letters* 13 (5): 1035–47.

Bello, J. P., E. Ravelli, and M. Sandler. 2006. Drum sound analysis for the manipulation of rhythm in drum loops. In *Proceedings of the 2006 IEEE International Conference on Acoustics, Speech, and Signal Processing*, 1520–3.

Bennett, M. 2011. Hackney soldiers: The birth of Jungle: With Shut Up And Dance & Ragga Twins. http://www.clashmusic.com/hackney-soldiers (accessed 23 April 2013).

Besson, S. 1995. "DJ Crystl." *Generator Magazine*, October, 16–20.

Bilmes, J. 1993. Timing is of the essence: Perceptual and computational techniques for representing, learning and reproductions expressive timing in percussive rhythm. Master's thesis, Massachusetts Institute of Technology.

Boser, B. E., I. Guyon, and V. Vapnik. 1992. A training algorithm for optimal margin classifiers. In *Proceedings of the 5th Annual Workshop on Computational Learning Theory*, 144–52.

Bowes, T. 2013. Personal communication.

Brewster, B., and F. Broughton. 2000. *Last Night a DJ Saved My Life: The History of The Disc Jockey*. New York, NY: Grove Press.

Brewster, B., and F. Broughton. 2010. *The Record Players: DJ Revolutionaries*. New York, NY: Black Cat.

Brown, J. 1993. Determination of the meter of musical scores by autocorrelation. *Journal of the Acoustical Society of America* 94 (4): 1953–7.

Brown, J., and B. Tucker. 1986. *James Brown: The Godfather of Soul*. New York, NY: Avalon.

Bryan, N. J., and G. Wang. 2011. Musical influence network analysis and rank of sample-based music. In *Proceedings of the 12th International Society for Music Information Retrieval Conference*, 329–34.

Bunz, M., O. Koehler, and S. Kösch. 1997. "Rob Playford." *de:Bug Magazine*, September 1997. http://de-bug.de/mag/123.html (accessed 20 May 2013).

Butler, M. 2006. *Unlocking The Groove: Rhythm, Meter, and Musical Design in Electronic Dance Music*. Bloomington, IN: Indiana University Press.

Butterfield, M. W. 2006. The power of anacrusis: Engendered feeling in groove-based musics. *Music Theory Online* 12 (4). http://www.mtosmt.org/issues/mto.06.12.4/mto.06.12.4.butterfield.html (accessed 27 April 2013).

Butterfield, M. W. 2010. Variant timekeeping patterns and their effects in Jazz drumming. *Music Theory Online* 16 (4). http://www.mtosmt.org/issues/mto.10.16.4/mto.10.16.4.butterfield.html (accessed 26 June 2013).

Caramanica, J. 2011. "Lots of Beats but No Drum in Sight." *New York Times*, 13 February 2011. 11. http://www.nytimes.com/2011/02/13/arts/music/13beatmachine.html (accessed 14 April 2013).

Carlson, L., A. Nordmark, and R. Wiklander. 2003. *Recycle! The Ultimate Tool for Sampled Grooves: Operation Manual (version 2.1)*. Operator's manual.

Casio Corporation. 1987. *Casio Digital Sampling Synthesizer FZ-1 Operation Manual*. Operator's manual.

Cemgil, A., and B. Kappen. 2003. Monte Carlo methods for tempo tracking and rhythm quantization. *Journal of Artificial Intelligence Research* 18 (1): 45–81.

Chang, C.-C., and C.-J. Lin. 2011. LIBSVM: A library for support vector machines. *ACM Transactions on Intelligent Systems and Technology*, 2 (3): 1–27.

Chang, J. 2005. *Can't Stop Won't Stop: A History of the Hip-Hop Generation*. New York, NY: St. Martin's Press.

Charnas, D. 2010. *The Big Payback: The History of the Business of Hip Hop*. London, UK: Penguin Books.

Chatzilias, J. 2013. Personal communication.

Chordia, P. 2005. Segmentation and recognition of tabla strokes. In *Proceedings of the 6th International Conference on Music Information Retrieval,* 107–14.

Christodoulou, C. 2011. Rumble in the Jungle: City, place, and uncanny bass. *Dancecult: Journal of Electronic Dance Music Culture* 3 (1): 45–63.

Clements, J. 2013. Personal communication.

Colebrooke, S. 2013. "History: Are You Ready for Some Jungle-Tekno?" http://www.2badmice.co.uk/history (accessed 8 March 2013).

Collin, M. 1997. *Altered State: The Story of Ecstasy Culture and Acid House*. London, UK: Serpent's Tail.

Collins, C. 2013. Personal communication.

Collins, K. 2008. *Game sound: An introduction to the history, theory, and practice of video game music and sound design*. Cambridge, MA: MIT Press.

Collins, N. 2001. Algorithmic composition methods for breakbeat science. In *Proceedings of International Conference: Music Without Walls? Without Instruments?*, 21–3.

Collins, N. 2002. Interactive evolution of breakbeat cut sequences. In *Proceedings of 2002 Cybersonica Symposium*. http://w.sussex-ucu.org.uk/Users/nc81/research/ieforbbcut.pdf (accessed 3 July 2013).

Collins, N. 2004. On onsets on-the-fly: Real-time event segmentation and categorisation as a compositional effect. In *Proceedings of Sound and Music Computing Conference 2004*, 20–2.

Collins, N. 2005. Using a pitch detector for onset detection. In *Proceedings of the 6th International Conference on Music Information Retrieval*, 100–6.

Collins, N. 2006. Towards autonomous agents for live computer music: Realtime machine listening and interactive music systems. PhD dissertation, University of Cambridge.

Collins, N. 2010. Computational analysis of musical influence: A musicological case study using MIR tools. In *Proceedings of the 11th International Society for Music Information Retrieval Conference*, 177–82.

Collins, N. 2012. Influence in early electronic dance music: An audio content analysis investigation. In *Proceedings of the 13th International Society for Music Information Retrieval Conference*, 1–6.

Collins, N., M. Schedel, and S. Wilson. 2013. *Cambridge Introductions to Music: Electronic Music*. New York, NY: Cambridge University Press.

Computer Music. 2009. "A Guy Called Gerald" *Computer Music*, February, 86.

Cooper, G., and L. Meyer. 1960. *The Rhythmic Structure in Music*. Chicago: University of Chicago Press.

Cortes, C., and V. Vapnik. 1995. Support-vector networks. *Machine Learning* 20 (3): 273–97.

Danielsen, A. 2006. *Presence and Pleasure: The Funk Grooves of James Brown and Parliament*. Middletown, CT: Wesleyan University Press.

Danielsen, A. 2011. Continuity and break: James Brown's 'Funky Drummer'. http://www2.hu-berlin.de/fpm/popscrip/themen/pst11/pst11_danielsen.html (accessed 27 April 2013).

Davies, D. 2013. Personal communication.

Davies, M. E. P. 2007. Towards automatic rhythmic accompaniment. PhD dissertation, Queen Mary, University of London.

Davies, M. E. P., and M. D. Plumbley. 2005. Comparing mid-level representations for audio based beat tracking. In *Proceedings of the Digital Music Research Network Conference*, 36–41.

Davies, M. E. P., and M. D. Plumbley. 2006. A spectral difference approach to downbeat extraction in musical audio. In *Proceedings of the European Signal Processing Conference.*

Davies, M. E. P., and M. D. Plumbley. 2007. Context-dependent beat tracking of musical audio. *IEEE Transactions on Audio, Speech, and Language Processing* 15 (3): 1009–20.

Davies, M. E. P., N. Degara, and M. D. Plumbley. 2009. Evaluation methods for musical audio beat tracking algorithms. Queen Mary University of London, Center for Digital Music, Technical Report C4DM-TR-09-06.

Davies, M. E. P., M. D. Plumbley, and D. Eck. 2009. Towards a musical beat emphasis function. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics,* 61–4.

Davis, R. 2005. Who got the Funk? An etymophony of Funk music from the 1950s to 1979. PhD dissertation, University of Montréal.

Davy, M., and S. Godsill. 2002. Detection of abrupt spectral changes using support vector machines. An application to audio signal segmentation. In *Proceedings of the 2002 IEEE International Conference on Acoustics, Speech, and Signal Processing*, 1313–6.

Dellow, B. 2003. "Nucleus & Paradox." *Knowledge Magazine*, October, 76–7.

Dellow, B. 2004. "Shy FX and T Power." *Knowledge Magazine*, May, 84–5.

Desain, P., and H. Honing. 1989. The quantization of musical time: A connectionist approach. *Computer Music Journal* 13 (3): 56–66.

Desain, P., and H. Honing. 1994. Advanced issues in beat induction modeling: Syncopation, tempo, and timing. In *Proceedings of the 1994 International Computer Music Conference*, 92–4.

Dittmar, C., and C. Uhle. 2004. Further steps toward drum transcription of polyphonic music. In *Proceedings of the 116th Convention of the Audio Engineering Society*, Paper 6031.

Dixon, S. 2001. Automatic extraction of tempo and beat from expressive performance. *Journal of New Music Research* 30 (1): 39–58.

Dixon, S. 2007. Evaluation of the beat tracking system BeatRoot. *Journal of New Music Research* 36 (1): 39–50.

Dixon, S., F. Gouyon, and G. Widmer. 2004. Towards characterization of music via rhythmic patterns. In *Proceedings of the 5th International Conference on Music Information Retrieval*, 509–16.

Dot, B. 2005. *Hip Hop Decoded: From Its Ancient Origin to Its Modern Day Matrix*. New York, NY: Mome Publications Limited.

Downie, J. 2005a. MIREX 2005 Audio drum detection results. http://www.music-ir.org/mirex/wiki/2005:Audio_Drum_Detection_Results (accessed 25 March, 2013).

Downie, J. 2005b. MIREX 2005 Audio onset detection results. http://www.music-ir.org/mirex/wiki/2005:Audio_Onset_Detection_Results (accessed 2 February 2013).

Downie, J. 2012. MIREX 2012 Audio onset detection. http://www.music-ir.org/mirex/wiki/2012:Audio_Onset_Detection (accessed 2 February 2013).

Driscoll, K. 2009. Stepping your game up: Technical innovation among young people of color in Hip Hop. Master's thesis, Massachusetts Institute of Technology.

Duffield, M. 2005. "Into The Blue." *Knowledge Magazine*, August, 33.

Duffield, M. 2009. "Turning Full Circle." *Knowledge Magazine*, July, 35.

Dugs, U. 2012a. "Uncle Dugs Interviewing A Guy Called Gerald on Rinse 106.8FM on 15-06-2012" (interview). MP3 format from Rinse FM, "Run Come Follow Fridays." https://soundcloud.com/uncledugs/dugsandgerald (accessed 15 September 2012).

Dugs, U. 2012b. "Uncle Dugs Rinse FM 01-07-2011 with Rebel MC aka Congo Natty" (interview). MP3 format from Rinse FM, "Run Come Follow Fridays." https://soundcloud.com/uncledugs/dugsrebelrinse (accessed 15 September 2012).

Duxbury, C., M. Sandler, and M. Davies. 2002. A hybrid approach to musical note onset detection. In *Proceedings of the 5th International Conference on Digital Audio Effects*, 33–8.

E-mu Systems. 1992. *E-mu Emulator IIIX Reference Manual*. Operator's manual.

E-mu Systems. 1994a. *E-mu Emulator IV: Professional Digital Sampling System Operation Manual (Revision D)*. Operator's manual.

E-mu Systems. 1994b. *E-mu ESI-32 Digital Sampling Instrument Operation Manual*. Operator's manual.

E-mu Systems. 2012. E-mu Product History. http://www.creative.com/emu/company/history/timeline (accessed 23 August 2012).

Eck, D. 2000. Meter through synchrony: Processing rhythmical patterns with relaxation oscillators. PhD dissertation, Indiana University.

Eck, D., and N. Casagrande. 2005. Finding meter in music using the autocorrelation phase matrix and Shannon entropy. In *Proceedings of the 6th International Conference on Music Information Retrieval*, 504–9.

Ellis, D. P. W. 2007. Beat tracking by dynamic programming. *Journal of New Music Research* 36 (1): 51–60.

Ensoniq Corporation. 1985. *Ensoniq Mirage Digital Sampling Keyboard: Musician's Manual*. Operator's manual.

Ensoniq Corporation. 1987. *Ensoniq Mirage DSK (UK)*. Brochure.

Ensoniq Corporation. 1988. *Ensoniq EPS Performance Sampler Musician's Manual*. Operator's manual.

Ensoniq Corporation. 1990. *Ensoniq EPS 16 Plus Digital Sampling Workstation Module Musician's Manual Version 1.1*. Operator's manual.

Ensoniq Corporation. 1993. *Ensoniq ASR-10 Advanced Sampling Recorder Operating Manual*. Operator's manual.

Eyben, F., S. Böck, and B. Schuller. 2010. Universal onset detection with bidirectional long short-term memory neural networks. In *Proceedings of the 11th International Society for Music Information Retrieval Conference*, 589–94.

Farrer, P. 1995. "Steinberg ReCycle: Sample Manipulation Software." *Sound on Sound*, May. http://www.soundonsound.com/sos/1995_articles/may95/steinbergrecycle.html (accessed 17 July 2013).

Fernando, S. H. 1999. Back in the day: 1975–1979. In *The Vibe History of Hip Hop*, edited by A. Light, 13–21. New York, NY: Three Rivers Press.

Ferrigno, E. 2008. Technologies of emotion: Creating and performing drum 'n' bass. PhD dissertation, Wesleyan University.

Fieber, C. 2013. Personal communication.

FitzGerald, D. 2004. Automatic drum transcription and source separation. PhD dissertation, Dublin Institute of Technology.

FitzGerald, D. 2010. Harmonic/percussive separation using median filtering. In *Proceedings of the 13th International Conference on Digital Audio Effects,* 184–7.

FitzGerald, D., and J. Paulus. 2006. Unpitched percussion transcription. In *Signal Processing Methods for Music Transcription,* edited by A. Klapuri and M. Davy, 131–62. New York, NY: Springer.

Foote, J. 2000. Automatic audio segmentation using a measure of audio novelty. In *Proceedings of the IEEE International Conference on Multimedia and Expo*, vol. 1, 452–5.

Fraisse, P. 1982. Rhythm and tempo. In *The Psychology of Music*, edited by D. Deutsch, 149–80. Orlando, FL: Academic Press.

Fraisse, P. 1984. Perception and estimation of time. *Annual Review of Psychology* 35 (1): 1–36.

Friberg, A., and A. Sundström. 2002. Swing ratios and ensemble timing in Jazz performance: Evidence for a common rhythmic pattern. *Music Perception* 19 (3): 333–49.

Gillet, O., and G. Richard. 2003. Automatic labeling of tabla signals. In *Proceedings of the 4th International Conference on Music Information Retrieval*, 117–24.

Gillet, O., and G. Richard. 2004. Automatic transcription of drum loops. In *Proceedings of the 2004 IEEE International Conference on Acoustics, Speech, and Signal Processing*, 269–72.

Gillet, O., and G. Richard. 2005. Drum track transcription of polyphonic music using noise subspace projection. In *Proceedings of the 6th International Conference on Music Information Retrieval*, 92–9.

Glass, L., and M. Mackey. 1988. *From Clocks to Chaos: The Rhythms of Life*. Princeton, NJ: Princeton University Press.

Goldie, and P. Gorman. 2002. *Nine Lives*. London, UK: Sceptre.

Goodwin, M., and C. Avendano. 2004. Enhancement of audio signals using transient detection and modification. In *Proceedings of the 117th Convention of the Audio Engineering Society*, Paper 6255.

Gordon, J. W. 1984. Perception of attack transients in musical tones. PhD dissertation, Stanford University.

Gotman, J. 1982. Automatic recognition of epileptic seizures in the EEG. *Electroencephalography and Clinical Neurophysiology* 54 (5): 530–40.

Goto, M. 2001. An audio-based real-time beat tracking system for music with or without drum-sounds. *Journal of New Music Research* 30 (2): 159–71.

Goto, M. 2006. RWC music database. http://staff.aist.go.jp/RWC-MDB (accessed 8 May 2013).

Goto, M., and Y. Muraoka. 1995. A real-time beat tracking system for audio signals. In *Proceedings of the 1995 International Computer Music Conference,* 171–4.

Goto, M., and Y. Muraoka. 1997. Issues in evaluating beat tracking systems. In *Proceedings of the IJCAI-97 Workshop on Issues in AI and Music*, 9–16.

Gouyon, F., and S. Dixon. 2005. A review of automatic rhythm description systems. *Computer Music Journal* 29 (1): 34–54.

Gouyon, F., and P. Herrera. 2003. Determination of the meter of musical audio signals: Seeking recurrences in beat segment descriptors. In *Proceedings of the 114th Convention of the Audio Engineering Society*, Paper 5811.

Gouyon, F., A. Klapuri, S. Dixon, M. Alonso, G. Tzanetakis, C. Uhle, and P. Cano. 2006. An experimental comparison of audio tempo induction algorithms. *IEEE Transactions on Audio, Speech, and Language Processing* 14 (5): 1832–44.

Gruhne. M., C. Uhle, C. Dittmar, and M. Cremer. 2004. Extraction of drum patterns and their description within the MPEG-7 high-level-framework. In *Proceedings of the 5th International Conference on Music Information Retrieval*, 150–3.

Hainsworth, S. 2006. Beat tracking and musical meter analysis. In *Signal Processing Methods for Music Transcription,* edited by A. Klapuri and M. Davy, 102–29. New York, NY: Springer.

Hainsworth, S., and M. Macleod. 2004. Particle filtering applied to musical tempo tracking. *EURASIP Journal on Applied Signal Processing* vol. 2004.

Hamilton, M. 2000. "Back 2 Basics." *Knowledge Magazine*, August, 16–7.

Hansen, W. 2013. Personal communication.

Headon, J. 1994. "Is Jungle Too Ruff?" *Mixmag*, April, 36–7.

Heinze, M. 2013. Personal communication.

Henaghan, L. 2003a. "Tunes that Shaped Drum & Bass: Part 3." *Knowledge Magazine*, March, 66.

Henaghan, L. 2003b. "Tunes that Shaped Drum & Bass: Part 7." *Knowledge Magazine*, September, 60.

Hesmondhalgh, D. 2006. Digital sampling and cultural inequality. *Social and Legal Studies* 15 (1): 53–75.

Hesmondhalgh, D., and C. Melville. 2002. Urban breakbeat culture: Repercussions of Hip-Hop in the United Kingdom. In *Global Noise: Rap and Hip Hop Outside the USA*, edited by T. Mitchell, 86–110. Middletown, CT: Wesleyan University Press.

Hill, A. 2002. Acid House and Thatcherism: Noise, the mob, and the English countryside. *British Journal of Sociology* 53 (1): 89–105.

Hockman, J. A., M. E. P. Davies, J. P. Bello, and M. D. Plumbley. 2008. Automated rhythmic transformation of musical audio. In *Proceedings of the 11th International Conference on Digital Audio Effects*, 177–80.

Hockman, J. A., M. E. P. Davies, and I. Fujinaga. 2012. One in the jungle: Downbeat detection in hardcore, jungle, and drum & bass. In *Proceedings of the 13th International Society for Music Information Retrieval Conference*, 169–74.

Hockman, J. A., and I. Fujinaga. 2010. Fast v. slow: Learning tempo octaves from user data. In *Proceedings of the 11th International Society for Music Information Retrieval Conference*, 231–6.

Hockman, J. A., M. M. Wanderley, and I. Fujinaga. 2009. Phase vocoder manipulation by runner's pace. In *Proceedings of the 2009 Conference on New Interfaces for Musical Expression*, 90–3.

Hockman, J. A., D. M. Weigl, C. Guastavino, and I. Fujinaga. 2011. Discrimination between phonograph playback systems. In *Proceedings of the 128th Convention of the Audio Engineering Society*, Paper 8547.

Holder, C. 1998. "Rob Playford: Producing Goldie." *Sound on Sound*, January. http://www.soundonsound.com/sos/jun98/articles/goldie.html (accessed 26 April 2013).

Huron, D. 2001. *Sweet Anticipation: Music and the Psychology of Anticipation*. Cambridge, MA: MIT Press.

James, M. 1997. *State of Bass: Jungle: The Story So Far*. London, UK: Boxtree Publishing.

Jehan, T. 1997. Musical signal parameter estimation. Master's thesis, University of California, Berkeley.

Jehan, T. 2005. Creating music by listening. PhD dissertation, Massachusetts Institute of Technology.

Jenkins, M. 1986. "Eat Your Heart Out PPG!" *Sound on Sound*, July, 50–3.

Johnson, D., and J. Poyser. 1999. "Bitheadz Unity DS1." *Sound on Sound*, April. http://www.soundonsound.com/sos/apr99/articles/bitzhead.htm (accessed 29 April 2013).

Jones, M., and M. Boltz. 1989. Dynamic attending and responses to time. *Psychological Review* 96 (3): 459–91.

Jones, S. 1988. Making waves: Pirate radio and popular music. In *Proceedings of the annual meeting of the association for education in journalism and mass communication*. http://www.eric.ed.gov/PDFS/ED295272.pdf (accessed 18 May 2013).

Kane, J. 2013. Personal communication.

Katz, M. 2012. *Groove Music: The Art and Culture of the Hip-Hop DJ*. New York, NY: Oxford University Press.

Klapuri, A. 1999. Sound onset detection by applying psychoacoustic knowledge. In *Proceedings of the 1999 IEEE International Conference on Acoustics, Speech, and Signal Processing*, 3089–92.

Klapuri, A., A. Eronen, and J. Astola. 2006. Analysis of the meter of acoustic musical signals. *IEEE Transactions on Speech and Audio Processing* 14 (1): 342–55.

Krebs, F., S. Böck, and G. Widmer. 2013. Rhythmic pattern modeling for beat and downbeat tracking in musical audio. In *Proceedings of the 14th International Society for Music Information Retrieval Conference*. http://www.cp.jku.at/research/papers/Krebs_etal_ISMIR_2013.pdf (accessed 5 December 2013).

Kurth, F., T. Gehrmann, and M. Müller. 2006. The cyclic beat spectrum: Tempo-related audio features for time-scale invariant audio identification. In *Proceedings of the 7th International Conference on Music Information Retrieval*, 621–6.

Lacoste, A., and D. Eck. 2007. A supervised classification algorithm for note onset detection. *EURASIP Journal on Advances in Signal Processing* vol. 2007.

Large, E., and J. Kolen. 1994. Resonance and the perception of musical meter. *Connection Science* 6 (1): 177–208.

Large, E., and C. Palmer. 2002. Perceiving temporal regularity in music. *Cognitive Science* 26 (1): 1–37.

Lee, W., and C. Kuo. 2006. Musical onset detection based on adaptive linear prediction. In *Proceedings of the 2006 International Conference on Multimedia and Expo*, 957–60.

Leete, N. 1999. "Fairlight Computer: Music Instrument (Retro)." *Sound on Sound*, April. http://www.soundonsound.com/sos/apr99/articles/fairlight.htm (accessed 13 September 2012).

Lerdahl, F., and R. Jackendoff. 1983. *A Generative Theory of Tonal Music*. Cambridge, MA: MIT Press.

Leue, I., and Ö. Izmirli. 2006. Tempo tracking with a periodicity comb kernel. In *Proceedings of the 7th International Conference on Music Information Retrieval*, 357–8.

Levy, M. 2011. Improving perceptual tempo estimation with crowd-sourced annotations. In *Proceedings of the 12th International Society for Music Information Retrieval Conference*, 317–22.

Li, Z., Q. Xiang, J. A. Hockman, J. Yang, Y. Yi, I. Fujinaga, and Y. Wang. 2010. A music search engine for therapeutic gait training. In *Proceedings of the Association of Computing Machinery International Conference on Multimedia*, 627–30.

Lindo, C. 2013. Personal communication.

Linn, R. 1989. *MPC60 MIDI Production Center Operator's Manual (software version 2.0)*. Operator's manual.

Linn, R. 1994. *MPC3000 MIDI Production Center Software version 3.0 Operator's Manual*. Operator's manual.

London, J. 2012. *Hearing In Time: Psychological Aspects of Musical Meter (2nd Edition)*. New York, NY: Oxford University Press.

Longuet-Higgins, H., and C. Lee. 1982. The perception of musical rhythms. *Perception* 11 (2): 115–28.

Lyons, R. 2001. *Understanding Digital Signal Processing*. Upper Saddle River, NJ: Prentice Hall.

Macciochi, R. 2013. Personal communication.

Mach, E. 1886. *Beitraege zur analyse der empfindungen*. Jena, Germany: Gustav Fischer.

Mainframe Music. 2012. "The Story of Greengate Productions and The DS:3." http://mainframe-music.info/the_ds3_digital_sampler.html (accessed 1 August 2012).

Manion, S. 1996. "LTJ Bukem Stateside." *Atmosphere Magazine*, May, 20–1.

Manning, P. 2004. *Electronic and Computer Music*. New York, NY: Oxford University Press.

Mauchly, J. W. 1985. *Ensoniq Mirage: Advanced Sampler's Guide*. Operator's manual.

Masri, P. 1996. Computer modeling of sound for transformation and synthesis of musical signals. PhD dissertation, University of Bristol.

Mayers, N. 2012. "LTJ Bukem Interview." *New Soul Magazine*, August. http://nu-soulmag.com/musings/?p=1757 (accessed 17 August 2013).

McAulay, R. J., and T. F. Quatieri. 1986. Speech analysis/synthesis based on a sinusoidal representation. *IEEE Transactions on Acoustics, Speech, and Signal Processing* 34 (4): 744–54.

McIlroy, S. 2012. "RA Exchange 104" (interview). MP3 format from Resident Advisor, "RA Podcast and RA Exchange." http://www.residentadvisor.net/podcast-episode.aspx?exchange=104 (accessed 14 March 2013).

McKinney, M. 2006. MIREX audio beat tracking task description. http://www.music-ir.org/mirex/wiki/2006:Audio_Beat_Tracking (accessed 9 March 2013).

McKinney, M., and D. Moelants. 2004. Extracting the perceptual tempo from music. In *Proceedings of the 5th International Conference on Music Information Retrieval*, 146–9.

McKinney, M., D. Moelants, M. E. P. Davies, and A. Klapuri. 2007. Evaluation of audio beat tracking and music tempo extraction algorithms. *Journal of New Music Research* 36 (1): 1–16.

Mellor, D. 1988. "Big Guns: Roland S550/S330 Sampling Modules." *Sound on Sound*, June, 8–12.

Michon, J. 1967. Timing in temporal tracking. PhD dissertation, Leiden University.

Minner, D. 2013. Personal communication.

Moore, B., and B. Glasberg. 1983. Suggested formulae for calculating auditory-filter bandwidths and excitation patterns. *Journal of the Acoustic Society of America* 74 (3): 750–3.

Moore, B., B. Glasberg, and T. Baer. 1997. A model for the prediction of thresholds, loudness, and partial loudness. *Journal of the Audio Engineering Society* 45 (4): 224–40.

Morgenstern, J. 2009. *Kontakt 4 Reference Manual*. Operator's manual.

Mueller, S. 2004. *Upgrading and Repairing Laptops*. Indianapolis, IN: Que.

Muniz, C. 2003. "Spirit." *Knowledge Magazine*, January, 53.

Murray, J. 2005. "A Bit of Nookie." *Knowledge Magazine*, August, 76–8.

Nehring, N. 2007. "Everyone's given up and just wants to go dancing": From Punk to Rave in the Thatcher era. *Popular Music and Society* 30 (1): 1–18.

Noys, B. 1995. Into the 'jungle'. *Popular Music* 14 (3): 321–32.

Obarski, K. 2013. Personal communication.

O'Dwyer, C. 2013. Personal communication.

O'Shea, S. 2013. Personal communication.

Papadopoulos, H., and G. Peeters. 2010. Joint estimation of chords and downbeats from an audio signal. *IEEE Transactions on Acoustics, Speech, and Signal Processing* 19 (1): 138–52.

Pardo, B. 2004. Tempo tracking with a single oscillator. In *Proceedings of the 5th International Conference on Music Information Retrieval*, 154–7.

Parncutt, R. 1994. A perceptual model of pulse salience and metrical accent in musical rhythms. *Music Perception* 11 (4): 409–64.

Parsons, P. 2013. Personal communication.

Paulus, J., and T. Virtanen. 2005. Drum transcription with non-negative spectrogram factorisation. *EURASIP Journal on Advances in Signal Processing* vol. 2005.

Peeters, G., and J. Flocon-Cholet. 2012. Perceptual tempo estimation using GMM-regression. In *Proceedings of the 2nd International Association for Computing Machinery Workshop on Music Information Retrieval with User-centered and Multimodal Strategies*, 45–50.

Peeters, G., and H. Papadopoulos. 2011. Simultaneous beat and downbeat-tracking using a probabilistic framework: Theory and large-scale evaluation. *IEEE Transactions on Acoustics, Speech, and Signal Processing* 19 (6): 1754–69.

Pertusa, A., and J. M. Iñesta. 2009. Note onset detection using one semitone filter-bank for MIREX 2009. http://grfia.dlsi.ua.es/repositori/grfia/pubs/238/PI.pdf (accessed 1 February 2013).

Phillips, D. 1992. "The Prodigy: Did 'Charly' Kill Rave?" *Mixmag,* August, 18–20.

Pras, A., R. Zimmerman, D. Levitin, and C. Guastavino. 2009. Subjective evaluation of MP3 compression for different musical genres. In *Proceedings of the 127th Convention of the Audio Engineering Society*, Paper 7879.

Pras, A., and C. Guastavino. 2010. Sampling rate discrimination: 44.1 kHz vs. 88.2 kHz. In *Proceedings of the 128th Convention of the Audio Engineering Society*, Paper 8101.

Prögler, J. A. 1995. Searching for swing: Participatory discrepancies in the Jazz rhythm section, *Ethnomusicology* 39 (1): 21–54.

Rabiner, L. R., and R. W. Schafer. 1978. *Digital Processing of Speech Signals*. Upper Saddle River, NJ: Prentice-Hall.

Raphael, C. 2001. A mixed graphical model for rhythmic parsing. In *Proceedings of the 17th Conference on Uncertainty in Artificial Intelligence*, 462–71.

Ravelli, E., J. P. Bello, and M. B. Sandler. 2007. Automatic rhythm modification of drum loops. *IEEE Signal Processing Letters* 14 (4): 228–31.

Reid, G. 2005. "The History of Roland: Part 3: 1986–1991." *Sound on Sound*, January. http://www.soundonsound.com/sos/jan05/articles/roland.htm (accessed 18 July 2013).

Repp, B. 2003. Rate limits in sensorimotor synchronization with auditory and visual sequences: The synchronization threshold and the benefits and costs of interval subdivision. *Journal of Motor Behavior* 35 (4): 355–70.

Repp, B. 2005. Sensorimotor synchronization: A review of the tapping literature. *Psychonomic Bulletin and Review* 12 (6): 969–92.

Reynolds, S. 1994. "It Ain't What Voodoo." *Melody Maker*, September, 23.

Reynolds, S. 2012. *Energy Flash: A Journey through Dance Music and Rave Culture*. Berkeley, CA: Soft Skull Press.

Roads, C. 1996. *The Computer Music Tutorial*. Cambridge, MA: MIT Press

Röbel, A. 2007. Onset detection in polyphonic signals by means of transient peak classification. http://www.music-ir.org/evaluation/mirex-results/articles/onset/roebel.pdf (accessed 1 February 2013).

Roland Corporation. 1986. *Roland MIDI Digital Sampler MKS-100 Owner's Manual*. Operator's manual.

Roland Corporation. 1988. *Roland MIDI Digital Sampler S-550 Owner's Manual*. Operator's manual.

Roland Corporation. 1990. *Roland MIDI Digital Sampler S-770 Owner's Manual*. Operator's manual.

Rolldabeats. 2013. "Stats." Rolldabeats. http://www.rolldabeats.com/stats (accessed 1 May 2013).

Rosenthal, D. F. 1992. Machine rhythm: Computer emulation of human rhythm perception. PhD dissertation, Massachusetts Institute of Technology.

Rose, T. 1994. *Black Noise: Rap Music and Black Culture in Contemporary America*. Hanover, NH: University Press of New England.

Rowe, R. 2001. *Machine musicianship*. Cambridge, MA: MIT Press.

Rumney, N. 2013. Personal communication.

Scheirer, E. 1998. Tempo and beat analysis of acoustical musical signals. *Journal of the Acoustical Society of America* 103 (1): 588–601.

Schloss, A. W. 1985. On the automatic transcription of percussive music: From acoustic signal to high-level analysis. PhD dissertation, Stanford University.

Seppänen, J., A. Eronen, and J. Hiipakka. 2006. Joint beat and tatum tracking from music signals. In *Proceedings of the 7th International Conference on Music Information Retrieval*, 685–8.

Sethares, W. 2007. *Rhythm and Transforms*. New York, NY: Springer.

Shapiro, P. 1999. *Drum'n'Bass: The Rough Guide*. London, UK: Rough Guides Limited.

Smith, L. M. 2010. Beat critic: Beat tracking octave error identification by metrical profile analysis. In *Proceedings of the 11th International Society for Music Information Retrieval Conference*, 99–104.

Smith, L. S. 1994. Sound segmentation using onsets and offsets. *Journal of New Music Research* 23 (1): 11–23.

Smith, R. J. 2012. *The One: The Life and Music of James Brown*. New York, NY: Gotham Books.

Snyder, J., and C. Krumhansl. 2001. Tapping to ragtime: Cues to pulse finding. *Music Perception* 18 (4): 455–89.

Stark, A., M. E. P. Davies, and M. D. Plumbley. 2007. Real-time beat-synchronous audio effects. In *Proceedings of the 2007 Conference on New Interfaces for Musical Expression*, 344–5.

Steedman, M. 1977. The perception of musical rhythm and metre. *Perception* 6 (5): 555–69.

Stewart, A. 2000. 'Funky Drummer': New Orleans, James Brown and the rhythmic transformation of American popular music. *Popular Music* 19 (3): 293–318.

Stewart, D. 2013. Personal communication.

Stowell, D., and M. Plumbley. 2007. Adaptive whitening for improved real-time audio onset detection. In *Proceedings of the 2007 International Computer Music Conference*. 312–9.

Sykes, N. 2013. Personal communication.

Tanghe, K., S. Degroeve, and B. De Baets. 2005. An algorithm for detecting and labeling drum events in polyphonic music. http://www.music-ir.org/mirex/abstracts/2005/tanghe.pdf (accessed 28 March 2013).

Taylor, T. 2001. *Strange Sounds: Music, Technology, and Culture*. New York, NY: Routledge.

Temperley, D. 2001. *The Cognition of Basic Musical Structures*. Cambridge, MA: MIT Press.

The Economist. 2011. "Seven Seconds of Fire." *The Economist*, December 17, 145–6.

Thompson, K. 2013. Personal communication (transcription).

Tindale, A., A. Kapur, G. Tzanetakis, and I. Fujinaga. 2004. Retrieval of percussion gestures using timbre classification techniques. In *Proceedings of the 5th International Conference on Music Information Retrieval*, 541–5.

Tingen, P. 2008. "Roni Size: Creating New Forms 2." *Sound on Sound*, May. http://www.soundonsound.com/sos/may08/articles/ronisize.htm (accessed 23 April 2013).

Toh, C., B. Zhang, and Y. Wang. 2008. Multiple-feature fusion based onset detection for solo singing voice. In *Proceedings of the 9th International Conference on Music Information Retrieval*, 515–20.

Toiviainen, P. 1999. An interactive MIDI accompanist. *Computer Music Journal* 22 (4): 63–75.

Toiviainen, P., and J. Snyder. 2003. Tapping to Bach: Resonance-based modeling of pulse. *Music Perception* 21 (1): 43–80.

Tzanetakis, G., and P. Cook. 2002. Musical genre classification of audio signals. *IEEE Transactions on Speech and Audio Processing* 10 (5): 293–302.

Vail, M. 2000. *Keyboard Magazine Presents Vintage Synthesizers: Pioneering Designers, Groundbreaking Instruments, Collecting Tips, Mutants of Technology (2nd Edition)*. San Francisco, CA: Miller Freeman Books.

Vapnik, V. 1995. *The Nature of Statistical Learning Theory*. New York, NY: Springer-Verlag.

Veal, M. 2007. *Dub: Soundscape, Studio Craft, and Science Fiction in Jamaican Reggae*. Hanover, NH: Wesleyan University.

Verma, R. 2000. "Shut Up & Dance." *Knowledge Magazine*, August, 24–5.

Vigil, J. 1990. "Equipment Test Drive: The Akai S1000 Digital Stereo Sampler." *Radio and Production*, February. http://www.rapmag.com/BackIssues/1990/Feb/test_drive_akai_s1000.aspx (accessed 17 July 2013).

Vincent, R. 1996. *Funk: The Music, The People, and The Rhythm of The One*. New York, NY: St. Martin's Press.

Vincent, R. 2008. James Brown: Icon of black power. In *The Funk Era and Beyond: New Perspectives on Black Popular Culture,* edited by T. Bolden, 51–72. New York, NY: Palgrave Macmillan.

Virtanen, T. 2003. Sound source separation using sparse coding with temporal continuity objective. In *Proceedings of the 2003 International Computer Music Conference*, 231–4.

Volume, A. 2013. "Jungle is Massive: Again." *Mixmag*, April, 80–1.

Ward, P. 1995. "Akai S3000XL." *Sound on Sound*, December. http://www.soundonsound.com/sos/1995_articles/dec95/akais3000xl.html (accessed 24 July 2013).

Ward, P. 1997. "Akai CD3000XL." *Sound on Sound*, January. http://www.soundonsound.com/sos/1997_articles/jan97/akaicd3000xl.htm (accessed 17 July 2013).

Whelan, A. 2009. The 'Amen' breakbeat as fratriarchal totem. In *Dichotomies: Essays on Gender and Music*, edited by B. Neumeirer, 111–33. Heidelberg, DE: Winter Verlag.

White, P. 1999. "Akai S5000 & S6000 Samplers." *Sound on Sound*, January. http://www.soundonsound.com/sos/jan99/articles/akais5000.325.htm (accessed 3 July 2012).

Wiffen, P. 1996. "E-mu E4K: Performance Sampling Keyboard." *Sound on Sound*, April. http://www.soundonsound.com/sos/1996_articles/apr96/emue4k.html (accessed 10 July 2012).

Wiffen, P. 1997. "E-mu E4X: Turbo 128-voice Stereo Sampler." *Sound on Sound*, May. http://www.soundonsound.com/sos/1997_articles/may97/emue4x.html (accessed 14 July 2012).

Wiffen, P. 2000a. "E-mu Systems Emulator II (Part 1)." *Sound on Sound*, August. http://www.soundonsound.com/sos/aug00/articles/emuretro.htm (accessed 1 July 2012).

Wiffen, P. 2000b. "E-mu Systems Emulator II (Part 2)." *Sound on Sound*, September. http://www.soundonsound.com/sos/sep00/articles/retroemu.htm (accessed 1 July 2012).

Wilson, A. 2013. Personal communication.

Wright, A. 2013. Personal communication.

Xiao, L., A. Tian, W. Li, and J. Zhou. 2008. Using a statistical model to capture the association between timbre and perceived tempo. In *Proceedings of the 9th International Conference on Music Information Retrieval*, 659–62.

Yeh, D. T., J. Nolting, and J. O. Smith. 2007. Physical and behavioral circuit modeling of the SP-12 sampler. In *Proceedings of the 2007 International Computer Music Conference*, 299–302.

Yoshii, K., M. Goto, and H. Okuno. 2005. AdaMast: A drum sound recognizer based on adaptation and matching of spectrogram templates. http://www.music-ir.org/mirex/abstracts/2005/yoshii.pdf (accessed 13 March 2013).

Yoshii, K., M. Goto, and H. Okuno. 2007. Drum sound recognition for polyphonic audio signals by adaptation and matching of spectrogram templates with harmonic structure suppression. *IEEE Transactions on Audio, Speech, and Language Processing* 15 (1): 333–45.

Young, S. 2003. "Amon Tobin." *Sound on Sound*, April. http:// www.soundonsound.com/sos/apr03/articles/amontobin.asp (accessed 23 April 2013).

Zhou, R., M. Mattavelli, and G. Zoia. 2008. Music onset detection based on resonator time frequency image. In *Proceedings of the 2008 IEEE International Conference on Acoustics, Speech, and Signal Processing*, 1685–95.