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Following the Instruments and Users:
The Mutual Shaping of
Digital Sampling Technologies

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Doctor of Philosophy
The University of Edinburgh
2016

Abstract: *The socio-musical practice of sampling is closely associated with the re-use of pre-existing sound recordings and the technological processes of looping. These practices, based on appropriation and repetition, have been particularly common within the genres of hip-hop and Electronic Dance Music (EDM). Yet early digital sampling instruments such as the Fairlight Computer Musical Instrument (CMI) were not designed for these purposes. The technologists at Fairlight Instruments in Australia were primarily interested in the use of digital synthesis to imitate the sounds of acoustic instruments; sampling was a secondary concern. In the first half of the thesis, I follow digital sampling instruments like the Fairlight CMI and the E-mu Emulator by drawing on interviews with their designers and users to trace how they were used to sample the sounds of everyday life, loop sequenced patterns of sampled sounds, and sample extracts from pre-existing sound recordings. The second half of the thesis consists of case studies that follow the users of digital sampling technologies across a range of socio-musical worlds to examine the diversity of contemporary sampling practices. Using concepts from the field of Science and Technology Studies (STS), this thesis focuses on the 'user-technology nexus' and continues a shift in the writing of histories of technologies from a focus on the designers of technologies towards the contexts of use and 'the co-construction' or 'mutual shaping' of technologies and their users. As an example of the 'interpretative flexibility' of music technologies, digital sampling technologies were used in ways unimagined by their designers and sampling became synonymous with re-appropriation. My argument is that a history of digital sampling technologies needs to be a history of both the designers and the users of digital sampling technologies.*

Signed Declaration

I declare this thesis is my own work and has not been submitted for any other degree or professional qualification.

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Date:

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Introduction: Studying Music Technologies/Digital Sampling Instruments

In January 2011, at the Anaheim Convention Center in California, a prototype of a musical instrument was launched at a trade show organised by the National Association of Music Merchants (NAMM). The show attracted more than 1500 companies: Akai Professional LLC, Fender Musical Instruments Corporation, Roland Corporation U.S., and Yamaha Corporation of America all exhibited their products. At booth 1252 in Hall E, representatives of an Australian company called Fairlight Instruments demonstrated the Fairlight CMI-30A. The promotional literature described it as: 'a unique instrument, combining the latest technology with the look and feel of the original Fairlight CMI. It achieves the classic Fairlight sound that defined the music of the eighties' (Fairlight 2011a). The Fairlight CMI-30A was not a new musical instrument but the thirtieth anniversary edition of an older instrument, the Fairlight Computer Musical Instrument (CMI). Often described as the first digital sampler, the Fairlight CMI was primarily a digital synthesizer and computer workstation. Launched in 1979, it was one of the digital technologies and instruments that were used to re-shape the practices of music making and the sounds of popular music in the 1980s. Like other digital synthesizers such as the Synclavier, developed by New England Digital Corporation, only a small number of people had the opportunity to use a Fairlight CMI: it was expensive and exclusive to an elite group of pop, rock, and soul stars like Stevie Wonder and Kate Bush, as well as employees of public service broadcasters such as the British Broadcasting Corporation (BBC). However, there were other significant users and these included the producers of

an early hip-hop and electro recording – Afrika Baambaataa and Arthur Baker - who gained late-night access to a New York recording studio equipped with a Fairlight CMI.

Thirty years after the introduction of the Fairlight CMI, Fairlight Instruments were quick to claim credit for the ways in which their instrument transformed the technological processes of making music.[1] The advertising brochure for the CMI-30A stated:

> When the Fairlight CMI arrived on the scene in the eighties it changed the way we make music, forever. Today every sampler, digital synthesizer, and audio workstation can trace its lineage back to this legendary machine. Known for its solid, hand-built quality and iconic sounds, the Fairlight CMI holds a special place in history and the hearts of musicians everywhere (*ibid.*).

Early experiments with the Fairlight CMI required users to learn new approaches to making music with a personal computer.[2] Pre-recorded library sounds were stored on 8-inch floppy disks. A laser pen was used to choose options from an on-screen menu prior to the introduction of WIMPS (Windows, Icons, Mouse, Pointers, Systems) interfaces. Typing commands on a QWERTY keyboard became as important as the interface of the piano keyboard.[3] Instruction manuals were required to work out how to programme a computer-based musical instrument and difficulties translating technical language resulted in ad-hoc tutorials over the telephone with the designers. When the Fairlight CMI arrived on the scene, users were not always sure what to do with this technology.

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[1] The makers of the Fairlight CMI, Fairlight Instruments, went into receivership in 1988. Fairlight Instruments Pty Ltd was started in 2010 by one of the designers of the Fairlight CMI, Peter Vogel, to launch the CMI-30A. Its name was changed to Peter Vogel Instruments in 2012.
[2] For studies about the move from mainframe and minicomputers to smaller computer-based technologies, see Ceruzzi 1996 on personal computing and Haddon 1988 on the home computer.
[3] In a review of the Fairlight CMI in 1981, Richard Elen outlined some issues involved in learning a programming language to communicate with a computer: 'half the battle with any computer system would seem to be getting to grips with the 'man-machine interface' – talking to the bloody thing without it informing you of a **COMMAND SYNTAX ERROR**!' (p. 45).

Theoretical/Conceptual Framework

> Of course a sampler is a musical instrument as well as a production tool. It allows you control over any sound. You can make music out of a toilet and a [Gheorghe] Zamfir record with a sampler! I think samplers have been considered musical instruments for at least the past 25-30 years or so haven't they? (Aaron Funk aka Venetian Snares, quoted in M3 Event 2012).

One of the problems for the researcher trying to develop a theoretical framework for understanding the historical and contemporary uses of digital sampling technologies is that the field of organology and the academic study of musical instruments appear to stop as the era of electricity begins. The study of western art music and the instruments of the past have dominated the field. After organology, the next place for the researcher to visit is the field of ethnomusicology where there is a long tradition of studying instruments and instrument making as part of cultural practices in non-Western societies rather than as static objects (Dawe 2012). Within the widening field of Popular Music Studies (PMS) we can turn to Steve Waksman's (1999) cultural history of the electric guitar and Paul Théberge's (1997) study of digital synthesizer instruments in the 1980s and 90s with its focus on the musician as a consumer of technologies. The final thing we might do, to understand the relationship between the inventors of music technologies and the users of these technologies, is enter the field of Science and Technology Studies (STS). Here, we are free to borrow from a rich mix of useful concepts and engage with the work of scholars identified with the social construction of technology (SCOT) approach to understanding the design and use of technologies: from bicycles to Bakelite (Bijker, Hughes, & Pinch 1987) and cars to contraceptives (Oudshoorn & Pinch 2003). Those involved in the sociology of science and technology (SST) have challenged both technological determinism and the emphasis on inventors as heroic geniuses that was

prevalent in the writing of histories of technologies in the twentieth century.[4] The social

study of technologies by scholars such as Trevor Pinch, Wiebe Bijker, Steve Woolgar,

Madeleine Akrich, and Bruno Latour signalled a shift towards a 'focus on what social

groups and actor networks actually say and do with technology' (Bijker & Pinch 2012,

p. xxi).[5] This thesis focuses on what the designers of digital sampling technologies were

trying to do and what social groups using the technologies were doing in practice.

One of the key concepts from SCOT that is useful in understanding the ways music

technologies such as the Fairlight CMI were used in a variety of different contexts and in

ways unforeseen by their designers is that of *interpretative flexibility* (Pinch & Bijker

1984). This is the idea that new technologies are designed and developed, undergo

changes as a result of use (or non-use) by 'relevant social groups' before arriving at a

period of stability and closure where a dominant form of the technology emerges.[6] For

example, in the 1960s engineers like Don Buchla and Robert Moog developed analogue

synthesizers using voltage control but with different designs. Moog's modular

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[4] For a useful discussion of technological determinism and theories of technology and society, see Taylor 2001. For an influential introduction to the social study of technology and more on those who began challenging the idea of the heroic inventor, see MacKenzie & Wajcman 1985.

[5] It is worth pointing out that Akrich and Latour are more closely associated with Actor Network Theory (ANT) than the SCOT approach to studying technologies. ANT ascribes agency to both humans and nonhumans, a flat ontology rejected by social constructivists like Bijker and Pinch who write: 'the typical ANT step of making no ontological distinction between human and nonhuman actants is not made in SCOT' (Bijker & Pinch 2012, p. xxii).

[6] The concept of interpretative flexibility is derived from The Empirical Programme of Relativism (EPOR) in the Sociology of Scientific Knowledge (SSK) to refer to the different interpretations of scientific facts before consensus emerges. In applying it to the sociology of technology, Bijker and Pinch use the safety bicycle as a case study to demonstrate how its development from earlier artifacts like the Boneshaker and the Penny Farthing was multidirectional rather than linear. The stabilisation of the technology as a bicycle with two (or three) wheels of equal size is part of a process that ends with closure or a 'closure mechanism'.

synthesizers proved to be more successful with users and social groups like rock musicians because the piano keyboard was used as its interface whereas Buchla preferred less conventional forms of controlling sounds with touchplates. The keyboard-based synthesizer became the dominant form of the technology in the 1970s and 80s.[7] One problem with the concept of 'interpretative flexibility' as part of different stages in the process of design is its emphasis on the stabilisation of a technology. The design and use of musical instruments might not end with any form of closure. Interest in modular synthesizers has been growing in recent years, as musicians grow frustrated with keyboards and computers.[8] Where Pinch and Bijker focus on closure in relation to the *design* of technological artefacts, this thesis is about the multiplicity of digital sampling technologies - digital synthesizers, sampling keyboards, sampling drum machines, rack-based samplers, PCs and laptops with software samplers - in relation to their design *and* use. As will be demonstrated by the case studies in the second half of the thesis, there has been no stabilisation or closure mechanism with the design and use of digital sampling technologies as they continue to be used by different social actors and groups.

In the collection of essays*, How Users Matter*, the contributors focus on what editors Nelly Oudshoorn and Trevor Pinch call 'the user-technology nexus' (2003, p. 2). This continued the shift in the writing of histories of technologies from a focus on the

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[7] For an interview with Buchla about his design of synthesizers, see Bernstein & Payne 2008: 'I was never tempted to build keyboards into synthesizers. To me, that was unnatural' (p. 167). For more on the differences between Buchla and Moog's synthesizers, see Pinch and Trocco 2002.

[8] See articles in newspapers/music blogs with titles such as 'Back to the Future: I'm in the Moog Again' (Gregory 2015). In 'The Synth Revival: why the Moog is back in vogue', Richard Norris of The Grid states: 'I don't want to use a mouse and laptop any more; writing something in music software has become like drawing on an Etch A Sketch' (quoted in Boxer 2015).

designers of technologies towards the contexts of use and 'the co-construction' or 'mutual shaping' of technologies and their users. To understand music technologies and avoid deterministic arguments about how technologies shape music and the lives of musicians, we have to follow both the designers *and* the users of music technologies.[9] This thesis will apply the SCOT approach to the study of digital sampling instruments – the Fairlight CMI, the E-mu Emulator - by focusing on their designers and users. As well as following these human actors/actants, I also take on board Pinch and Bijsterveld's advice to 'follow the instruments' (2004; 2012) and want to widen the field of organology to include the study of analogue synthesizers, drum machines, and digital samplers – Minimoogs, Roland TR-808s, Ensoniq's Mirage. The text that connected SCOT research to the study of music technologies was Trevor Pinch and Frank Trocco's (2002) book on the history of the Moog synthesizer, which presents a chronological narrative for the general reader before smuggling in concepts from anthropology in its conclusion to explain the instrument's move from the laboratories of scientists to the studios of progressive rock musicians. This thesis about the design and use of digital sampling instruments is another chapter in a longer narrative about the development of electronic music and music technologies: two of the companies associated with early digital sampling instruments, Fairlight Instruments and E-mu Systems, had been developing synthesizers rather than trying to design an instrument for digital sampling.

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[9] An important concept to a study focusing on the users of music technologies is Woolgar's idea of 'configuring the user' (1991). Along with Grint, he explains how users interpret what a machine can do, although this is limited by its designers: 'along with negotiations over who the user might be, comes a set of design (and other) activities which attempt to define and delimit the user's possible actions. Consequently, it is better to say that by setting parameters for the user's actions, the evolving machine effectively attempts to configure the user' (1997, p. 71).

Defining Sampling

One of the major research questions that have guided this research is: 'what is sampling?' In setting out the historical context for the study of digital sampling instruments it is necessary to situate the use of the terms 'sampling' and 'digital sampling' within the history of digital systems design (Nyquist, Shannon & Weaver, Mathews) and within scientific and demographic contexts (e.g. research data sample sizes). There is also a longer etymology that is relevant to the history of digital sampling instruments. The word sampler comes from the Latin *exemplar*, which means a model or pattern. From the seventeenth century onwards, presentation samplers were created and used as a reference point for teaching needlework skills so that those learning the art of embroidery could copy stitches and patterns.[10] In 1912, the Philadelphia-based chocolate company, Whitman's began selling a selection of its best-selling chocolates as the Whitman's Sampler with an embroidery pattern on the box. As will be discussed in chapter three, this product partly inspired the designers at E-mu Systems to come up with Sampler as the working title for its sampling keyboard, the Emulator (1981). As well as the use of the word sample in the context of marketing to denote a specimen or a small example of a larger range of products, sampling has been widely used as a term in both qualitative and quantitative methods of research since the development of a sampling theory approach to statistics in the eighteenth century (Chatterjee 2003) and its

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[10] The Philadelphia Museum of Art has one of the largest collection of presentation samplers in the world: 'in the early nineteenth century girls as young as four years of age began to learn practical stitchery and would have completed a few basic samplers by about age nine. Ornamental needlework was the primary subject of middle-class girls' education, as the many "showpiece" samplers from this period, once proudly displayed on parlor walls, attest. This genteel "accomplishment" was most often acquired at an academy, with the teacher dictating the sampler's composition as well as overseeing its construction (Haugland 1995, p. 90).

more recent application to demographic analysis and political polling in the last century. The idea of not being able to gather a complete collection of data is also important to the principles of digital audio that underpin the design of digital sampling technologies.

With the development of digital computing technologies in the 1940s and the introduction of computers into the workflows of US corporations by companies like International Business Machines (IBM) in the 1950s (Friedman 2005), experiments in computer music continued to take place in research institutes, communications laboratories, broadcasting corporations, and university departments.[11] In his work as director of the Behavioral Research Laboratory at Bell Telephone Laboratories in New Jersey, Max Mathews used an IBM 7090 mainframe computer and the programming languages *Music I* to *Music V* (1957-1968) to make music. One of the problems he was trying to solve was: 'How can the numbers with which a computer deals be converted into sounds the ear can hear?' (Mathews 1963, p. 553). The answer was that binary digits needed to be converted into analogue signals using a digital-to-analogue converter (DAC). To convert sounds or analogue signals into a sequence of numbers an analogue-to-digital converter (ADC) or a sampler needed to be used (Mathews 1969). Up until very recently, the standard sampling rate for converting sound from analogue to digital CD quality was 44.1 kHz or 44,100 samples each second. This was based on the sampling theorem developed by Harry Nyquist (Nyquist 1924; Nyquist 1928) and the

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[11] Engineers Harry F. Olson and Herbert Belar at Radio Corporation of America (RCA) began developing synthesizers in the late 1940s. The RCA Electronic Music Synthesizer was demonstrated at a meeting of the American Institute of Electrical Engineers in New York on 31 January 1956. Operated by a computer, its sounds were generated using analogue methods. For more on this and other early uses of computing technologies to make music, see Manning 2013.

later work of Claude Shannon (Shannon 1948) at Bell Laboratories.[12] In short, digital

sampling is the conversion of sound from an analogue signal into a digital one and is the

basis of how all digital computer music instruments are used to process sounds. As

Thom Holmes explains: 'sampling can refer to the sampling rate of sounds that are

directly synthesized by a computer or the digital reproduction of externally generated

sounds' (2016, p. 309). This does not mean that all computer-based music technologies

or musical instruments using digital technologies developed since the 1960s should be

referred to as digital sampling instruments. The generation of sounds using digital

synthesis was the priority for companies like New England Digital and Fairlight

Instruments in the 1970s. These companies are now associated with digital sampling

technologies but the use of digital sampling instead of digital synthesis to replicate the

sounds of acoustic instruments was an accidental discovery by the designers at Fairlight

Instruments. Similarly, the recording of external sounds using the principles of digital

sampling was a feature of the Fairlight CMI that was of secondary importance to its

designers.[13] It was the users who experimented with recording, storing, and reproducing

sounds digitally: a musical and technological practice that became known as sampling.[14]

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[12] For an outline of the principles of digital audio processing and digital synthesis, see Holmes 2016. For a discussion about the work of Harry Nyquist at Bell Laboratories, its relationship with Claude Shannon and Warren Weaver's *Mathematical Theory of Communication*, and the development of digital audio technologies such as MP3 compression, see Sterne 2012b.

[13] Vogel told me the Fairlight CMI was 'initially intended to be a performance instrument, like a modular synthesizer of the time. It wasn't until we got well into it that it became apparent that it could be a whole production tool' (Vogel 2011b).

[14] A question that arises is when the concept of sampling first began to be applied to music. Pierre Schaeffer uses the term in his 'Outline of a Concrete Music Theory' to define 'an extract of any duration (for example, from several seconds to a minute) that is not chosen for any well-defined center of interest' (Schaeffer 1952). However, he was referring to an extract of recorded sound on magnetic tape rather than the digitally recorded sounds being used in the late 1970s

A Short History of Digital Synthesizers

The design and development of digital synthesizer technologies in the 1970s was made possible by the wider availability of minicomputers and increases in the power of microprocessor technology. It was also the indirect result of experiments in previous decades with magnetic tape-based music production and the use of analogue technologies like modular synthesizers in avant-garde musical worlds.[15] At the San Francisco Tape Music Center in the early 1960s, Ramon Sender, Morton Subotnick, and Don Buchla developed the Buchla 100 series Modular Electronic Music System or 'Buchla Box' as a device for the mass consumption/production of electronic music. It was also a solution to the problem of making incidental music using found sounds and magnetic tape in recording studios.[16] Creating *musique concrète*, or what Subotnick calls a 'landscape of sound' (2008, p. 112), by cutting, splicing, and sticking together pieces of tape was time consuming. Voltage-controlled synthesizers could generate sounds electronically but were also difficult to control without a keyboard. As this became the dominant interface, some users complained that the 'interpretative flexibility' of synthesizer technologies had closed. Bernie Krause was a member of folk group The Weavers who began experimenting with a Buchla Box as a student at the San Francisco

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until today. One of the translators of Schaeffer's writings, John Dack has explained that sample remains the most accurate translation of the term Schaeffer used (*enchantillon*) despite possible confusion over the contemporary usage of the term to refer to a digital sample (Dack 2014).

[15] For more on the history of magnetic tape recording, see Brøvig-Hanssen 2013, Malsky 2003.

[16] Subotnick explains how he and Sender began working together with Buchla on the Buchla Box: 'Ramon and I began to share our dream of some sort of 'black box' that would serve us better for creating tape music. We had begun to imagine this electronic music easel as a tool for any person who wanted to be creative with sound, to be able to afford it, and to have it in his or her home. The transistor had arrived, and most of us knew that the consequences of that foretold that electronics were now destined to be affordable by all. We put an ad in the *San Francisco Chronicle* to find an engineer who could build our music box' (Subotnick 2008, p. 114).

Tape Music Center and demonstrated the Moog synthesizer to rock bands like The Byrds and The Beatles. He expressed disappointment in the early 1970s that the potential of the modular synthesizer as a means of creating new sounds had not been fully explored. According to Krause, they were 'witnessing the evolution of the synthesizer from an instrument that could produce a variety of unknown sounds to one that reproduced a standard package of familiar sounds' (quoted in Pinch & Trocco 2002, p. 130). For Krause, synthesizers were to be used to make sounds that had not yet been imagined. The Buchla Box, though, was designed as a way of re-creating sounds without using magnetic tape and earlier synthesizers had been designed for the purpose of imitating existing musical instruments.[17] Those interested in doing so discovered that the sounds of acoustic musical instruments as performed by human beings were not easy to replicate due to the limitations of using analogue synthesis and, later, digital synthesis.

The aim of developing digital sampling technologies had been a dream of electronic music makers and engineers in the 1960s when figures like Peter Zinovieff, Tristram Cary, and David Cockerell founded the Electronic Music Studios (EMS) in London. According to Pinch and Trocco, Zinovieff was interested in designing a digital sampler to record and analyse sounds because of problems with the fidelity of synthesized

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[17] The imitation of string, wind, and percussion instruments was a goal of the electronic synthesizer designers at RCA Laboratories in the 1950s: 'The electronic music synthesizer has been used to provide simulations of the voice and existing musical instruments as well as entirely new musical tones which cannot be produced by the voice or existing musical instruments' (Olson & Belar 1955, p. 608). For more on the use of synthesizers to imitate acoustic instruments, see Pressing 1992, Jenkins 2007.

sound.[18] Like the composers of *musique concrète*, he believed that 'real sounds have got so much complexity that they're better than synthetic sounds' (quoted in Pinch & Trocco 2002, p. 281). The development of devices that could digitally record and reproduce 'real sounds' rather than synthesized sounds introduces an important distinction with instruments and technologies that could only be used to playback pre-recorded sounds. In a useful history of sampling, Hugh Davies looks as far back as ancient Rome for examples of instruments that imitated the sounds of other instruments before stating: 'The first digital sampling instruments appeared as long ago as 1971. These were electronic church organs manufactured by the Allen Organ Company in Pennsylvania (1996, p. 8). While these instruments contained a sample library of digitally recorded sounds from different pipe organs they did not offer users the option to digitally record and reproduce their own sounds. These organs were more like digital versions of the Mellotron on which pre-recorded sounds could be reproduced rather than instruments that enabled users to sample and playback externally recorded sounds.[19] At Fairlight Instruments, the engineers used eight-bit microprocessor technologies that were developed by Motorola to design a keyboard-based device using digital synthesis that could be used to record, store and playback digitally sampled sounds from its memory.

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[18] EMS is well known for designing and developing analogue synthesizers like the VCS3 (1969) and the Synthi A (1971) as used by The Who and Pink Floyd. Its Musys III system of generating electronic music consisted of two DEC PDP-8 minicomputers and software written by Peter Grogono whose work for EMS was based around computer-mediated voltage control. He told me that 'Musys was not a digital sampling system but deserves a brief mention in the history of digital sampling' (Grogono 2015). For more on EMS, see Reid 2000a, Reid 2000b, Pinch & Trocco 2002, Jenkins 2007. For more on Musys, see Grogono 1973, Manning 2013.

[19] Davies also refers to the RMI Keyboard Computer (1974), developed by a subsidiary of the Allen Organ Company called Rocky Mount Instruments. For more on the RMI, see Carson 1995. For more on the Mellotron, see Vail 2000e, Samagaio 2002, Reid 2002, Awde 2008.

The Fairlight CMI was the not the only digital synthesizer designed in the 1970s that offered users the opportunity to experiment with digital recording and playback. Inspired by the work of engineers like Bob Moog, Max Mathews, and John Chowning, the designers at New England Digital used a sixteen-bit microprocessor called ABLE to develop a performance instrument using digitally synthesized sounds.[20] Composer, Jon Appleton, and engineers, Sydney Alonso and Cameron Jones, began collaborating on the Dartmouth Digital Synthesizer in the Thayer School of Engineering at Dartmouth College in 1972 and formed New England Digital Corporation in 1977.[21] After a visit to Max Mathews at Bell Laboratories in June 1978, the instrument was renamed the Synclavier and fifteen were sold at a cost of $13,500US (Appleton 1989). The digital memory recorder it contained was an important feature and anticipated the development of MIDI sequencing[22] and the Digital Audio Workstation (DAW).[23] After witnessing the success with users of the digital sampling technologies that were part of the Fairlight CMI, New England Digital decided to offer Synclavier users the opportunity to digitally record/sample, store, and playback individual sounds of their own. Alonso explained:

> They [Fairlight Instruments] would show up at AES shows and they'd say, 'Well, let's draw a picture of a Volkswagen on the screen and then we'll play

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[20] For more on Chowning's work at Stanford University in the Center for Computer Research in Music and Acoustics (CCRMA), pronounced 'karma', see Nelson 2015. Frequency Modulation (FM) synthesis was developed by Chowning in the late 1960s and licensed by Yamaha in 1975. It was used as the basis for the DX7, one of the best-selling digital synthesizers released in 1983.

[21] The first four compositions produced using the synthesizer by Appleton, Lars-Gunnar Bodin, Russell Pinkston, and William Brunson can be heard on recordings released by Folkways Records, *The Dartmouth Digital Synthesizer* (1976), which have since been re-released on CD.

[22] MIDI is an acronym of Musical Instrument Digital Interface.

[23] Appleton writes: 'The feature of the instrument that attracted most public attention was its sixteen-track recorder. The performer could start the recorder, and the computer memorized what was played. Unlike tape, the recording, called a sequence, could be instantly played back at the touch of a button. Tracks could be added on top of each other…' (1989, p. 24).

that wave,' and lo and behold, the public bought it, so all of a sudden the idea was that we want to do sampling – and this was a very strong market force, so we were forced to develop the sampling unit (quoted in Chadabe 1997, p. 186)

The Synclavier II was launched in 1980 and the option of monophonic sampling added two years later before the introduction of a polyphonic sampling synthesizer in 1985.[24] The Synclavier was primarily a digital synthesizer designed to give users a larger palette of sounds and more control over these sounds than was possible with analogue synthesizers; the inclusion of a digital sampling function so that users could record external sounds was a commercially driven decision to compete with the Fairlight CMI.[25]

The Early History of Digital Sampling Instruments

The Fairlight CMI was the not the only computer music technology developed in the 1970s that offered users the opportunity to experiment with the digital reproduction of externally recorded sounds. In the Presser Electronic Music Studio at the University of Pennsylvania, Dan Coren and Harry Mendell designed an instrument that became known as the Computer Music Melodian and formed a company called Computer Music Incorporated in 1975 to market the product. Coren told me that 'before the product had a

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[24] Cameron Jones, who now runs a company called Synclavier Digital, told me how: 'New England Digital introduced the 'Monophonic Sampling' option (called 'Sample-to-Disk') in 1982. I developed the software during 1981. At that point in time we could buy 5-megabyte hard drives (called 'Winchester Disks') made by a company called IMI. This was all before the SCSI hard drive standard. By 1982 we could get 10-megabyte and 20-megabyte versions of the hard drive. They were big and clunky - about the size of a shoebox. The Sample-to-Disk option used a 16-bit analog-to-digital converter that could capture sound at a 50 kHz sampling rate. That was revolutionary since it provided full-fidelity digital sampling' (Jones 2015).
[25] For more on the development of the Synclavier, see Alonso, Appleton & Jones 1976 and Appleton 1989. For more on the development of the Synclavier II, see Appleton 1983.

name and long before Computer Music Incorporated existed, the product was simply a late 1960's vintage Moog synthesizer attached to an A/D converter and a PDP-8 minicomputer' (Coren 2015). The hardware and software enabled users to digitally record their own sounds and play them on the keyboard – a demonstration tape sent to recording studios included melodies performed with the sampled sounds of burping (Beethoven's 'Ode to Joy') and bouncing basketballs (The Beatles' 'When I'm Sixty-Four'). Manufactured by Digital Equipment Corporation (DEC), the makers of the PDP-8, it cost $20,000US. The only customer was Stevie Wonder who used it on *Journey Through The Secret Life of Plants* (1979) as a way of digitally reproducing birdsong, bugs, and other non-human sounds: 'The very first thing Stevie did was take a recording of a single note from a bird he had recorded in Hawaii and use it to play the melody from the second track called 'The First Garden'. It completely blew him away. Me too!' (Mendell 2015). Coren left the company to search for employment as a computer programmer and Mendell continued working with Stevie Wonder after taking up a job with Bell Laboratories. The instrument was, in the words of Coren, 'not a commercial success'. In 1978, a French company called Publison launched a Stereo Digital Audio Computer called a DHM 89 B2. It offered dual digital delay and the indefinite repetition of memorised sounds.[26] By 1980, it could be used in conjunction with a KB 2000 keyboard, which Publison introduced to playback any sound that had been recorded by tape or microphone: 'Put any sort of sound in memory and tame it!' a trade show flier

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[26] The owner of Publison, Peter Dean, told me: 'this machine was exhibited for the first time at the AES of Hamburg, Germany (February 28-March 3, 1978). It became famous as it was the only machine to perform high quality pitch-shifting, without audible glitches' (Dean 2015).

advised.[27] At the same time as Fairlight Instruments were developing the CMI,

companies like Publison and Computer Music Incorporated were making digital

sampling technologies available for users to sample and playback externally recorded

sounds. The use of the Computer Music Melodian on a recording by Stevie Wonder

predates the use of the Fairlight CMI on Peter Gabriel's *Melt* album, released in May

1980. The Fairlight CMI may not, then, have been the first instrument to make digital

sampling available to users but as a music computer with its own hardware and software,

a digital synthesizer with two six-octave keyboards, and a digital sampling instrument

with its own QWERTY keyboard, it is arguably the most important of the early digital

sampling technologies. It was not only the most commercially successful of the first

digital sampling instruments; it was also the most widely used instrument for sampling.

In his story of one of the pre-existing library samples contained on one of two floppy

disks supplied with the instrument, Robert Fink writes that the Fairlight CMI was

> the first commercially available electronic musical instrument that, in addition to
> generating musical sounds through analogue/digital synthesis, gave its owner the
> ability to sample pre-existing sounds into digital memory, process them, and play
> them back through a keyboard. It is thus the single evolutionary starting point for
> an entire phylum of ubiquitous (and much cheaper) digital samplers, including
> the Akai S-series (1984) and the Ensoniq Mirage (1985),[28] so crucial to the rise
> of sample-based hip-hop (2005, p. 341).

While it is problematic to isolate a single starting point in the history of digital sampling

instruments, Fairlight Instruments were more successful than Computer Music

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[27] The Publison Infernal Machine 90, a 16-bit multi-effects device using Digital Signal
Processing (DSP), was released in 1983 and used by Stevie Wonder, Jean Michel Jarre, Marcel
Dadi, and Stock, Aitken, and Waterman (SAW). For more on its use by SAW, see Harding 2010.
[28] Ensoniq released the Mirage in 1984. Akai released its S612 in 1985.

Incorporated or Publison in manufacturing, distributing, marketing, and selling its synthesizer/sampling technology. In his study of the Minimoog and its adoption as an instrument in rock, Trevor Pinch writes that 'it is sellers who tie the world of use to the world of design and manufacture. Sellers are 'boundary shifters'. They are the true 'missing masses' of technology studies' (2003, p. 270).[29] He was referring to David Van Koevering, one of the individuals responsible for developing a market for the Minimoog. In the case of the Fairlight CMI, the 'boundary shifters' were individuals such as Bruce Jackson who was responsible for distributing and marketing the instrument in the USA. In the UK, Peter Vogel demonstrated the Fairlight CMI to Peter Gabriel who started a distribution company called Syco Systems and marketed the instrument along with the Synclavier and the Linn LM-1 Drum Computer. Unlike Computer Music Incorporated and Publison, Fairlight Instruments and its distributors connected the engineering worlds of its designers with the musical worlds of its users.

Using Digital Samplers

Having sketched out the historical context for the development of digital synthesizers and the early history of digital sampling instruments, I want to give a brief overview of how digital sampling instruments, or samplers as they became known, started to be used in the 1980s and the consequences of this for the academic study of digital sampling. In *The Grove Dictionary of Musical Instruments*, Hugh Davies defines a sampler as an

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[29] When Bruno Latour asked where are the missing masses in our studies of societies and their technologies he was referring to non-human actors: 'the missing masses of our society are to be found among the nonhuman mechanisms' (1992, p. 248). In (popular) music studies, the missing masses include technologies of music making such as digital synthesizer/sampling instruments.

electronic musical instrument or software equivalent that uses digital samples (recorded portions of sounds) stored in memory for sound production, both in performance and composition. The sounds can be played back by the sampler itself or be routed to a keyboard, sequencer, or other electronic device. Samplers can record, edit, store, and replay samples (2014, pp. 373-374).

The Fairlight CMI Series I was not referred to as a sampler.[30] It was a digital synthesizer that also enabled users to digitally record (or sample) external sounds. E-mu released an instrument specifically designed for sampling and playing back externally recorded sounds in 1981: the Emulator, a digital sampling keyboard. Like Fairlight Instruments and New England Digital, E-mu was a synthesizer company. They had developed modular analogue-based synthesizers in the 1970s and introduced a computer-controlled system called the Audity at the AES convention in May 1980 but it never went into production. The E-mu designers had witnessed the popularity of the Fairlight CMI's sampling technology with users when demonstrated at trade shows organised by NAMM and AES and they began to develop the Emulator, which might accurately be described as the first dedicated sampler. Like the Fairlight CMI, there was other keyboard-based music computers in the early 1980s that offered users the ability to digitally sample externally recorded sounds including the PPG Wave system, designed by Wolfgang Palm of Palm Products Germany (PPG).[31] This was another synthesizer/sampling hybrid instrument, unlike the Greengate DS:3 (1984), which was marketed as a sound sampling

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[30] Articles and reviews of the Fairlight CMI Series I and II referred to it as a digital synthesizer and music computer. See Crombie 1979, Farber 1980, Levine & Mauchly 1980, Elen 1981, Meredith 1981, Williams, E. 1982, Williams, N. 1982, Dawson 1983.

[31] The PPG Wave System consisted of the Wave 2.2 (1982) or Wave 2.3 (1984) digital synthesizers. These could be used separately or used with Waveterm - a computer, monitor, and two 5¼-inch disc drives, which could sample external sounds. Its most famous user was Thomas Dolby. For more on PPG Wave and Waveterm, see Molloy 1996, Vail 2000b, Vail 2014.

system.[32] When Ensoniq launched the Mirage in 1984, it was described as a digital sampling keyboard.[33] As Japanese companies like Akai and Casio entered the market and offered dedicated rack-based samplers and keyboard-based samplers at lower prices, these were also referred to as samplers.[34] They were not digital synthesizers with digital sampling provided as an additional function.

Since the mid-1980s sampling and samplers have been closely associated with the genres of hip-hop and electronic dance music (EDM) and synonymous with a particular musical practice: the re-use of an extract from a pre-existing sound recording in a new recording.[35] Sampling has been viewed as a form of appropriation, musical quotation, or theft.[36] As a result, the concept of sampling, which previously referred to a specifically digital process, is now used ahistorically to describe the re-use and repetition of sounds from pre-existing recordings using technologies other than digital samplers such as magnetic tape and Technics turntables: from Pierre Schaeffer's *musique concrète* to the

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[32] The Greengate DS:3 consisted of a keyboard and circuit boards that connected to an Apple IIe computer with keyboard and monitor. It introduced Bill Drummond of The KLF to digital sampling: 'The first sampler I saw was called the Greengate. Greengate something, can't remember what it was actually and it was a very primitive sampler and I think it could sample one and a half seconds. It maybe could sample three seconds, I don't know. Stock, Aitken and Waterman owned it' (Drummond 2008). For more information on the DS:3, see Colbeck 1985.

[33] For more on Ensoniq and the Mirage, see Hastings 1986a, Hastings 1986b, Anderton 1988b.

[34] In 1986 Casio launched the SK range of sampling keyboards with the SK-1. Akai's S612 (1985) and S900 (1986) rack-mounted devices were called MIDI digital samplers. As can be seen in their adverts, Akai also registered the word Sampler as a trademark (Akai 1985).

[35] In a dictionary of key concepts relating to the study of popular music, Roy Shuker defines sampling as 'the practice of using computer technology to take selected extracts from previously recorded works and using them as part of a new work, usually as a background sound to accompany new vocals' (2012, p. 98).

[36] For examples of articles that appeared in the UK and US music press in the mid-to-late 1980s about the legal issues surrounding digitally sampling sounds from pre-existing sound recordings without the permission of copyright owners, see Barry 1987, Sutcliffe 1987, Torchia 1987.

beat juggling of Grandmaster Flash. The definition of sampling has moved away from the digital and widened to include the re-use of a single phrase, the quoting of lines from a well-known song, or the copying of a bass line or guitar riff. The Sugarhill Gang are said to have 'sampled' Chic's 'Good Times' even though no digital sampling instruments were used in the making of 'Rapper's Delight'. In short, the term sampling is often used to explain the use and re-use of any pre-existing sound source in a new musical context: an excerpt of dialogue from a film or a catchphrase used by a DJ on a radio broadcast. The definition of sampling that runs through this thesis is the use of digital technologies to record, store, and reproduce any sound. This is why Eliot Bates writes: 'In contemporary computer-based audio recording, every moment of recorded sound is essentially a 'sample.' Thus, rock 'n' roll, country, blues, and classical genres not traditionally associated with sampling – are now sample-based musics' (2004, p. 283). Rather than focusing solely on sampling as the re-appropriation and re-use of sounds from pre-existing sound recordings, in this thesis I explore a diverse range of socio-technological processes that have shaped the musical practices of sampling both historically and in relation to the contemporary uses of digital sampling technologies.

The range of musical practices relating to digital sampling and the use of samplers considered in this thesis include the imitation of acoustic instruments and the recording and manipulation of the sounds of everyday life.[37] These uses will be introduced in the

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[37] I use the sounds of everyday life as shorthand for a range of music making activities using sound reproduction technologies in ways traditionally associated with film Foleys, *musique concrète*, and field recordings. These include recording the sounds of human/non-human

first three chapters of the thesis. They focus on the design of digital sampling

instruments at companies such as Fairlight Instruments and E-mu Systems, which were

determined to achieve objectives relating to realism (fidelity of sounds) and modernism

(control and progress). However, the users of musical technologies did not always read,

understand, or have access to instruction manuals for instruments like the Fairlight CMI

and the Emulator or operate them in the ways intended by their designers. One of the

themes that runs through the thesis is the question of whether users of early digital

sampling instruments like the Fairlight CMI or newer devices like the Akai MPC2000

read and followed manuals: some admitted they did - hip-hop producer Pete Rock, for

example - and some admitted they did because they had little choice - Ian Curnow, who

worked with Stock, Aitken, and Waterman. Following the instructions for digital

sampling instruments would not have led hip-hop producers to reproduce the rhythms of

their favourite funk recordings. As will be discussed in chapter three, Marley Marl's use

of the Emulator to sample drums from a pre-existing sound recording was an accident. A

narrative about the use and misuse of music technologies, which might include the use

of feedback and distortion in blues and psychedelic rock or the use of the Roland TB-

303 in acid house music, continues with the story of sampling and samplers.[38] Digital

sampling instruments like the Fairlight CMI, which was designed primarily for imitating

the sounds of acoustic instruments, and the Emulator, which was designed for sampling

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environments and the use of everyday (and non-everyday) objects such as glass and guns to
make music. For more on the ambiguity of the everyday in social theory, see Sandywell 2004.
[38] Writing about experiments with amplification in the late 1960s and Jimi Hendrix's use of
effect pedals to create distortion, Steve Waksman explains that 'Hendrix could more readily
enact his own wilful deviations from the norms of electronic sound design and capitalize upon
the accidents made possible by amplification to push the sound of his guitar in new directions'
(p. 184). For a socio-technical biography of the Roland TB-303 Bass Line synth, see Prior 2007.

and playing back the sounds of everyday life on a keyboard, were used for a range of musical activities. As the sample time available to users increased, digital sampling instruments were adopted by different social groups and became closely associated with the recycling, repetition, and recontextualisation of pre-existing sound recordings.[39]

Analogue/Digital

It had been assumed digital samplers would take over many of the cutting, splicing, and editing techniques associated with magnetic tape recording. In an article published in the magazine, *Electronic Musician*, when more affordable digital samplers were becoming available in the mid-1980s, Tony Thomas compared digital sampling to existing uses of analogue technologies rather than describing a new and revolutionary musical practice:

> Sampling is like magnetic tape recording in that both technologies involve the capturing, storing, and recreating of audio (sound) waves. In fact, many of the standard terms associated with this technique (e.g. loop, splice, crossfade, etc.) have been borrowed directly from the world of magnetic tape recording (1986, p. 26).

For some users, samplers were tools for digital editing and a good example of this technological practice is found in Bill Drummond's account of his collaboration with Tammy Wynette on The KLF's 'Justified and Ancient' in 1991. He flew to Nashville to record her vocals onto a backing track created in a South London studio with partner, Jimmy Cauty. The session was a disaster because 'The First Lady of Country' was used to working with a band that would slow down or speed up depending on her timing and

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[39] Tricia Rose refers to the 'redefinition of the role' of digital samplers and describes how they had initially been used to replicate the sounds of acoustic instruments. She writes: 'rap producers have inverted this logic, using samples as a point of reference, as a means by which the process of repetition and recontextualisation can be highlighted and privileged' (1994, p. 73).

so was only able to keep in time with the track for a few bars. On his return to the UK, Drummond feared the recording of the vocals would be unusable until Cauty explained: 'We just got this new machine. We can sample up every word she sang separately – stretch them, squeeze them, get them all in time. As for her pitching, the listener will hear them as emotional integrity' (quoted in Drummond 2001, p. 185). A digital sampler saved the day because Drummond and Cauty used it to combine perfect timing with imperfect pitch. This anecdote illustrates the lack of a straightforward relationship between the reproduction of sampled sounds and their perception as either artificial or authentic. Rather than the accusation of artifice, aimed at technologically mediated vocal performances throughout the history of popular music from the use of microphones and vocoders to software like Auto-Tune, Cauty believed the vocal performance would be interpreted as authentic by listeners who would hear imperfections as a form of integrity.

This thesis demonstrates how the realism and authenticity of sampled sounds was as important to the designers and users of early digital sampling technologies as the fidelity of sound was to the designers of early sound reproduction technologies. Emily Thompson and Jonathan Sterne both write about the discourses of fidelity and realism that accompanied the invention of late nineteenth century recording technologies. In her history of tone tests in the US between 1915 and 1925, Thompson outlines The Edison Phonograph Company's quest for 'phonographic fidelity' (2005, p. 134). Sterne describes how Victor Talking Machine Company used their advertisements to market the way its recording technologies could achieve 'true fidelity' by reproducing sound as a 'vanishing mediator' (2003, p. 283). This concept is also relevant to the use of early

digital synthesizer/sampling instruments like the Fairlight CMI to imitate the 'real sounds' of acoustic instruments as well as the practices of contemporary producers like Matthew Herbert who use field recordings to sample the sounds of the 'real world'. Questions about the authenticity of live performances were raised by the use of digital technologies in 1980s pop music – lip synching, backing tracks - and sampling was celebrated for its subversive qualities – a new aesthetic of plunder and pastiche, the death of the song, the end of music! Rather than being devices associated with artifice that challenged ideas of authenticity, this thesis outlines how an ideology of authenticity developed around digital sampling and why users of digital technologies continue to value it. The case studies in its second half illustrate how authenticity is still important for the contemporary users of digital sampling technologies including software samplers.

In this thesis I argue that the way sampling and samplers have been used and continue to be used by musicians in a wide variety of social contexts demonstrates a complex relationship of co-existence between analogue and digital technologies. The second chapter of the thesis explores how JJ Jeczalik and members of Trevor Horn's production team started to use the Fairlight CMI with other digital instruments to add sampled loops to recordings by Malcolm McLaren and The Art of Noise. These mirrored the hip-hop aesthetic of isolating and repeating rare breakbeats using analogue technologies such as turntables and magnetic tape. The third chapter highlights how these analogue technologies continued to be used in hip-hop even after the availability of more affordable digital sampling devices. The use of digital sampling technologies like the Fairlight CMI and the Emulator involved learning new technological practices relating

to programming and pitchshifting. They were also used to replicate musical practices that had previously been executed using analogue technologies and did not necessarily replace them. This thesis challenges the view that a 'digital revolution' is currently replacing analogue ways of doing things. Nick Prior describes this as the problem of hype and asks: 'How does one avoid the overly utopian embracing of all things digital as revolutionary without suggesting that nothing has changed at all?' (Prior 2012). Instead of accepting simplistic arguments about a complete transition from analogue to digital or the entering of a 'digital age', this thesis deals with Prior's problem by adopting a nuanced approach that looks dispassionately at the digital. The use of digital technologies since the 1980s *have* changed the way in which music is stored, distributed, and consumed.[40] The uses of digital technologies have also reshaped the processes of musical production and, by focusing on the users of technology, this thesis examines how the use of digital sampling technologies have changed the ways music is produced.

As well as its focus on the reshaping of musical practices, the other research question that has guided this thesis is: how have sampling and the use of digital sampling technologies shaped and reshaped the *sounds* of popular music since the late 1970s? In answering this question, the sounds produced by digital sampling technologies are

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[40] Simon Frith describes notation and recording as the first two revolutions in musical storage and the storage of sound in the form of bits and bytes as the third stage of this historical process. He outlines how this was 'shaped by analogue practices: it allowed people to do more quickly and easily what they were doing anyway. The CD replaced the vinyl LP, digital editing the tape machine, but the music was much the same' (2001, p. 32). As downloads and streaming replaced the CD as the primary forms of digital consumption, music has not remained the same.

central to this study but commercially released sound recordings are not treated as texts

prepared for the purposes of musicological analysis. I try to follow Fink's advice:

> *Loosen up.* We had analytical rigor, and it felt dangerously close to rigor mortis. Avoid totalizing (framing) critical gestures altogether, whether in the service of autonomous form or cultural code; stop trying to put the entire piece together (musicology) or take it totally apart (popular music studies). Get in, say something that helps convey the immediacy of the musical experience, and *get out.* Stop marching through the music's architecture-and *dance* a little (1998, p. 167).

While influenced by musicology, my approach to the study of music and its technologies

has been shaped by the interdisciplinary work of scholars in the areas of Popular Music

Studies (PMS) and the emerging field of the study of record production.[41] Rather than

exploring the ways samplers have been used as music technologies, the academic

literature on digital sampling has tended to focus on issues relating to authorship (Sanjek

1994), copyright (Schumacher 1995, Hesmondhalgh 2006), morality (Porcello 1991),

gender and sexuality (Bradby 1993, Loza 2001), and postmodernism (Goodwin 1988).

This is why the field of STS has been useful in providing a conceptual framework for

the study of samplers as musical instruments. A central argument of the thesis is that it is

necessary to study digital sampling within the cultural and social contexts of *music*

making: in recording studios, home studios, concert stages, performance spaces and

other sites of musical production. Here, I draw on the work of scholars such as Tara

Rodgers who has made a valuable attempt to 'shift the focus from well-worn debates

over copyright infringement issues by pointing toward greater understanding of the

musical attributes of samplers and other digital instruments' (2003, p. 313). Rodgers,

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[41] For an introduction to this field, see Cook, Clarke, Leech-Wilkinson, & Rink 2009, Bayley 2010, Frith & Zagorski-Thomas 2012, and The Journal of the Art of Record Production (JARP).

though, chooses to restrict her study of electronic music and sample-based music to the 'underground', a problematic term that inhibits a comparative exploration across a wide range of genres and styles in favour of a narrow focus on 'perceived non-mainstream cultural and economic space' (*ibid*.). This is likely to exclude much of popular music and some of the key users of digital samplers and sampling instruments. The research for this thesis began with an attempt to focus on digital sampling within pop music, popular music, and less popular forms of popular music. By the end of the research it became clear it was not possible to understand the design and use of digital sampling instruments or write a history about the design and use of digital sampling instruments without understanding and moving between the musical worlds of art, folk, *and* popular music.[42]

'The Rest is History': Writing a History of Music Technologies and their Users

To provide context for the contemporary uses of digital sampling technologies discussed in the case studies of this thesis, its first half contains studies relating to the design and use of digital sampling technologies produced by Fairlight Instruments (chapter one and two) and E-mu Systems (chapter three). These are historical and are written to present accurate information about musical instruments, their designers, and their users. Archival research was carried out by reading back issues of music technology magazines like *Sound International, Studio Sound, Sound on Sound,* and *Keyboard* and it was also necessary to interview engineers and designers to find information about historical

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[42] Simon Frith draws on Howard Becker's idea of 'art worlds' (1982) and Pierre Bourdieu's concept of 'cultural capital' (1984) to discuss how musical taste and consumption work within these three different musical worlds that should be understood as an interrelated field: 'what is involved here is not the creation and maintenance of three distinct, autonomous music worlds but, rather, the play of three historically evolving discourses across a single field' (1996, p. 42).

processes relating to the design of digital sampling technologies. An email interview was conducted with Peter Vogel of Peter Vogel Instruments to establish his 'facts' about the Fairlight CMI – the design objectives, its manufacture and distribution, the sale and marketing of the instrument, the relationship between the designers and users – as it was difficult to rely solely on secondary sources containing conflicting information. Longer interviews with the users of early digital sampling technologies including Richard Burgess, JJ Jeczalik, and Keith LeBlanc form the basis of the first three chapters of the thesis and these were conducted in person or via Skype. These users were asked to recall events that occurred more than thirty years previously and if the answers of some interviewees seemed less reliable because of an apparent need to write themselves into the history of digital sampling technologies as innovators or pioneers, others were careful to avoid myth making by admitting how much they were unable to remember about the musical activities of the distant past.

This thesis aims to be an accurate writing of a history of digital sampling technologies but it is not a definitive one. As Antti-Ville Karja suggests, 'Writing history is always about selecting things to tell – writing total history is impossible' (2006, p. 4). It contains useful findings about the instruments of digital sampling and their designers and users but there are also important things it leaves out. The focus is the study of sampling in relation to the *production* of popular music; more research into the experiences of listeners will be required to answer questions about how the musical practices of sampling have shaped perceptions about popular music and its *consumption*. Choices were made about which of the early digital sampling technologies to focus on –

the Fairlight CMI and E-mu Emulator over the Synclavier, for example. The first three chapters of the thesis form part of a short history about the use of digital sampling technologies such as the Fairlight CMI and the Emulator and it is one shaped by focusing on the earliest users of these technologies. The designers of instruments like the Fairlight CMI are quick to claim that they 'changed the way we make music, forever' or refer to 'the classic Fairlight sound that defined the music of the eighties'. Those writing histories about instruments and their designers also tend to draw on a series of myths about the construction of new technologies, including the light bulb moments experienced by geniuses that change history and musical history forever.[43] One of these eureka moments can be found in an article celebrating twenty five years of Fairlight and is discussed in more detail in the first chapter: Peter Vogel accidentally stumbles across the realisation that digitally sampling the sound of a piano playing on the radio sounded better than trying to create a similar sound using digital synthesis. 'The rest is history' writes journalist Rita Street (2000). However, history was still to be written by the users of digital sampling technologies in ways that were completely unforeseen by their designers. This is not a history written by the designers of digital sampling instruments. It is a history written by both the designers *and* the users of digital sampling instruments.

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[43] Outlining and questioning the 'notion of the heroic inventor', MacKenzie & Wajcman write that 'great inventions occur when, in a flash of genius, a radically new idea presents itself almost ready-formed in the inventor's mind. This way of thinking is reinforced by popular histories of technology, in which to each device is attached a precise date and a particular man (few indeed are the women in the stereotyped lists) to whom the inspired invention 'belongs'' (pp. 7-8).

Part One:
Following the Instruments

1 – Tomorrow's Music Today: The Fairlight CMI Series I and II

Introduction

The technology that is the focus of this chapter is the Fairlight Computer Musical Instrument (CMI) and, more specifically, the CMI Series I and II. As outlined in the introduction, its designers at Fairlight Instruments, Peter Vogel and Kim Ryrie, were primarily interested in the use of digital synthesis to replicate the sounds of acoustic instruments. Their interest in using digital sampling to do so was the result of experimentation and failure. Early users of the Fairlight CMI like Richard Burgess, Kate Bush, and Peter Gabriel used its digital sampling technologies to record the sounds of everyday life and incorporated these sounds into recordings; composers such as Peter Howell and other members of the BBC Radiophonic Workshop used digital sampling to combine the sounds of acoustic instruments with random noises to create new instruments and libraries of sound effects; hip-hop producers, Afrika Bambaataa and Arthur Baker, experimented with the pre-set sounds of the digital sample library including the ORCH2 orchestra sample.[1] These are examples of musicians using the instrument in ways unforeseen by their designers and of users failing to follow what Madeleine Akrich refers to as the 'script' inscribed in the technical object. Akrich writes that 'we have to go back and forth continually between the designer and the user, between the designer's projected user and the real user' (1992, pp. 208-9). There are examples of the instrument being used as a digital synthesizer but this is where one of

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[1] Thom Holmes (2016) traces the history of pre-set sounds to the Hammond Novachord electronic organ (1939) and their use to imitate the sounds of orchestral instruments. In the 1960s, modular synthesizers generated instrumental sounds using basic waveforms; in the 1970s, synthesizers like the Yamaha CS-80 (1976) contained non-programmable preset sounds.

the designers (Vogel) was also a user. Users such as Burgess quickly realised that rather than trying to replicate the sounds of acoustic instruments, the digital sampling technology that was of secondary concern to its designers could be used as a new form of *musique concrète*. This chapter draws on archival research and interviews to focus on both the designers and users of the Fairlight CMI but I start with the musical instrument.

Figure 1 Fairlight Computer Musical Instrument (CMI) Series I

The Fairlight Computer Musical Instrument (CMI) consisted of a large Central Processing Unit (CPU) with two microprocessors and two 8-inch floppy disk drives, a QWERTY keyboard with a monitor, and two six-octave keyboards (Figure 1). There were three ways that users could generate new sounds (and data) with the instrument: sampling external sounds, using additive synthesis, or drawing waveforms with a light-pen attached to the monitor. The light-pen was successful with audiences at Audio Engineering Society (AES) conventions where the Fairlight CMI was demonstrated to potential customers but irked rival companies who rejected it as a gimmick.[2] Cameron Jones of New England Digital (NED) dismissed it by saying that 'Using a light pen to draw a visual representation of a sound wave is kind of like using a pencil to draw a high-resolution JPEG image' (quoted in Milner 2009, p. 317). Roger Linn was blunt:

> It was completely useless, a stupid idea, because you're only going to get very odd and bad harmonics, which was emphasized by the fact that Fairlight's sampling rate and bit width was so low. It was a feature they kept talking about, like you could 'make any sound,' but imagine making any sound by drawing a waveform. It's just impossible (quoted in Milner pp. 317-318).

While technologists have criticised the non user-friendly interface of a monitor and light-pen, musicians like Peter Gabriel and Herbie Hancock were interested in the opportunity to make music with touch-screen technology. In 1980, Gabriel described his experiments with it:

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[2] Kim Ryrie states: 'I remember at the AES show in 1979, we had people coming up to the instrument, which was being used to demonstrate how you could play natural sounds, and they couldn't understand what it could be used for! It was a case of, 'Yes, that's great – but who can make music with such a thing?'' (quoted in Gilby 1987a, p. 52).
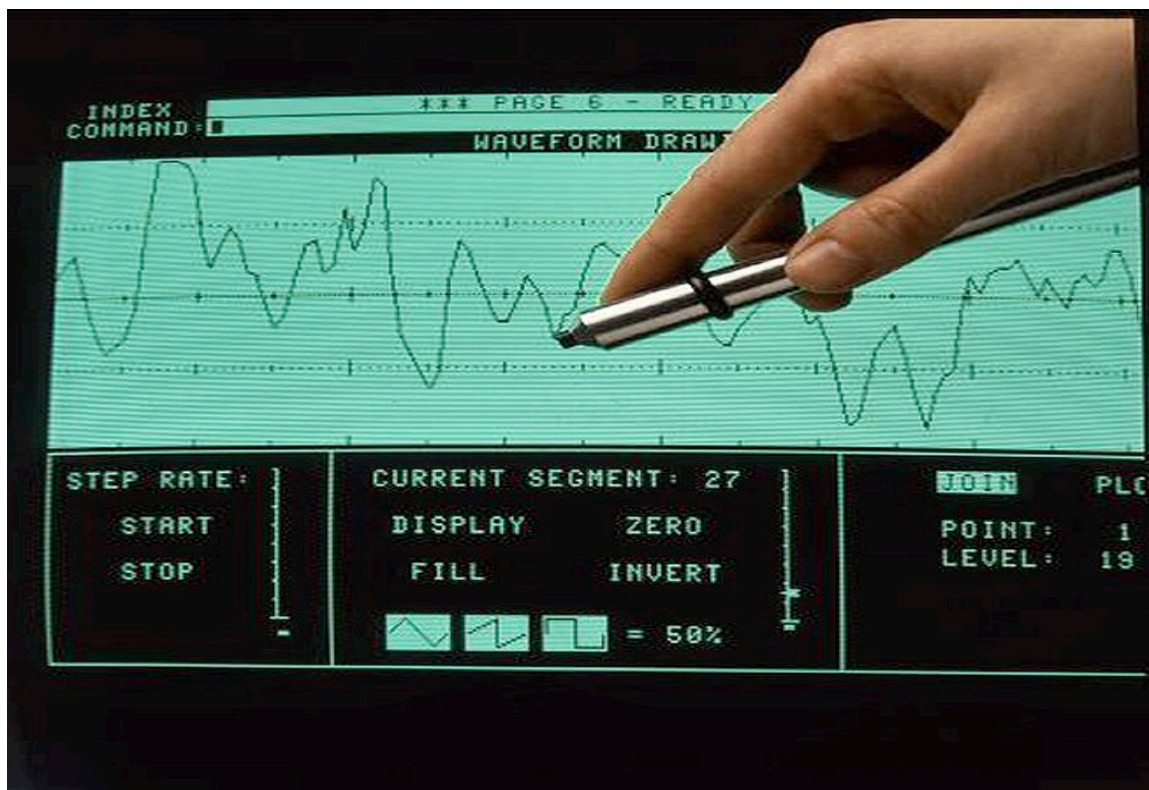
Figure 2 Fairlight CMI Control Page 6 (Waveform Drawing) with Light-Pen

> You have a sort of TV screen, which you work with so you're working to some extent with the waveform. You have a light pen that you can programme the waveform on to the screen and get a considerable amount of control over the sound like that. So as they develop the visual correspondence I think it will become easier. At the moment it does take a little time to get the hang of it, but I think it's within anyone's grasp if they have the time available (quoted in St. Michael 1994, pp. 81-2).

Hancock was effusive with praise about the light-pen and the instrument more generally:

> The use of the light pen and all the different screenings and menus you have available, and the different ways in which you can manipulate sound, are incredible. The fact that you can draw your waveforms, loop any points you want, merge different waveforms together is fantastic. There's nothing even close to that as far as I know (quoted in The Keyboard Staff 1983, p. 53).

Despite this enthusiasm, users did not overcome the difficulties of creating sounds with the light-pen and it was discontinued when the Fairlight CMI Series III was launched in 1986. For other participants at the AES conventions like Dave Rossum and Scott Wedge

of E-mu Systems, the company that would go on to develop digital sampling keyboards like the Emulator and sampling drum machines like the SP-12, the digital sample-based technology that was of secondary importance to the designers of the Fairlight CMI was more interesting and had more potential for the future development of their instruments.

As well as the use of a light-pen to draw waveforms, the sounds of acoustic instruments could be played on the keyboards of the Fairlight CMI using the library of pre-recorded samples stored on one of two 8-inch floppy diskettes that came with it. In an article in the August 1983 issue of *New Scientist* magazine, which demonstrates there was interest in using the Fairlight CMI and other new digital synthesizers within the scientific world as well as the fields inhabited by music technologists, Giles Dawson wrote: 'Insert a systems disc in the left-hand drive, a library disc in the right, and you can explore a world of sound limited only by your imagination' (1983, p. 333). Rather than being used to create 'any sound you can imagine' there was a fear that digital synthesizer/sampling instruments like the Fairlight CMI would be used to imitate existing instruments. For this reason, they were not welcomed by trade unions representing the economic interests of performing musicians.[3] Dawson's article about digital synthesizers like the Fairlight CMI and Synclavier in *New Scientist* recognised that attitudes to their imitative capabilities divided musicians depending on whether they were performers or composers. In the UK, the Musicians' Union, which has traditionally campaigned about

[3] For a discussion about the relationship between the uses of electronic music technologies for emulating acoustic instruments from the 1930s onwards and the impact on performing musicians, see Doerschuk 1983. For more about restrictions placed on the use of Moog synthesizers by the American Federation of Musicians (AFM), see Pinch and Trocco, pp. 148-9.

issues relating to the live performance of music, was concerned with protecting the rights and employment opportunities of performers. Their spokesperson, Maurice Jennings, suggested: 'If you want the sound of violins, book violins; if you want the synthesizer sound, we've no objection to synthesizers' (quoted in Dawson, p. 334). The problem was that both digital synthesizers and digital sampling instruments like the Fairlight CMI had no one sound of their own: as well as the pre-set sounds contained on diskette, they could also be used to sample the sounds of existing instruments, create the sounds of 'new' instruments, and sample the 'natural' sounds of everyday life.

External sounds could be recorded and sampled with the Fairlight CMI using a microphone or line input. The sounds of acoustic instruments could also be sampled in this way and early adopters of the Fairlight CMI such as electronic music composer Eberhard Schoener were evangelical about its ability to imitate orchestral sounds:

> The Fairlight is incredible…you can make a sound which is just like (snaps fingers) which you can program and make a whole symphony from it. You keep a library of sounds on floppy disc. So with a Fairlight you can have a Steinway piano sound or whatever you want. You can blend and shape sounds however you wish (quoted in Denyer 1980, p. 16).

However, with a sample rate of 24 kHz, the objective of imitating acoustic instruments with a level of fidelity sufficient to satisfy audio experts was difficult. A report on the Fairlight CMI delivered to the 1980 International Computer Music Conference concluded:

> Steinway needn't worry about competition from this instrument. In general, the Fairlight offers an enormous palette of sounds to the musician, but it can't do everything. Like a camera, the CMI becomes transparent to the viewer, with no characteristic sound of its own (Levine & Mauchly 1980, p. 366).

Music technology journalists writing short histories of the Fairlight CMI have also been sceptical about whether the designers of the instrument succeeded in their search for fidelity. This highlights how judgements relating to sound quality shift with the development and introduction of new digital sampling instruments and other technologies of sound reproduction. Few would now claim that the Victor record player provided a high quality listening experience or that the Fairlight CMI was able to sample and 'faithfully' reproduce the sounds of acoustic instruments. Paul Tingen writes:

> The sound quality of the Fairlight's samples was extremely crude, but the Fairlight was nevertheless initially hailed for its capacity to emulate real instruments 'perfectly', the 'orchestra-in-a-box' syndrome (1996a, p. 49).

Despite this praise and the fears of organisations like the Musicians' Union, the use of the Fairlight CMI to reproduce the sounds of acoustic instruments was difficult because of its technical constraints or, to use James J. Gibson's (1979) term, the 'affordances' of the technology.[4] The technological limitations were the result of the high price of microprocessors at this time and the availability of RAM memory. The available sample time on the Fairlight CMI Series I was one second so the length of sounds that could be digitally recorded and reproduced was limited. Along with issues over the sound quality of its samples, one of the other reasons users found it difficult to replicate the sounds of acoustic instruments was because the Fairlight CMI was a keyboard-based instrument.

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[4] Ian Hutchby writes: 'the affordances of an artefact are not things which impose themselves upon humans' actions with, around, or via that artefact. But they do set limits on what it is *possible* [original emphasis] to do with, around, or via the artefact' (2001, p. 453).

Keyboard-based digital synthesizers and sampling technologies like the Fairlight CMI were based on the same way of organising sound as an older technology, the piano.[5] While some users struggled with using a computer and QWERTY keyboard, the inclusion of two piano keyboards on the Fairlight CMI was one of the reasons for its successful adoption by those familiar with the keys of a piano keyboard.[6] In an interview with Richard Burgess, who used the Fairlight CMI on the recording sessions for Kate Bush's *Never for Ever* album, he referred to the design interfaces of analogue synthesizers and the problem of using them to generate sounds without a keyboard. His first synthesizer, the EMS Synthi A – a portable version of the VCS3 - was built into a plastic briefcase consisting of aluminum knobs, a matrix, and a joystick-like controller but did not have a touch-plate keyboard like the Synthi Aks.[7] In comparison, he explains how the inclusion of piano keyboards with a digital synthesizer like the Fairlight CMI

> made it easy for people to relate. I've played keyboards on tons of records but I'm not a great keyboard player by any means. That's one of the reasons why I liked the whole computer thing. I could play the part, program it and fix the mistakes. It made it good, for instance, [on] the Kate Bush sessions. I'd be programming stuff. All the percussive parts I played but if there was a melodic part someone else would play it. It was obviously a smart move putting a keyboard on the front of it so that it was relatable to anybody (Burgess 2011).

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[5] Paul Théberge's description of the piano as 'one of the dominant musical and cultural forces in the West – theoretically, practically, and symbolically – during the past two centuries' (1997, p. 19) helps explain why keyboards continued to be an integral feature in the design of the Fairlight CMI and other digital synthesizer and sampling instruments.

[6] Tara Brabazon argues the Fairlight CMI was popular with users because it combined *both* interfaces: 'One of the reasons for its success was that it applied the design lesson of the Hammond organ and Moog by developing a conventional piano keyboard and a computer keyboard. This dual interface predicted the future of both computing and music, combining their two histories into a package and a meshed future' (2012, p. 101).

[7] Mark Vail explains that the VCS3 contains 'a tiny patchboard matrix into which you insert pins to route audio and control signals through the device' (2014, p. 88). For more on the Synthi A and Synthi Aks, see Jenkins 2007, Pinch & Trocco 2002, Vail 2000a.

Sounds could be played over the octaves of an instrument like the Fairlight CMI using the same gestures as other keyboards but problems arose for users when trying to imitate the sounds of stringed instruments on a keyboard-based instrument. Stephen Paine, who was the cousin of Peter Gabriel and the co-owner of Syco Systems, the company that distributed the Fairlight CMI in the UK, recalled: 'It became clear after a while that it was impossible to achieve the expressiveness with a keyboard that players of acoustic instruments have with finger and/or mouth control' (quoted in Tingen 1996a, p. 50). The difficulties involved in using the Fairlight CMI to imitate the sounds of orchestral instruments or other musical instruments resulted in early users experimenting with it in ways that had not been envisaged by the designers at Fairlight Instruments.

Following the Designers (and Distributors): Peter Vogel, Kim Ryrie, and Bruce Jackson
At the same time as Ryrie and Vogel were developing their music computer/digital synthesizer/sampling instrument in Australia, Roger Linn, a guitarist and computer programmer, was making a drum machine in Los Angeles. The Linn LM-1 Drum Computer used pre-recorded digital samples to replicate the sounds of an acoustic drum kit and was also released in 1979.[8] In 1980 New England Digital released the Synclavier II with a sixteen-track digital memory recorder but, as Ralph Denyer described in an article in *Sound International* in May 1980, Fairlight Instruments had an advantage:

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[8] For more on the Linn LM-1, see Cann 1981, Vail 2000f. For an interview with Roger Linn about making samples for the LM-1, see White 2002. Advertisements for the LM-1 focused on the authenticity of its sounds: 'Here's the most amazing rhythm machine *ever* – the new Linn LM-1 Drum Computer from Linn Electronics. Amazing because it has real drum sounds – not synthesized noises, but *real* drums, digitally recorded and stored in memory' (Linn n.d.).

> Although several manufacturing companies have built prototype digital synthesizers and circulated technical data on the same at exhibitions, the Australian Fairlight company have pipped the Japanese, Europeans *and* [original emphasis] the Americans to the post by getting their instrument into production first (Denyer 1980, p. 16).

It may be surprising that the development of musical instruments based on digital sampling technologies did not occur first in East Asia.[9] Even those who were involved in the development of new music technologies at this time could not have predicted that the first commercially available digital synthesizer with sampling technology would be designed in Australia. Richard Burgess was involved in the development of drum synthesizers and electronic drum kits like the Simmons SDS5 and was also one of the earliest users of the Fairlight CMI on recording sessions in the UK. He states:

> You could not have expected that anyone would come up with a device like that at that time I don't think and certainly not from Australia. You would have thought it would have come out of one of the major Universities like MIT or Stanford or IRCAM or something like that (Burgess 2011).

Compared with the connections between the designers of the Synclavier and Dartmouth College or the designers of the Computer Music Melodian and their relationship with the electronic studios and engineering departments at the University of Pennsylvania, Fairlight Instruments grew from a looser arrangement of social and family networks. Ryrie and Vogel were not University graduates but high school friends who bonded over building electronics. The initial design of the Fairlight CMI was the result of engineering experiments in makeshift spaces underneath neighbouring houses in the suburbs of Sydney rather than the laboratories of research institutes and university departments.

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[9] As Gene Gregory writes: 'By 1970, East Asia had become the epicentre of the world consumer electronics industry, with Japan in undisputed leadership; virtually all the revolutionary innovations in consumer electronic products since the first transistor radio have come from Japanese industry (1985, p. 7).

Fairlight Instruments was started by Kim Ryrie and Peter Vogel in 1975 and named after a hydrofoil that passed a suburb called Rushcutter's Bay, where they had set up a technology laboratory in the basement of Ryrie's grandmother's house. For Vogel, the reason for starting up a company to design a digital synthesizer was because he

> was inspired by the modular Moog, which could make amazing music but was very finicky to set up and only monophonic. Microprocessors were just becoming available in the 70s and I thought there must be a way to use them to eliminate all the knobs and patchleads of the usual synth (Vogel 2011b).

Ryrie and Vogel moved to new headquarters in 1976 and began working with an expert on microprocessor technology named Tony Furse on what would turn out to be prototypes of the Fairlight CMI called the Fairlight QASAR M8 and M8 CMI.[10] They saw the electronic emulation of acoustic instruments using digital synthesis as 'the holy grail' (*ibid.*). However, the difficulties in doing so led them to digitally record (or sample) the sound of a piano and use a form of Fourier waveform analysis to try and understand and replicate its complexity. Vogel explained what happened next:

> On a whim I decided to see what would happen if I changed the software to allow the sampled sound to be replayed at a pitch determined by the keyboard. The sampling time was less than a second and the first source connected to the ADC [analogue to digital converter] was a radio I had going with some music playing. I captured a fragment of a piano note and when I played it back on the keyboard I was surprised how good it sounded, especially polyphonically (quoted in Street 2000).

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[10] Furse was an electronics engineer who set up a company called Creative Strategies Pty Ltd in 1972 and developed hybrid analogue/digital synthesizers called Qasar I and Qasar II. His work was supported by the composer Don Banks, who had set up an electronic music studio at the Canberra School of Music. With the help of a grant secured by Banks from the Australian Council for the Arts, Furse began developing a digital synthesizer called the Qasar M8 (Multimode 8), which incorporated microprocessors from Motorola and a monitor with light-pen. A version of the QASAR M8 called the M8 CMI was redesigned at Fairlight Instruments and became a prototype of the Fairlight CMI. For more on Furse's archive, see Chapman 2012.

Despite this breakthrough in the attempt to use digital technology to imitate acoustic instruments, Ryrie was unhappy at not being able to do so using synthesis:

> We wanted to digitally create sounds that were very similar to acoustic musical instruments, and that had the same amount of control as a player of an acoustic instrument has over his or her instrument. Sampling gave us the complexity of sound that we had failed to create digitally, but not the control we were looking for. We could only control things like the attack, sustain, vibrato, and decay of a sample, and this was a very, very severe limitation of the original goal that we had set ourselves. We regarded using recorded real-life sounds as a compromise - as cheating - and we didn't feel particularly proud of it (quoted in Tingen 1996a, pp. 48-49).

The emphasis on control and some of the claims in advertising materials and brochures aimed at its projected users suggest that as well as the goals of fidelity and authenticity, the aims of the Fairlight CMI designers were based on the twin ideals of technological progress and the extension of creative freedom.[11] However, the designers were not able to control the design process and using digital sampling rather than synthesis to replicate the sounds of acoustic instruments was the result of failure rather than successful design.

In the marketing of the Fairlight CMI by its designers at Fairlight Instruments and its distributors like Syco Systems in the UK, there was a tension: between the original goal of using digital technology to imitate acoustic instruments and the presentation of a revolutionary new musical instrument, which enabled its users to produce sounds that had not yet been imagined. An advertisement in the magazine *Sound International* in September 1980 describes the Fairlight CMI as 'an entirely new concept in electronic musical instruments' (Fairlight 1980) with the ability to 'sample 'natural' sounds from,

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[11] As Théberge (1997) points out, these have been recurring themes in the marketing of musical instruments. From pianos in the nineteenth century to electric instruments in the twentieth, the emphasis has been on increased volume and having more control over a greater range of sounds.

say, a microphone, which can then be played on the keyboard and manipulated in various ways' (*ibid.*). When New England Digital launched the Synclavier II in the same year, it claimed superiority in the imitation of acoustic or 'real' instruments:

> Synclavier II is a revolutionary advancement in synthesizer technology. Its patented digital method transcends 'realism'. Many of its sounds *are real* [original emphasis], virtually undetectable from real instruments. The violins and cellos are so true, you can hear the rosin on their bowstrings (Synclavier 1980).

Jonathan Sterne writes how the idea that a reproduced sound can be faithful to an original sound has existed since the early days of sound reproduction. Advertisements that accompanied sound recording technologies such as the Victor record player in 1908 referred to the inability of listeners to tell the difference between the voices of opera singers and the mechanically reproduced voices of opera singers. The use of technologies to reproduce sound as a 'vanishing mediator' (2003, p. 283) is as relevant to the marketing of the Fairlight CMI over seventy years later; the same discourse of transparency and realism used to sell gramophones was part of the marketing of computer musical instruments and digital recording technologies designed to imitate 'real sounds' in unmediated ways. An advertisement for the Fairlight CMI in the February 1982 issue of *Keyboard* magazine asked the question 'Orchestra for sale?' (Figure 3) as if the fidelity of digitally sampled sounds was making orchestral musicians redundant. By 1983, Fairlight had launched the CMI Series IIx and were promoting how users could overcome the limitations of the imagination to produce sounds that had not yet been conceived rather than the realism and authenticity of the instrument's sounds:

Figure 3 'Orchestra for sale?' advertisement (*Keyboard*, February 1982)

> This is the story about a new concept in music production. It goes well beyond the ideas of musical instruments as we know them. It is a concept inspired by the wish to create literally ANY type of music, no matter how complex or difficult to express. To incorporate literally ANY type of sound – not only classical and modern instruments but sounds of the world (Fairlight 1983a).

The removal of claims about the realism of sounds may have been a result of the technology being used by *actual users* in ways that did not correlate with the projected uses imagined by the designers. Some users of the Fairlight CMI felt that the ability to sample the sounds of acoustic instruments was exaggerated. On the concept of sound fidelity that developed at the start of the twentieth century, Sterne writes: 'Sounds could neither hold faith nor be faithful – that task was left to listeners and performers' (p. 282). With the digital reproduction of sounds by computer musical instruments like the Fairlight CMI at the end of the twentieth century, the test of fidelity was left to the users.

Along with the use of marketing materials to sell the Fairlight CMI to individuals and groups of users, the role of connecting the worlds of design and manufacture to the worlds of users was assumed by individuals and companies in different territories. Peter Gabriel and his cousin Stephen Paine set up a company called Syco Systems and became the sole agents in the UK (Vogel 2011b).[12] In the US, the instrument was initially sold by a single individual: Bruce Jackson, an old friend of Ryrie and Vogel who was also obsessed by electronics and had lived next door to Ryrie's grandmother's house.[13]

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[12] According to an obituary of Paine (Wiffen 2015), the relationship began when he collected Peter Vogel and a Fairlight CMI at Heathrow Airport. Paine drove them to Ashcombe House near Bath where Peter Gabriel was recording his third album in the summer and autumn of 1979.

[13] In an interview with *Audio Technology* magazine, Jackson recalled: 'I was pretty young when I first started meddling with audio equipment. As a kid I just enjoyed electronics. I had a little lab under the house in Point Piper, which coincidentally, was right next door to where Kim Ryrie

Jackson worked as a sound engineer in the US and assisted with international distribution of the Fairlight CMI because Ryrie and Vogel did not have any business connections within the music industries or the ability to identify potential customers:

> I helped them by setting up distribution in the US, where I was friends with a whole bunch of musicians like Rick Wakeman and Tony Bonjovi (who built the Power Station in New York City). Tony was kind enough to let me set it up in an unfinished studio he had. I flew all over the US promoting Fairlight in my private plane for almost a year before anyone bought one. Remember, this was the first music sampler ever made, so it wasn't as if people were automatically into it – the concept was entirely foreign at this stage. I remember taking it into Power Station with Bruce Springsteen and he said: 'Ah yeah, BJ that's great, but what am I gonna do with it?' (quoted in Stewart 2005, pp. 67-8).

It may not be surprising that a rock star closely associated with the authenticity of his performances and the use of electric guitars was reluctant to incorporate computer-based instrumentation into his technological practices as a musician.[14] In the same way that David van Koevering travelled around the US in the early 1970s to develop a dealer network and a market for the Minimoog because synthesizers had never been sold by music instrument retailers, Jackson flew across the country at the end of the decade to demonstrate the Fairlight CMI at the homes of individuals like Herbie Hancock[15] and

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had a setup under his grandmother's house. Kim, in fact, named his company after the hydrofoil that went past us every day – The Fairlight. One day when Kim was searching for a company name, the Fairlight went by, and the rest is history' (quoted in Stewart 2005, p. 65).

[14] For more on Springsteen's guitar of choice, a 1950's Fender Esquire, as featured on the cover of *Born to Run*, see Hunter 2009. For a classic discussion of the tension between Springsteen's commercial success and his representation of authenticity, see Frith 1988.

[15] Jackson recalls: 'out of the blue I got this phone call from Herbie Hancock, who said he knew this guy in California who would buy two. Later that same day I got a call from Stevie Wonder saying he really wanted to check it out. So I put the sampler in the back of the plane and took off for California. I flew solo for 15 hours, (only stopping for fuel and a pee), landed in Los Angeles and took the Fairlight straight over to Herbie's house' (quoted in Stewart 2005, p. 68). Herbie Hancock used the Fairlight CMI on the hit single 'Rockit' and *Future Shock* (1983) and demonstrated it on the children's TV programme, *Sesame Street*. The 'guy in California' was George 'Geordie' Hormel, who owned a recording studio called The Village Recorder.

Stevie Wonder.[16] Where van Koevering was trying to persuade amateur and semi-professional rock musicians to buy a smaller, portable, keyboard version of Moog's modular synthesizers for approximately $1,500 (Pinch 2003), Jackson was trying to sell an expensive digital synthesizer and computer musical instrument to an elite group of musicians and recording studio owners. He was also dealing directly with the end users.

The Users

One of the earliest advertising slogans that accompanied the Fairlight CMI in the 1980s was 'Tomorrow's Music Today' and the full-page advert in the September 1980 issue of *Sound International* warned readers: 'Turn this page and the future of music is passed'. The opportunity to imagine what the future might sound like if programmed and played on a Fairlight CMI was restricted by its expense. Figures ranging from £12,000 to £27,500 for the Series I can be found in online music magazines and audio industry websites and these have become part of the mythology of the machine – the more accurate figure is £13,000 (Crombie 1979). The serious point is that it was affordable mainly to a small number of wealthy individuals like Stevie Wonder, Herbie Hancock, and Peter Gabriel, as well as university departments, professional recording studios, and institutions like the British Broadcasting Corporation (BBC). The price of the Fairlight

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[16] Jackson remembers: 'Stevie Wonder bought one on the spot and signed a personal check with his thumb print. He then talked me into taking it out on tour with him on his *Secret Life of Plants* tour' (quoted in Stewart 2005, p. 68). A purchase agreement between Fairlight Instruments and Stevie Wonder was signed on 20 November 1979. The cost of the Fairlight CMI was $25,220[US] plus $1700 for computer crating, airfreight, and customs charges. As well as its use for live performance, the first recording on which Stevie Wonder used the Fairlight CMI was 'Happy Birthday' from the album *Hotter Than July*, which was released in September 1980.

CMI may have limited the number of owners but their purchase by publicly funded institutions ensured the users were more diverse. The technology was not restricted to the world of music and began to be used in the contexts of education, health, public service broadcasting, and film. Simon Emmerson, who lectured in the Applied Arts Department of the City University, London, described how 'our postgraduate students use the hardware in ways no one else has before' (quoted in Dawson 1983, p. 335). Geoff Twigg, who taught composition at Goldsmith's College in London, used digital synthesizers like the Fairlight CMI and the Syntauri alphaSyntauri to help children with learning difficulties while employed by local education authorities.[17] As well as the use of the Fairlight CMI in the field of music therapy, the article in *New Scientist* documented its use for aiding computer literacies and demonstrates how the instrument was being explored in a variety of social contexts relating to the production of music.

I want to now present three short case studies that illustrate how the Fairlight CMI Series I and II was being used in the worlds of electronic and popular music in the late 1970s and early 1980s: firstly, I draw on primary sources including interview material to examine its use as part of the practices of progressive rock and pop musicians like Peter Gabriel (who was assisted by Peter Vogel) and Kate Bush (who was assisted by Richard Burgess and John Walters in EMI's Abbey Road Studios). I then use secondary sources

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[17] The alphaSyntauri (1980) was described as an 'affordable' digital synthesizer. Along with four- and five-octave keyboards, the complete alphaSyntauri Computer Music System consisted of two foot pedals and a set of Mountain Computer boards to be used with an Apple II computer and monitor. These were purchased separately from the keyboards, which cost under $1000 for the Plus 4 and $1795 for the alphaSyntauri 5 (Acerra 1983). For more, see Kellner, Lapham, & Spiegel 1980, Levine & Mauchly 1981, Moog 1981, Lehrman 1983, Greenwald & Burger 2000.

including histories of the BBC Radiophonic Workshop to examine its use by composers and employees like Peter Howell and Roger Limb. They welcomed the 'real sounds' that could be reproduced using the Fairlight CMI, explored the range of new sounds and new musical instruments that could be created, and mixed the sounds of acoustic instruments with other noises to create surreal sound effects for programmes. Lastly, I draw on secondary sources about the production of electro and hip-hop in a Manhattan recording studio called Intergalactic to investigate its use by Afrika Bambaataa, Arthur Baker, and John Robie in the making of 'Planet Rock'. In the initial stages of its adoption by professional musicians, artists such as Herbie Hancock and Stevie Wonder used the Fairlight CMI as part of live performances but I will mainly be examining its use in a series of recording studio contexts. The Fairlight CMI was adopted for use in a number of different ways. These can be roughly categorised under four headings: (i) the replication of 'real' or 'natural' sounds; (ii) the creation of 'new' sounds; (iii) sampling 'the sounds of everyday life'; and (iv) experimenting with sounds from the Fairlight CMI's sample library. I begin in the UK with a network of users including Richard Burgess, John Walters, Peter Gabriel, and Kate Bush, who were recording the 'sounds of everyday life' and using the Fairlight CMI to insert these sounds into new recordings.

(i) A Social Network: Richard Burgess, John Walters, Peter Gabriel, and Kate Bush
Outwith the context of large institutions like the BBC and university departments, it is the social networks of professional and freelance musicians that are vital in explaining who was using the Fairlight CMI in the early 1980s and where they were being sourced. One of the key users and intermediaries in this story is Richard Burgess who was a

'studio musician playing sessions' (Burgess 2011). Inspired by forecasts about the future in Christopher Evans' *The Mighty Micro* (1979), he developed an interest in using microprocessor-based technologies.[18] These included the Roland MC8 MicroComposer (1977), a digital sequencer used by Burgess to programme individual parts on the Landscape album *From the Tea-rooms of Mars ....* (1981) and the single, 'Einstein A Go-Go'.[19] Disproving fears that digital synthesizers would make session musicians redundant, Burgess became involved in digital sampling and drum synthesis design.[20] His work on the development of the Simmons SDS5 electronic drum kit showed him the limitations of using analogue synthesis to re-create the sounds of acoustic drums:

> You realise that no matter how many oscillators you have and how many times you can add on a harmonic somehow you never quite get to the complexity of a natural sound. So when you see the possibility of starting with a natural sound that's very attractive. You start with complexity rather than starting with simplicity and trying to build complexity (Burgess 2011).

Digitally sampling the sounds of acoustic instruments with the Fairlight CMI offered the kind of realism that was the initial aim of Ryrie and Vogel: 'with sampling you could sample a timpani and it really was a timpani. It really sounded like a timpani' (*ibid*.). Burgess is a little unclear about exactly how or where he first became aware of the Fairlight CMI. It may have been a demonstration at Morgan Studios in Willesden Green,

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[18] Writing about 'the Computer Revolution', Evans predicted: 'we will move out of the era of industrialization which began in the early part of the nineteenth century, and into a radically different world' (1979, p. 73).

[19] Burgess writes: 'We could cut, paste, and copy, we programmed parts that were impossible to play, and changing keys, tempi, sounds, notes, or timings, after having recorded all the parts into the MC-8, was no problem' (2014, p. 138). Yellow Magic Orchestra used the MC8 during the recording of their debut album in 1978 and on live tours. See Dayal 2006 for an interview with Ryuichi Sakamoto. For histories of the Roland Corporation, see Kakehashi 2002, Reid 2004a, 2004b, 2005a, 2005b. For more on the MC8, see Hammond 1983, Vail 1990, Carter 1997.

[20] See Burgess 1979 for an overview of drum synthesis/rhythm synthesizers such as The Moog Drum, the Impakt Percussion synthesizer, Syndrums, the Simmons SDS3, and Synare range.

a visit to the Fairlight offices in Sydney, or a trip to the village of Box in Wiltshire: 'I think I heard about it first then went out to Peter Gabriel's place out in Box. This was before he had Real World Studios and he was recording the third solo album. I remember going out there and I think that was the first time I ever saw one' (*ibid*.).

One of the first commercially available recordings to feature the sampled sounds of the Fairlight CMI was Peter Gabriel's *Melt* album, released in May 1980. The recording sessions took place the previous year and Peter Vogel is credited on the sleeve notes with duties relating to Computer Musical Instrument. When asked about his role on the album, Vogel told me: 'I was staying with Peter Gabriel while he was recording *Melt* and gave him some tuition on use of the CMI (which he had bought). We recorded some tracks that ended up on that album' (Vogel 2011b). Gabriel began to use it by experimenting with the sounds of smashing milk bottles and bricks banging together and his biographer Spencer Bright (2000) suggests that these sampled sounds can be heard as the track 'I Don't Remember' fades out. Franco Fabbri speculates that the Fairlight CMI may have been used for string sounds on 'Start' or the bagpipes in 'Biko' but concludes: 'all of these (except perhaps for the bagpipes) could also be generated at that time by analogue polyphonic synths' (2010, p. 179). According to the sleeve notes, the bagpipes are synthesized and the results of Gabriel's experiments in *musique concrète* with a Fairlight CMI are not audible. In this case, the Fairlight CMI was used as a digital synthesizer for the purpose of imitating instruments and is an example of the technology being used in accordance with the original design objectives of Fairlight Instruments.

This is not surprising as Peter Vogel of Fairlight was the one programming the CMI: the user of the musical instrument was also its designer.

The results of using the Fairlight CMI to digitally sample the sounds of everyday life are more obvious on Kate Bush's album, *Never for Ever*. Released in September 1980, she was assisted by Richard Burgess who had spent time learning to programme the technology and demonstrate it to prospective users. He explained how his relationship with Syco Systems led to him using the Fairlight CMI on sessions with Kate Bush:

> What I did was strike a deal with them [Syco Systems] and I demonstrated it to a lot of people. That's how the Kate Bush sessions came about because Kate was friends with Peter [Gabriel]. My understanding is she called Peter to see if Peter could do the session and I guess he couldn't so they called me and [asked if] I [could] do the session with them. So John Walters and myself threw the Fairlight into the back of my BMW and drove it up to Abbey Road Studios where we did the sessions (Burgess 2011).

The sound of breaking glass that Gabriel had been playing with punctuates the first song 'Babooshka'. Burgess explains the process of recording and playing back the sounds:

> We took glasses, I guess, from the kitchen. I don't know where they came from but we had, I seem to remember, a concrete block or something in the studio and we just threw them down on the concrete block and recorded it. We had several samples and we stacked them up and then just found a combination of keys that made the best sound. The pitch changing is all from the keyboard on the Fairlight and mostly they were clusters, semi-tone clusters on the keyboard (*ibid*.).

The collaborative use of the Fairlight CMI by Richard Burgess and Kate Bush on the *Never for Ever* sessions continued a tradition of introducing everyday sounds into popular music to emphasise or illustrate a particular lyrical theme and the use of unusual

or unexpected sounds to create an experience of incongruous juxtaposition.[21] Echoing the founders of *musique concrète*, Kate Bush stated: 'What really gets me about the Fairlight is that any sound becomes music. You can actually control any sound that you want by sampling it and then playing it. Obviously, it doesn't always sound great, but the amount of potential exploration that you have there with sounds is never-ending' (quoted in Diliberto 1985, p. 60). Referring to technical limitations and fidelity issues, Kate Bush celebrated the limitless possibilities of the instrument as described in Fairlight's advertisements and the blurring of boundaries relating to music and noise rather than the ability of the Fairlight CMI to imitate the sounds of acoustic instruments.

In an approach that would have pleased representatives of the Musicians' Union, Kate Bush did not want to use the Fairlight CMI to replace the role of performer and was keen to ensure that performing musicians remained an integral part of the production process:

> I don't feel that I want to create the world's greatest cellist on the Fairlight. I'd rather get a really good cello player in and record him with a good engineer and then use the Fairlight to do something that complemented that. The most exciting thing for me is the combination of real and natural sounds and extremely electronic synthesized ones (quoted in Diliberto, p. 72).

Acoustic instruments were sampled so that sounds could be played on the piano keyboards of the Fairlight CMI and musicians used to working in more traditional ways

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[21] For more on the relationship between *musique concrète* and rock and pop, see Pouncey 2002. He refers to the 'sampling' of traffic noises on 'Summer in the City' by The Lovin Spoonful, jet engines on 'The Letter' by The Box Tops, barking dogs on 'Caroline, No' by The Beach Boys, and bomb blasts on Love's 'Seven and Seven Is'. On Frank Zappa and *musique concrète*, see Gardner 2013. On George Martin's tape editing and looping experiments for The Beatles, see Martin 1979. He explains how effects for comedy records were created in the early 1960s: 'in those days we didn't have the sound effect tapes you can buy today. The BBC had a certain amount in their library, but we couldn't get at it. So we had to invent our own effects' (p. 88).

were puzzled by forms of technological experimentation that seemed illogical: 'She [Kate Bush] had recorded this penny whistle which Paddy could play and then played it on the keyboard, and I thought it was a bit of a strange circle. 'Why not just play the penny whistle?!'' (quoted in Thomson 2010, p. 166). The answer to keyboardist Max Middleton's question is that the sampling of these instruments enabled a layering of sounds and Burgess recalls that the digital sampling of acoustic instruments added additional textures to songs. Kate Bush's brother Paddy provided the raw materials:

> He plays a lot of instruments and he had all these traditional Irish instruments or maybe it was a mandolin and violin and things like that. I can't exactly remember but we sampled a bunch of those and some of those sounds are on 'Babooshka' and 'Army Dreamers' as well. They sound almost Mellotron-ish. The Fairlight [CMI Series I] was 8-bit so it wasn't really high quality sound so it had a Mellotron-ish quality if you were doing strings (Burgess 2011).

Early users of the Fairlight CMI refer to a lack of realism relating to the replication of sounds and acoustic instruments that was claimed in advertisements. In this case, digitally sampled acoustic instruments sound as if they have been produced by an older tape-based instrument: the Mellotron. With the development of audio software packages offering bit rates of 24 or 48 bits and sample rates of 96 kHz or above, digital synthesizer/sampling technologies like the Fairlight CMI, once described as the sound of the future, now sound to Burgess like an analogue instrument from the 1960s and 70s.[22]

One of the differences between the use of magnetic tape and instruments like the Mellotron in the 1960s and 1970s and the sampling of the sounds of everyday life on the

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[22] Burgess's memories of using the Fairlight CMI in the 1980s are mediated by recent listening experiences: 'I heard a bit of 'Army Dreamers' the other day because it was on YouTube. There's a little flutish sound, somewhere between a flute and a string sound, kinda like the way Mellotrons are. You can't quite tell [but] I'm pretty sure that was the Fairlight' (Burgess 2011).

Fairlight CMI in the 1980s was that sounds were recorded and stored digitally. Users then organised these sounds melodically or rhythmically using the six-octave keyboards. The song 'Army Dreamers' from *Never for Ever* incorporates the sounds of cocking rifles to emphasise the anti-military theme of wasted lives and lost opportunities. Burgess explains where the guns came from and expands on the capacity of the Fairlight CMI to organise and perform these sounds using a piano keyboard device in ways that were not possible using the older technologies of magnetic tape, sellotape, and scissors:

> I think the older brother had an arsenal of guns. He brought in a bunch of guns and we tried them all, cocking them and recording them and the rhythm. If I remember rightly 'Army Dreamers' is in 3/4. I haven't heard it in years but my recollection is that the rhythm was and 1 so click click. To do that, to cock and uncock a rifle in that time, would be impossible. I went to a quasi-military school and we had shooting ranges and we learned to assemble and disassemble rifles in the dark so I know quite a lot about guns. It's not that easy to do it in [real] time but to sample it and put it on the keyboard and then play it in time was really no problem. So we sampled, I don't remember how many guns but quite a lot and then again I stacked them up and I found that sweet spot, some sort of cluster where you could do that click click and it worked really really well. It was amazing and actually it wound up, if I recall, being multiple weapons on top of each other so it gave it a much more substantial sound because, as you probably know from recording, the real thing often doesn't sound like the real thing. That happens a lot in movies. If you want running water it doesn't necessarily sound like running water if you just record a stream. Sometimes you have to fake it up in order for it to sound correct (Burgess 2011).

The layering of sounds and the tricks of record production were employed so that the sounds sampled by the Fairlight CMI sounded 'real' and realistic: authentic sounds could only be achieved using processes that might be described as 'fake' or 'artificial'. As Kate Bush assumed more control of the production process on this album and its follow-up *The Dreaming* (1982), the perception of her as a pioneering user of the Fairlight CMI allowed her to move away from the stereotype of the teenage pop prodigy that accompanied the reception of her first two albums to being hailed in one music

technology magazine as 'a vital and innovative composer, singer, keyboardist, and producer who has shaped a uniquely personal and organic sound' (Diliberto 1985, p. 57). The irony is that the 'organic' sound and sounds in Kate Bush's music were the result of using a highly sophisticated computer musical instrument like the Fairlight CMI with its 8-bit microprocessors, digital synthesis, and digital sampling technologies.

Sounds that signal the intrusion of the non-human world are to be found on other songs from *Never For Ever*: buzzing insects can be heard on 'Delius (Song of Summer)' and on 'All We Ever Look For' there is a short interlude towards the end of the song that contains the sounds of footsteps on stairs before the opening of doors that expose Hare Krishna chants, bird sounds, and the muted clapping of an audience in a performance space. As with Peter Gabriel's recordings, it is difficult to be certain if these sounds are the result of using digital sampling technologies. Problems operating the Fairlight CMI were experienced during the sessions and tape-based techniques such as 'flying in' were used to insert some sounds into recordings.[23] Biographer Graeme Thomson states:

> Because of the technical limitations of this new machine, several of the sounds that might at first appear to be samples – Hare Krishna chants, countryside noises, random spoken voices – were actually flown in by [Jon] Kelly using a tape recorder, which at the time gave a much better sound quality (2010, p. 165).

As analogue recording technologies continued to be used alongside new digital sampling technologies, the important thing for Kate Bush about the Fairlight CMI was that it enabled the reproduction of 'real sounds': 'What attracts me to the Fairlight is its ability

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[23] The process of 'flying in' was a common way of overdubbing sounds onto multi-track recordings prior to the introduction of Digital Audio Workstations (DAWs). Burgess explains how: 'it might entail bouncing a segment such as, say, chorus background vocals or handclaps onto a second tape machine and then back onto the master in the desired location' (2014, p. 138).

to create very human, animal, emotional sounds that don't actually sound like a machine' (quoted in Anon 1982, p. 46). We return to Sterne's idea of the 'vanishing mediator': the Fairlight was a machine that could be used in ways that did not sound like a 'machine'. For this user, and at this time, the Fairlight CMI could digitally reproduce the sounds of humans and other animals without reproducing the sounds of its own digital production.

(ii) An Institution: The BBC Radiophonic Workshop

From 1958 to 1998, the BBC Radiophonic Workshop operated as a tape-based and electronic music studio to provide sound effects and soundtracks for television and radio programmes produced by the British Broadcasting Corporation (BBC).[24] Most famous for the signature theme to *Doctor Who* (1963) and the work of female composers like Daphne Oram and Delia Derbyshire, there was in the 1960s what Louis Niebur calls, 'a gradual shift away from exclusively tape-manipulated techniques towards the use of sounds produced electronically, first by simple oscillators and then, at the end of the decade, by voltage-controlled synthesizers' (2010, p. 121). In the 1970s, the BBC purchased analogue synthesizers including two EMS VCS3s, a Synthi 100 (referred to as Delaware), and an ARP Odyssey, which were welcomed as timesaving technologies in the making of sound effects.[25] A Fairlight CMI was purchased in 1981 and praised two

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[24] In May 2012, the BBC Radiophonic Workshop was re-established as The New Radiophonic Workshop (NRW) by the BBC in partnership with The Arts Council of England.

[25] An internal BBC memo stated: 'One music cue for Dr. Who would have taken at least a day to realize by conventional methods [magnetic tape]. With a mini synthesizer the fastest time was 1 hr. 15 mins. With the Delaware, after only a few weeks, realizations, more ambitious than ever before were being completed in 34 minutes' (quoted in Niebur 2010, p. 137).

years later in a book that gives insight into the musical practices of its composers:

> Behind many of the doors, late in the evening, the sounds still continue. Some of them being made, perhaps, on a machine called the Fairlight Computer Musical Instrument, one of the Workshop's most powerful allies to date. Long past are the 'Glowpot Days' of do-it-yourself equipment. Synthesizers are standard aids and have done away with much of the drudgery of realisation. The Fairlight offers an almost alchemical combination of concrete music and electronic music (Briscoe & Curtis-Bramwell 1983, p. 56)

The Fairlight CMI enabled its users at the BBC to be less reliant on the mixing desk referred to as the 'Glowpot Desk' and avoided the practical difficulties of cutting and splicing tape to create sound effects. These included some of the stranger sounds of everyday life that are difficult to imagine such as germs eating plaque on teeth. One of the Workshop's composers Roger Limb explained how it was constructed:

> I scrunched an apple and put it on tape, then fed it into the Fairlight and started playing it on the keyboard. It worked very well as an effect. There was a sound there that *could* [original emphasis] be arranged in a musical fashion (p. 59).

Instead of using the Fairlight CMI to record and sample the sound of eating an apple, the older technology of tape was still being used. Unlike magnetic tape, though, these sounds could now be played melodically over the octaves of the keyboard. Rather than the sounds of acoustic instruments Peter Vogel and Kim Ryrie had in mind when designing the instrument, these were the types of sounds generated by users of the Fairlight CMI – 'ANY type of sound' – as envisioned in the brochure for the Series IIx.

As well as being employed to assist with the imagination and realisation of unusual sounds, the Fairlight CMI was used in the BBC Radiophonic Workshop to create new instruments and textures by mixing the sounds of acoustic instruments with other noises. Composer Peter Howell is described as having built

a battery of composite sounds, and named them according to their components. Clarjang is made from a clarinet sound combined with a metallic jangle. Pluckvox combines the plucking of a mandolin note with the second half, his own voice (pp. 98-99).

Howell praises the Fairlight CMI as another step in the onward march and advance of technological progress; in a statement that could have been lifted from the manufacturer's literature, he describes its creative possibilities as endless: 'With just the Fairlight there are apparently no limits. The road goes on for ever [*sic*]' (p. 99). However, the purchase and adoption of the Fairlight CMI was not the next stage in a linear path for the Radiophonic Workshop and its musical practices. The use of digital sampling technologies to record, store, and playback 'real sounds' was welcomed for providing a solution to problems that had been experienced through the introduction of analogue synthesizer technologies. Desmond Briscoe stated:

> In the past, electronic sound has tended to be dehumanized, and boring, because it was created from very basic waveforms. Natural sounds have much more information in them. They are warmer and more interesting than synthesized sounds; using the Fairlight's ability to provide the composer with a means of *playing* [original emphasis] real sounds is a return to the early days without all the disadvantages of tape manipulation (p. 57).

Rather than a revolutionary instrument that could be used to create the sounds of the future, the Fairlight CMI was being used by the BBC Radiophonic Workshop to recover the texture of sounds that had been lost as a result of technological changes in the past.

(iii) A Recording: 'Planet Rock' and the Story of ORCH2 (also known as ORCH5)

'Planet Rock' (1982) by Afrika Bambaataa & the Soul Sonic Force is a recording based on the appropriation of sounds from other recordings: 'Trans-Europe Express' and 'Numbers' by Kraftwerk are its basic building blocks. The Fairlight CMI offered the

possibility of sampling sounds from pre-existing recordings, albeit of only one second, but this musical and technological practice had not yet been established and on 'Planet Rock' the elements of the Kraftwerk recordings were reproduced using other instruments. The melody from 'Trans-Europe Express' was copied using Robie's keyboards - a Micromoog and Prophet 5 - and the rhythmic pattern of 'Numbers' was reconstructed using a Roland TR-808 drum machine.[26] While composers in the BBC Radiophonic Workshop used the Fairlight CMI to create new sounds from unusual juxtapositions and appreciated a return to 'real sounds' after the experience of using analogue synthesizers and Richard Burgess, John Walters, and Kate Bush used the Fairlight CMI to incorporate found sounds and 'real sounds' into recordings, the use of the Fairlight CMI on 'Planet Rock' was different. Despite not having access to an instruction manual or technical support, its producers used the technology in a way more closely aligned with the design objectives of Vogel and Ryrie: they used the sounds of orchestral instruments contained in the pre-recorded sample library. However, the digitally sampled sounds were not used to imitate the sounds of acoustic instruments. At least one listener heard the samples as the sounds of both electric and acoustic instruments: the sounds of a DJ scratching on turntables *and* the sounds of orchestras.

Users of synthesizer technologies have faced challenges trying to operate the instruments. Users of Moog synthesizers did not always have access to instruction

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[26] The Roland TR-808 was sourced through an advertisement in the *Village Voice* and its owner paid $20 (Brewster & Broughton 1999), $25 (Barr 1998), or $30 (Buskin 2008) for its use on the session. For more on the Roland TR-808, see Vail 1994, Mansfield 2013. For more about the development of drum machines and their use of microprocessors, see Hammond 1983.

manuals;[27] users of Roland TB-303 Bass Line synthesizers could not penetrate what has been called the 'cryptic programming language' (Hsieh 2003) in its manual.[28] Users who attempted to read the Fairlight CMI manual had problems deciphering the information it contained. It had not been translated into clear instructions and even technologically literate users like Richard Burgess experienced difficulties interpreting them. The relationship Burgess had developed with the designers and distributors of the Fairlight CMI meant he was able to make a telephone call to Fairlight Instruments in Australia after encountering basic operational problems such as turning the instrument on:

> So we got the thing and I got it in the studio and had set it up with pride of place and it said initiate Fairlight. We were like okay initiate Fairlight. So we were trying to figure out how to initiate it and it's a command driven device. There's no windows, there's no nothing. You just get a C prompt and you have to know the command or you're not going to get anything out of it at all. So we hacked away at this thing for 10 hours trying to figure out what initiate the Fairlight means. I looked at my watch and I realised that they would be in the office in Sydney so I put in a call to Sydney. I think I spoke to Peter and I said 'Peter, What does initiate the device mean?' He said, 'that just means turn it on' [Laughs] (Burgess 2011).

Burgess remembers experimenting with the Fairlight CMI first, then using the manual:

> It wasn't difficult to decipher. It was just a learning curve. The thing about the Roland MC8 MicroComposer was that every decision had to be yours. It didn't come pre-loaded with anything or doing anything at all. You had to make all the decisions. The Fairlight was a little bit different to that in the sense that you could put in the floppy disk and pull up the sounds that they'd already sampled in Australia. I suppose we did that first. They had a dog barking and a few different things. And then you could mess with their loops and stuff so you could see how they did it. I'm very much turn it on mess around with it, see how much you can

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[27] George Harrison described his initial problems navigating the Moog: 'It was enormous, with hundreds of jackplugs and two keyboards. But it was one thing having one, and another trying to make it work. There wasn't an instruction manual, and even if there had been it would probably have been a couple of thousand pages long. I don't even think Mr Moog knew how to get music out of it; it was more of a technical thing' (quoted in Taylor 2000, p. 71).
[28] Prior (2007) writes that the manual for the Roland TB-303 was ninety-pages long and many users quickly disposed of the instruments because they were unable to follow its instructions.

figure out without reading the manual and then go to the manual when you get stuck kind of thing (*ibid.*).

Without the luxury of a manual, Robert Fink writes that: ''Planet Rock' was pure serendipity. Bambaataa and Baker had no idea how to use the machine, no one to show them, nor any time to learn' (2005, p. 344). They did not know that external sounds could be sampled using the Fairlight CMI and instead sought out sounds from the library of pre-recorded samples. Continuing the theme of contingency, Baker describes how:

> There were a lot of happy accidents when we were making these kinds of records. Like the orchestra hit. We were going through the sounds on the Fairlight, which, although it was worth over a hundred thousand dollars back then [*sic*], probably only had what a thousand-dollar computer can do these days. You couldn't sample on the Fairlight, it was all pre-sampled sounds, so we used an explosion, the handclaps and the orchestra (quoted in Buskin 2008, p. 82).

It *was* possible to sample any sound on the Fairlight CMI Series I and II but only for one second. Without the availability of advice from the designers of the instrument in Australia or those with close connections to the designers and distributors who had taken the time to learn how to use it, no one knew how to use it to sample external sounds. The sounds of the Fairlight CMI on 'Planet Rock' *were* samples from a pre-existing recording: a recording that had been sampled by the designers at Fairlight Instruments.

In 'The story of ORCH5, or, the classical ghost in the hip-hop machine', Robert Fink traces the orchestra hit that Baker describes to a recording of *The Firebird* ballet by Igor Stravinsky. The orchestral sample was digitised by a computer programmer/musician and added to the sample library on the floppy diskettes of the Fairlight CMI Series I and II. The ORCH5, though, is actually the ORCH2. Information that is part of the Fairlight CMI mobile application (or app) for iPhone and iPad, developed by Peter Vogel

Instruments and released in March 2011, aimed to correct a misconception:

> Quite possibly the most ubiquitous and instantly familiar Fairlight sample was the ORCH2 orchestra stab that appeared on more piece of music than one would care to remember. From this moment on, no self respecting [*sic*] synth or sampler would be without an orchestra stab patch that was some variation of the ORCH2 sample. This is often misidentified as ORCH5 (Fairlight 2011b).

One of the reasons for the popularity of the ORCH2/ORCH5 sound in hip-hop was that the sound resembled the emerging practice of scratching with turntable styluses by DJs like Grand Wizzard Theodore and Grandmaster Flash.[29] David Toop describes how: 'the resulting noise, a tearing jolt of electricity, rocketed hip-hop into a new dimension. The effect combined the qualities of a Grandmaster Flash scratch, amplified to monstrous bandwidth, with the science-fiction suggestion of ten orchestras, all playing a single chord in perfect synchronization' (2000, p. 99). Rather than ORCH2/ORCH5 sounding like acoustic instruments, listeners like Toop heard the sample as a more powerful digital version of sounds that were part of the existing aesthetic and practices of hip-hop.

The ORCH2/ORCH5 sound also became commonplace in the production of pop music in the early 1980s and was used by Art of Noise and Kate Bush. In an interview with Kate Bush in *Keyboard* magazine she commented on the use and overuse of a specific sample in the Fairlight CMI sample library: 'Some of the presets that they supply are actually quite good. But there's one favourite that everyone is using, called 'Orch. 5' or something. Every time anyone who has a Fairlight hears it they go, 'Oh no! Not again!'' (quoted in Diliberto 1985, p. 64). On an online forum for Fairlight CMI users, Peter

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[29] For more on the history of scratching and the role of the DJ in hip-hop, see Poschardt 1995, Brewster & Broughton 1999, Fricke & Ahearn 2002, Hansen 2002, Shapiro 2002, Katz 2004, Chang 2005, Katz 2006, Katz 2012, Smith 2013, Hansen 2015, and the DVD *Scratch* (2001).

Vogel has explained the origins of a digital sound that quickly became a musical cliché:

> Here I am with the very record from which possibly the most famous orchestra stab of all time came off. It was sampled when I was demonstrating the CMI to English musician David Vorhaus at the Fairlight factory, 15 Boundary Street, Rushcutters Bay, around 1978. David wanted to try out the sampling and I grabbed a random record from a nearby box. The rest is history (Vogel 2011a).

The history of the Fairlight CMI is one of contingency. Vogel and Vorhaus did not choose the recording of *The Firebird* by Stravinsky because they wanted a particular orchestral sound. The sample library could easily have contained the sounds of another pre-existing recording. Arbitrary decisions made by the instrument's designers were followed by the accidental discoveries of users. The orchestral hit and keyboard stab that became known as the ORCH2, and mistakenly referred to as the ORCH5, might not have become an important part of musical history had Afrika Bambaataa, Arthur Baker, and John Robie not found it as they searched through the library of pre-sampled sounds.

Conclusion

The use of the Fairlight CMI Series I and II between 1979-1982 resulted in a number of trends and practices relating to the use of digital synthesizer/sampling instruments. Early users like Peter Gabriel and Eberhard Schroeder tried to emulate acoustic instruments in ways that had been important to the designers of the Fairlight CMI, although debate continued about the fidelity of the reproduced sounds. Found sounds were recorded, stored, and digitally reproduced using QWERTY and piano keyboard devices by Richard Burgess and Kate Bush in ways that were not possible with the cutting and splicing of magnetic tape; a discourse of authenticity about sampling 'real sounds' developed in a similar way to the ideology of transparency that was applied to earlier

technologies of sound reproduction. Employees of the BBC Radiophonic Workshop used the Fairlight CMI to create new juxtapositions of sounds using acoustic instruments like the clarinet and the mandolin and were pleased that the 'real sounds' produced by digital sampling technology were 'warmer' than those produced by analogue synthesizers. As digital sampling instruments became both more powerful and cheaper in the mid-1980s, the sample time available to users increased and the fascination with emulating the sounds of existing instruments decreased. The next chapter looks at the ways the Fairlight CMI Series II, IIx, and III were used along with other new digital technologies to create loops on the recordings of a well-known pop producer (Trevor Horn) and the world music collages of a music industry Svengali (Malcolm McLaren). By focusing on the musical practices of a keyboard technician who became one of the programmers and users closely associated with the Fairlight CMI (JJ Jeczalik), the chapter also examines the use of digital sampling instruments to carry out what the Art of Noise described as a raid on the recorded sounds of the twentieth century.

2. Page R and the Art of the Loop: The Fairlight CMI Series II, IIx, and III

Introduction

As the sample time on the Fairlight CMI Series I and II was limited to one second, users

employed it for inserting short sounds into recordings in real time. This began to change

with the release of the Fairlight CMI Series IIx in 1983 and the Series III in 1986. The

IIx was an 8-bit device with one second of sample time and a sample rate of 30.2kHz

(Wielk 2016).[1] The Series III was a 16-bit device with sampling rates of 44kHz and

50kHz (or 100kHz in mono) with up to two minutes of sample time at 50kHz (Fairlight

1986). Both contained a built-in sequencer called Page R (or Real Time Composer),

which enabled users to build rhythmic patterns of sampled sounds. JJ Jeczalik and other

members of Trevor Horn's production team started to use the Fairlight CMI with other

digital technologies to add sampled loops to recordings by Malcolm McLaren and The

Art of Noise in ways that mirrored the hip-hop aesthetic of isolating and repeating rare

breakbeats using analogue technologies such as turntables and magnetic tape. Using

archival research and material from an interview with Jeczalik, this chapter traces the

use of the Fairlight CMI Series II, IIx, and III in the years between 1983 and 1988. I

focus primarily on three things: (i) its use to construct collage-like recordings, which

were inspired by the cut and scratch turntable techniques of hip-hop DJs; (ii) the use of

Page R and other sequencing technologies to create musical performances that were

strictly in time; and (iii) its use to digitally sample pre-existing sound recordings and

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[1] Peter Wielk was Studio Manager and Product Specialist at Fairlight Instruments in the 1980s.
He runs a company called Horizontal Productions, which restores and sells old Fairlight CMIs.

manipulate them in new ways. In this chapter of the thesis I explore these uses of digital sampling/sequencing technologies and trace the history of Fairlight Instruments until the company closed in 1988. With a focus on both users and non-users, the chapter continues the history of the Fairlight CMI by following an instrument that moved from being a computer-based digital synthesizer designed to emulate the sounds of acoustic instruments towards its redefinition as a digital sampling instrument, which helped to re-shape the sounds and practices of a loop-based aesthetic in pop/ular music in the 1980s.

Following the Users and Non-Users: Trevor Horn and the art of delegation

The focus on users in Science and Technology Studies (STS) over the last decade developed as a counterbalance to the privileging of actors like scientists, designers, and engineers in the shaping of new technologies. Users, though, are not a homogenous group. Sally Wyatt draws attention to different categories of users - former users as well as current users. We might also extend this to first-time users versus experienced users. There are non-users who 'resist' or 'reject' a technology for reasons that do not fit the traditional narrative of access being restricted due to socio-economic reasons. Wyatt asks: 'What exactly does it mean to be user? How is it defined? Is it possible to distinguish between non-users and non-owners?' (2003, p. 76). The first chapter focused on a range of users: the designers of the Fairlight CMI (Peter Vogel) who demonstrated it to first-time users, users who quickly became owners of a Fairlight CMI (Richard Burgess, Peter Gabriel, Stevie Wonder, and Herbie Hancock), and users who were non-owners (Kate Bush). While remaining focused on the instruments (Series II, IIx and III),

this chapter begins by following a well-known music producer who owned a Fairlight CMI but never learned to become a user, for reasons relating to time rather than money.

As processes relating to digital synthesis and the digital sampling of sounds began to play an important role in the technological practices of musicians who had purchased a Fairlight CMI, some users who had not bought one decided to become owners. In an interview in 1982, Kate Bush explained how she had hired a Fairlight CMI during the sessions for her album, *The Dreaming* (1982), but eventually decided to buy one:

> Initially I thought a lot about buying one because it was so much money. When I started this album I did try hiring one in but it was costing me so much and I knew that to do everything I wanted I'd need it more or less all the time. So I decided to buy it and I haven't regretted it once (Anon 1982, p. 47).

The producer Trevor Horn also decided to buy a Fairlight CMI when the one he had access to suddenly became unavailable because its owner left to join another band:

> Geoffrey [Downes, Horn's partner in the Buggles] had a Fairlight but he'd gone off to form Asia. So when he went I bought a Fairlight. That, actually, I must admit, freaked my wife out because it was £18,000 and that was a fortune back then! There was [*sic*] only four of them in the country and I had one of them. But what was even more important was I knew what it was capable of, because I understood what it did. Most other people didn't understand at the time — sampling was like a mystical world (quoted in Peel 2005, p. 52).

Horn became associated with the Fairlight CMI while producing commercially successful recordings in the 1980s by acts like ABC, Malcolm McLaren, Yes, and Frankie Goes to Hollywood. Yet he admitted to possessing very little technical expertise in the recording studio: 'You ask anyone I work with, I never touch anything. I've got no idea how to work a Fairlight' (quoted in Hoskyns 1984, p. 26). Horn would also be dismissive about the lasting impact of the Fairlight CMI and other new technologies:

'All the equipment, the Fairlights and so on, are just another passing fad. I'm beginning to hate all of that stuff…' (*ibid*.). Rather than confusing the owner with the user, close attention to the collective processes of music making leads to another social actor credited with programming the Fairlight CMI on recordings produced by Trevor Horn.

The difficulties involved in decoding the instruction manual for the Fairlight CMI and programming basic functions, outlined in the previous chapter by Richard Burgess, resulted in it being used on hit singles by ABC, Malcolm McLaren, Yes, Frankie Goes to Hollywood, and Art of Noise by an individual other than the owner. Horn tells how he

> realised almost straight away that it [the Fairlight] was a full-time occupation for somebody, but luckily there was a guy called JJ Jeczalik who worked with Geoff Downes. He was bored and looking for work, so I did a deal with him and I gave him the Fairlight and he worked on it night and day (quoted in Peel 2005, p. 52).

A geography graduate from Durham University with little formal musical training, Jeczalik taught himself how to use the Fairlight CMI. His musical career began when he was employed as a roadie for the band Landscape. Their drummer Richard Burgess advised Jeczalik to 'get into computers [and] learn how to type' (Jeczalik 2011) rather than learn how to play drums.[2] As a session musician, Burgess also played drums on recordings by The Buggles, a duo consisting of Geoffrey Downes and Trevor Horn who had a number one hit in 1979 with 'Video Killed the Radio Star'. Working as a roadie and being part of a network of musicians led to an offer of employment by Downes and

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[2] This was the vision of a future based around the computer as outlined by Christopher Evans in *The Mighty Micro*. Jeczalik said: 'I read a book, which again was Richard's suggestion, called *The Mighty Micro* by somebody Smith [*sic*] and he, in this book, gave his view of how the world would go electronically and he was wildly out. Not in terms of what he predicted but in terms of the timescale. It all happened in about five years and he said it would take 10-15 years' (2011).

Horn: Jeczalik became their keyboard technician.[3] This role included using the Fairlight CMI, which had left Jeczalik overwhelmed when it was first demonstrated to him:

> That was with Trevor and with Geoff. I think we went to the store that was selling them and they explained what it could do. I was just completely blown away. I mean I didn't sleep for about a week because I just thought it was incredible. It was just an amazing thing. They give a quick demo. Plug this in, do that, turn that, hit that, do this and I can play back my voice. I could suddenly see it all. In this blinding flash, I thought 'blimey, this is incredible' (*ibid.*).

Rather than using the Fairlight CMI to replicate the sounds of acoustic instruments, Downes planned to use the instrument as a single replacement for the large number of keyboards that he used during live performances. Jeczalik began by asking himself:

> 'Why don't I start off by sampling all his keyboards?' but it became very apparent that the quality wasn't good enough. Because of the polyphony issues - it was only 8-note polyphony in those days - we could never get enough sounds on it from a live context to have one keyboard. I think we both envisaged that we could use the one Fairlight keyboard to do everything but it rapidly became clear that that wasn't going to be the case. It was too slow. There wasn't enough polyphony and it wasn't designed for that sort of work but we used to do a lot of sampling in the studio. Just editing sounds, trimming them, cutting them (*ibid.*).

The initial excitement about using the Fairlight CMI to sample external sounds such as the voice was tempered by the technological limitations and fidelity issues that affected users and were outlined in the first chapter. The issue here was not so much the low sample rate that made it difficult to replicate the sounds of acoustic instruments with a degree of fidelity appropriate to the users but the lack of memory needed to store sounds from analogue synthesizers and electronic keyboards. Language associated with

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[3] When I asked Jeczalik about how the relationship with Downes and Horn developed, he explained: 'I was working for Richard and Richard was drumming on sessions for The Buggles when they were recording an album. This was after 'Video Killed the Radio Star' but sometimes he would go to *Top of the Pops* and I would go and set up there and I'd met them, talked to them, and they just offered me a job' (2011).

analogue technology - the splicing of magnetic tape - is employed by Jeczalik to explain

how the Fairlight CMI was used instead for digitally editing the sounds of recordings.[4]

Jeczalik describes his initial attempts to use the Fairlight CMI as being as much about

learning to use a computer as it was learning to use a musical instrument. Unlike the

approach of a user such as Burgess who had professional experience of playing acoustic

instruments and using analogue synthesizers, he chose to ignore the instruction manual:

> In the very early days when I was working with Geoff Downes on his Fairlight I
> didn't really understand the process. I had a general understanding of what was
> going on. You put it [a sound] into the computer, some interesting stuff
> happened, then you saw some lines on the screen and you pressed a key and it
> came back. And so in that respect I suppose when I first started we were just
> playing with it right from the get go and didn't approach it from a technical point
> of view. We just sort of plugged it all in and played with it because the initial
> manual that came with the Fairlight was about twenty pages long (*ibid.*).

Jeczalik did not approach the Fairlight CMI with the embodied knowledge of a pianist or

keyboard player and a lack of musical training or technical experience may have been an

advantage as he experimented with it.[5] For him, the appeal of the technology was that

musical training did not seem a pre-requisite for using it in creative ways. There was

also an opportunity for Jeczalik to position himself in the field as a user with expertise:

> I think the potential was that you could do pretty much anything you want[ed]
> and it was very early in the game. I could see that I could build a niche for

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[4] A more successful example of using digital synthesizers to reduce the number of keyboards for live performance was given by Steve Leonard, keyboard player in Los Angeles band, Cretones: 'I used to play with many more instruments, but I've replaced my B-3, Clavinet, Wurlitzer piano, and combo organ with a single Alpha Syntauri. If I were playing a Rhodes piano or a string machine, I would replace them with the Alpha, too' (quoted in Moog 1981, p. 77).
[5] Ignoring the instruction manual, Jeczalik chose 'learning by doing' (Arrow 1962) or 'learning by using' (Rosenberg 1982). Rosenberg writes: 'in an economy with complex new technologies, there are essential aspects of learning that are a function not of the experience involved in producing the product but of its *utilization* [original emphasis] by the final user' (p. 122).

myself in terms of doing something that was creative. I didn't play as such. I'm a one fingered keyboard player so it gave me the opportunity to think well actually one could really do some interesting stuff with this thing. I didn't know what specifically at the time (*ibid*.).

One of the recurring themes in the discourse about digital sampling has been that it offers everyone the opportunity to become a musician.[6] In an insightful critique of articles by rock journalists who celebrated sampling as a subversive practice relating to the pillage and plunder of music, Simon Reynolds and David Stubbs wrote that 'Sampling has been championed as a new punk – both a repossession of control from the industry, and a liberation from the inhibiting effects of notions of expertise' (Reynolds & Stubbs 1990, p. 168). In Jeczalik's case, he began with enthusiasm but little knowledge about how to the use the Fairlight CMI. As drum machines, digital synthesizer/sampling instruments, and computers were introduced into recording studios in the early 1980s the freelance role of some session musicians morphed into that of a session programmer; they developed new sets of skills and learned how to use new instruments.[7] Jeczalik quickly became recognised for his expertise in the field of digital sampling technologies as a Fairlight CMI programmer and was hired for his knowledge about operating a musical instrument that only a small number of people had access to.

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[6] For examples of this democratisation argument in music journalism, see Gray 1987: 'This new, usable technology will erode away the privileged position of the artist, of the musician, who, too often, is revered not for what he can do, but for what others can't' (p. 28).

[7] For more on the life of session musicians and session programmers, see Webley 1998a, 1998b: 'I first became an unofficial programmer in the early 1980s, when the first generation of LinnDrums hit town…It was a revolution, followed shortly by the arrival of the Fairlight, which needed a team of boffins just to switch it on and was better at drawing sine waves than it was at creating music. You also needed to be filthy stinking rich to own or hire one' (1998b, p. 28).

(i) JJ Jeczalik: Sessions, Recordings, and the Life of a Freelance Fairlight User

Before going on to look at how the Fairlight CMI Series II/IIx was used by JJ Jeczalik and other users after the introduction of the sequencing software, Page R, and how it was used when connected to music technologies like the Roland TR-808 and Linn drum machines, I want to briefly sketch out how it was used by Jeczalik on recording sessions in the years before 1983. Concerns expressed by trade unions about the impact of digital synthesizers/sampling instruments on the careers of performing musicians and fears about redundant orchestral musicians encouraged by the marketing campaigns of instrument manufacturers - Fairlight's 'Orchestra for Sale?' advertisement, for example - had the unintended consequence of increasing employment opportunities for Jeczalik:

> There was a lot of press at the time, which did me no harm in terms of getting work. People were going: 'it's the end of the orchestra. This is going to take over everything. Musicians are going to be redundant'. And a lot of people wanted to see what all the fuss was about. So I was going on sessions with this kit, sampling things and explaining that actually it had a very short sample time and to loop it you had to have all the tuning aspects and everything going for you otherwise it sounded pretty bad to be honest (Jeczalik 2011).

A user like Jeczalik decided the ability to imitate acoustic instruments with the Fairlight CMI was exaggerated. The producer and recording industry veteran, George Martin, was also unimpressed by the results of using digital sampling technologies to try and do so:

> One of the sessions I was working on was Paul McCartney and he'd had a trombonist in. This was with George Martin [who] said 'let's put the note in from the trombone and then we can have a horn section'. So sure enough I put it in [and] tried to loop it. It was really difficult to loop it to get any sustain and he pressed the call and he turned to me and he said 'that doesn't sound much like a horn section does it?' And I went 'No. Well, it's not. That's not what it is. It's a sample of trombone played with 4 notes'. And it became very apparent at that moment that it was pointless sampling other instruments (*ibid.*).

As well as the realisation that the Fairlight CMI could not be used to meet Ryrie and Vogel's original objective of digitally imitating acoustic instruments, one of the other consequences of this session was that it forced Jeczalik to make a decision about his patterns of temporary employment. It might have been interesting to speculate whether someone like George Martin, with experiences of cutting and splicing magnetic tape while working in the recording studio with The Beatles in the mid-to-late 1960s, recognised the creative possibilities of digital sampling instruments or their application as time and energy saving technologies, but Jeczalik was unable to discuss it with him:

> I didn't really talk to him about it actually. I had a bit of a bad session there. I had to rush back to the rehearsal studios because there was a leak. I had to leave the McCartney sessions and you don't do that. Someone else got the gig and I thought 'Right. I know what I need to do now. I need to do either work for Geoff or work on the Fairlight' so I decided to go on my own (*ibid.*).

As a freelance user and programmer of the Fairlight CMI, Jeczalik worked on a number of recording sessions including those for Kate Bush's *The Dreaming* before she became a Fairlight CMI owner *and* user. Like Burgess, Jeczalik has fond memories of working in the recording studio with Kate Bush and describes a session he was part of in 1981:

> The main thing we did with her was a thing called 'Sat in your Lap' and we went round sampling doors closing in Townhouse Studios for a day, which was quite a lot of fun actually because you started to hear how all the doors sounded. Obviously doors just close and you don't think about it but after a while we started going round thinking 'that's an interesting door' (*ibid.*).

When asked whether the track ended up on one of Kate Bush's albums, Jeczalik replied: 'You might find that appeared elsewhere but I'm not entirely sure that it did. In fact, it almost certainly didn't' (*ibid.*). A recording called 'Sat in your Lap' *did* appear on Kate Bush's album, *The Dreaming*. However, as with the Peter Gabriel recordings discussed

in the previous chapter, it is difficult to detect whether found sounds that had been digitally sampled like the opening, closing, and creaking of doors were included.

The first projects on which Trevor Horn and JJ Jeczalik collaborated were tracks released on Dollar's *The Dollar Album* (1982) and ABC's album, *The Lexicon of Love* (1982). On the latter, Horn was the producer and Jeczalik was credited with Fairlight programming, although the sounds of the CMI do not dominate the sound of the recordings. Jeczalik explained that 'the role for the Fairlight at that time was just popping in some interesting bits and pieces here and there' (*ibid.*). This can be heard on two examples of the 'New Pop' music ABC had begun to explore along with other post-punk groups like Scritti Politti.[8] At the beginning of 'Date Stamp', the breathy sound of a synthesizer is interrupted by the ringing sound of an old cash register being opened, which provides a suitable motif to accompany the song's lyrics about the supply and demands of love. Jeczalik told me: 'I can't remember where I got the cash till from but again [it's] a fantastic attack and sustained sound. [It's] very distinctive' (*ibid.*). The inclusion of a sound to signify consumption is similar to the way Pink Floyd used the sound of a cash register on 'Money' from *Dark Side of the Moon* almost a decade earlier. Before the Fairlight CMI could be connected to other musical technologies like the Linn Drum and before Page R was available, Jeczalik was inserting into recordings the same sounds of everyday life that had been reproduced in progressive rock using analogue technologies. The other example from *the Lexicon of Love* where the use of the

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[8] In the sleeve notes to *the Lexicon of Love*, Martin Fry wrote: 'A.B.C. were hell bent on making a record that would fuse two very different worlds. We loved Chic. We loved the Clash. We were through with matt and into gloss'. See Reynolds 2005 for more on post-punk and New Pop.

Fairlight CMI is audible is the track '4 Ever 2 Gether', which begins with the sinister

tone of a synthesized voice repeating the word 'evil'. Jeczalik explains:

> I recorded someone - it was Julian, one of the engineers, I think - saying 'speak no evil' and we played that into the track and actually that was the first time I had played on a record, playing that. I did that. It was my first overdub. It went 'speak no evil' and then I just de-tuned the 'evil evil evil' down into a really low menacing sound (*ibid.*).

The excitement Jeczalik felt when seeing a Fairlight CMI for the first time resulted in

him using it to sample his own voice and this was replicated in the recording studio. The

recording of the human voice was limited to one second of sound but is an early

example of the ways in which later digital sampling technologies like the E-mu

Emulator and digital delay technologies such as the AMS DMX 15-80 digital delay line

were used to create the effects of stuttering and other forms of vocal manipulation.[9]

(ii) 'Sampling' the Sounds of the World: Field Recordings, Copyright, Collages, Loops

The initial uses of the Fairlight CMI by Jeczalik on the recording projects led by Horn

were similar to examples of *musique concrète* in progressive rock and the art rock

experiments of Peter Gabriel and Kate Bush. Its use on Malcolm McLaren's album,

Duck Rock (1983), demonstrates how a wider set of musical practices associated with

digital sampling technologies were developing as users like JJ Jeczalik began

constructing collages and loops from studio recordings and, in this case, field recordings.

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[9] The DMX 15-80 Programmable Digital Delay Line/Harmoniser, DMX 15-80S Stereo Digital Delay Line/Harmoniser, and DMX 15-80SB Stereo Broadcast Delay Line were a series of microprocessor-controlled digital delay devices produced by Advanced Music Systems (AMS) in Worsthorne Village near Burnley. By 1981, these could be fitted with a Loop Editing System. An AMS catalogue claimed: 'L.E.S. is the friend of every engineer who has spent hours editing and splicing tapes to create vocal/backing/drum loops. With L.E.S. musical information can be captured in the system memory and non-destructively edited via the keypad' (AMS 1981).

After the implosion of the Sex Pistols, McLaren moved from managing bands to making records. He recruited Trevor Horn and Gary Langan as technical assistants on a trip around the world to record folk dances, although the only stop offs were in Soweto and New York. The inclusion of sounds from pre-existing recordings into new recordings pre-dates the arrival of digital sampling/synthesizer instruments like the Fairlight CMI but these digital sampling technologies were beginning to make it easier to incorporate pre-existing recordings from around the world into studio recordings.[10] Even though the Fairlight CMI was available to Trevor Horn and Malcolm McLaren while working on the project, however, the field recordings that provided basic materials for *Duck Rock* and resulted in controversies over the copyright ownership of traditional musics were recorded and stored using the analogue technologies of magnetic tape. As amateur anthropologists conducting field recordings, Horn stated that he, Langan, and McLaren

> had two options. Either we could take a Fairlight…copy the rhythms from all the different sources Malcolm had and then go out and make songs from that, or we could actually go out and get the sounds from the actual people, capture the real things on a Nagra [a two-track tape recorder] (quoted in Bromberg 1989, p. 260).

With one second of sample time available, it was only possible to record and playback very short musical performances or excerpts from sound recordings using the Fairlight CMI Series I and II/x so they had little choice but to opt for a more portable recording device. The recordings were made by employing musicians from a variety of continents who were living in the towns and cities of North America and the townships of South

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[10] Paul Théberge writes how: '[digital] sampling technology *enhances* [my emphasis] our ability to deploy an increasingly diverse range of 'other people's music' but does so in a manner that is at once fragmentary and exceedingly rich, consisting of individual sounds, timbres, and rhythmic and melodic loops organised and densely layered into a 'global mix'' (2003, p. 106).

Africa.[11] This led to a legal dispute over copyright that predated the controversy about the inclusion of performances by South African musicians on Paul Simon's *Graceland* (1986) (Meintjes 1990) and subsequent debates about the ethics of digitally sampling recordings featuring non-Western musicians (Feld 2000; Taylor 2003; Théberge 2003).[12]

Having collected the sounds of performances using magnetic tape, the Fairlight CMI was used on the sessions for *Duck Rock* to playback and insert a diverse range of sounds into recordings. These began to take the form of collages and loops as well as the addition of what users referred to as 'bits and bobs' or 'bits and pieces'. Anne Dudley, a classically trained musician who had provided string arrangements on the ABC album and who would later join Jeczalik, Horn, Langan, and Morley as part of Art of Noise, also missed out on the field trips to New York and Soweto: 'I wasn't involved in the process that they went through with *Duck Rock*, going around the world collecting various bits and bobs. I was only involved when they started putting them all together, trying to collate it into some sort of sense' (quoted in Buskin 1995, p. 108). Jeczalik described his part in the process of locating the recorded materials used on *Duck Rock*:

> Gary [Langan] and Trevor [Horn] went off to South Africa and came back with tapes and tapes of recordings out there. I used to go into the back room and pick out sounds that I thought sounded interesting. [I] put them into the Fairlight and then we just used to play around with them [to] see what would work. It was very, very experimental. We were just experimenting with bits and pieces that they'd picked up. Gary would put some tapes together, half-inch tapes of things

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[11] For discussions on issues relating to race, ethnicity, technology, and the appropriation of ethnic sounds as a form of exoticism, see Toop 1999, Born & Hesmondhalgh 2000, Taylor 2007.

[12] For more on the legal action over songs on *Duck Rock* that were credited to McLaren/Horn, see Robertson 1983 and Bromberg 1989. McLaren paid performers for session work but claimed to own the copyright and received royalties for songs he considered to be traditional and in the public domain. For a defence of McLaren against accusations of exploitation, see Rambali 1983.

that he thought were cool and interesting. I'd sit in the back room and bung them in the Fairlight for a couple of days and then we'd go into the studio (Jeczalik 2011).

As well as the Fairlight CMI, analogue technologies like turntables were also used to insert recorded sounds into songs like 'Buffalo Gals', which contained the cut and scratch techniques of hip-hop DJs. The sleeve notes to the single contained instructions that continued punk's DIY ethic of sharing knowledge and demystifying the production process but expensive digital synthesizer/sampling technologies were not included as one of the prerequisites.[13] However, the rhythm boxes used in the making of 'Buffalo Gals' were drum machines that contained digital samples. Trevor Horn explained how:

> By the time I did [the] McLaren [record] I'd bought an Oberheim sequencer and drum machine, a DMX and a DSX. I told the World's Famous Supreme Team to tell me their favourite drum beat. It took a couple of hours for them to actually communicate it to me, but once I'd got it, that was 'Buffalo Girls' [*sic*]: 'du du — cha — du du — cha'.' That was done on this DMX and DSX and they just scratched on top of that (quoted in Peel 2005, p. 53).

As it was not possible at this point to use the Fairlight CMI and digital sampling instruments to isolate and reproduce drum patterns from pre-existing sound recordings, rhythms were created using drum machines such as the Oberheim DMX (1981), which, like the Linn LM-1 Drum Computer, contained digital samples of 'real' drum sounds.[14]

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[13] The instructions outlined the process of how DJs and MCs used turntables and a microphone: 'Two manual decks and a rhythm box are all you need. Get a bunch of good rhythm records, choose your favourite parts and groove along with the rhythm machine. Use your hands, scratch the record by repeating the grooves you dig so much. Fade one record into another and keep that rhythm box going. Now start talking and singing over the record with the microphone. Now you're making your music out of other people's records' (quoted in Taylor 1988, p. 14).

[14] An advert for the Oberheim DSX Digital Polyphonic Sequencer and Oberheim DMX Programmable Digital Drum Machine in the November 1981 issue of *Keyboard* magazine listed a number of design features including 'real drum sounds stored in digital memory' (Oberheim 1981). See Aikin 1983a for more on the Oberheim Synthesizer Performance System, 'an integrated music laboratory' (p. 72) consisting of an OB-8 synthesizer, a DSX, and a DMX. For

Before the introduction of Page R on the Series II, IIx and III, the Fairlight CMI was being used for recording and playing back what Jeczalik calls 'short punchy sounds' (Jeczalik 2011). Sounds from the sample library were also starting to be looped by users and this can be heard at the end of the track 'Punk it Up' on *Duck Rock* as it draws to a close.[15] When I played this back to Jeczalik over the telephone he recognised its source:

> That's obviously ORCH5 [*sic*] in there from the Fairlight, which was one of the library sounds. I think that was just a loop that I put together because I was goofing around at the time. Trevor said 'what have you got?' and I went 'I've got this' and we just sort of looped it. I don't really remember to be honest. [I'm] not being vague. There was a voice sample as well but quite short and obviously that was the Supreme Team doing the voice over. That was live. That was the sort of thing we were doing, coming to the end of a track, you need something in here, something different, and I just sort of spun out some sounds [to] see what stuck (*ibid.*).[16]

This is an early example of a digital sampling instrument like the Fairlight CMI being used as a looping device rather than as a way of inserting short sounds into recordings by playing them in real time. However, while the sample library of the Fairlight CMI was the source of the sounds – the ORCH2 rather than the ORCH5 sound – another digital device had to be employed to create the loop itself. Jeczalik explained:

> I think that that ended up in something like an AMS digital sampler. It was looped in that. That would be my guess. I don't remember whether we had the sequencer or not. I think the sequencer was around about then or just after but I have a suspicion that because Gary [Langan] and I used to work quite a lot together, he would use the AMS digital delay and sample a mono block into that and just repeat it. I suspect although I couldn't really be sure that's what happened there (*ibid.*).

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more on the history of Oberheim Electronics and its development of digital sequencers like the DS-2 and its range of analogue synthesizers like the OB-8, see Moog 2000 and Jenkins 2007.
[15] The Fairlight CMI Series I had a loop function. This was for repeating individual sounds by holding down a key on one of the piano keyboards rather than looping whole bars of music.
[16] Jeczalik's willingness to admit he cannot remember clearly what happened during a recording session that took place in the early 1980s is helpful to the researcher as is his reluctance to claim the ability to construct particular loops was the result of anything other than 'goofing around'.

Figure 4 AMS DMX 15-80s Digital Delay Line/Harmoniser

The AMS that Jeczalik refers to was not a digital sampler but an AMS DMX 15-80 digital delay line that could be used to trigger loops in a similar way to the contemporary use of digital delay pedals to sample and repeat parts of performances in real time.[17] The AMS was being used to create loops of sounds that had been programmed into the Fairlight CMI after being sampled from tape recordings of performances by musicians. As the Fairlight CMI did not contain enough sample time to digitally record and playback loops, they were constructed using analogue technologies like magnetic tape, digital delay devices such as the AMS DMX 15-80, *and* digital sampling technologies.

The inspiration for using the Fairlight CMI and other technologies to loop sounds in recordings came from a history of using tape loops in music and the emerging practices of hip-hop. It was also fuelled by an approach to creativity that ignored conventions or following instructions and included Malcolm McLaren's desire to do things differently:

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[17] The AMS Neve website claims adding 'loop triggering' to the DMX 15-80 series started the 'sampling revolution'. Like Jeczalik, legendary music producers and engineers have also described them as digital samplers. Discussing the stutter effect on Chaka Khan's 'I Feel For You', Arif Mardin states: 'In the old days there was a sampler called the AMS and my finger slipped on the key so it became [sings] 'Chaka-chaka-chaka-khan' so we said let's keep it. It was an accident (*laughs*)' (quoted in Burgess 2005, p. 282). See also Ken Scott's autobiography, *Abbey Road to Ziggy Stardust* (2012) in which he describes AMS as launching digital sampling.

It was inspired by all of those things. It was inspired by Malcolm who just used to say 'well, why not?' which was an interesting point of view because people will go 'you just don't do that' and he would go 'well, why not?' and you'd go 'okay let's do it' because he really was challenging the concepts of what a record was and I suppose the looping came out of all of that, of the guy scratching, the tape loops had been used before for many years. Then there was looping in the samplers but the Fairlight wasn't looping. Around that time I'm fairly confident we didn't use it as a sequencer because it didn't have a sequencer at the time but it would have contributed to something that would have ended up probably in a digital loop, in a delay or something (*ibid.*).

Anne Dudley also paid tribute to McLaren's preference for breaking rules ('he was outrageous – he showed us that anything is possible' (quoted in Husband 1985, p. 20)) and explained that the production work on *Duck Rock* was responsible for stimulating musical ideas that were developed further during work with the Art of Noise. The key difference is that with Page R, the Fairlight CMI could be used to both sample sounds and arrange them rhythmically using an in-built digital sequencer. Horn describes how:

It was an amazing time because it was all exploding. Just as the McLaren thing came to an end, Page R arrived on the Fairlight. And that was gobsmacking because that was the first time you heard those sort of sounds sequenced. And that's where the Art Of Noise came from (quoted in Peel 2005, p. 53).

Before going on to look at the approach to digital sampling by Jeczalik and the members of Art of Noise, including the way in which they recycled their own recordings and raided the pre-existing recordings of others, I want to examine how a digital synthesizer/sampling instrument like the Fairlight CMI Series II/x with a built-in sequencer (or a Fairlight CMI Series I connected to separate digital sequencing technologies) were used to create sound recordings that were in time and fully quantised.
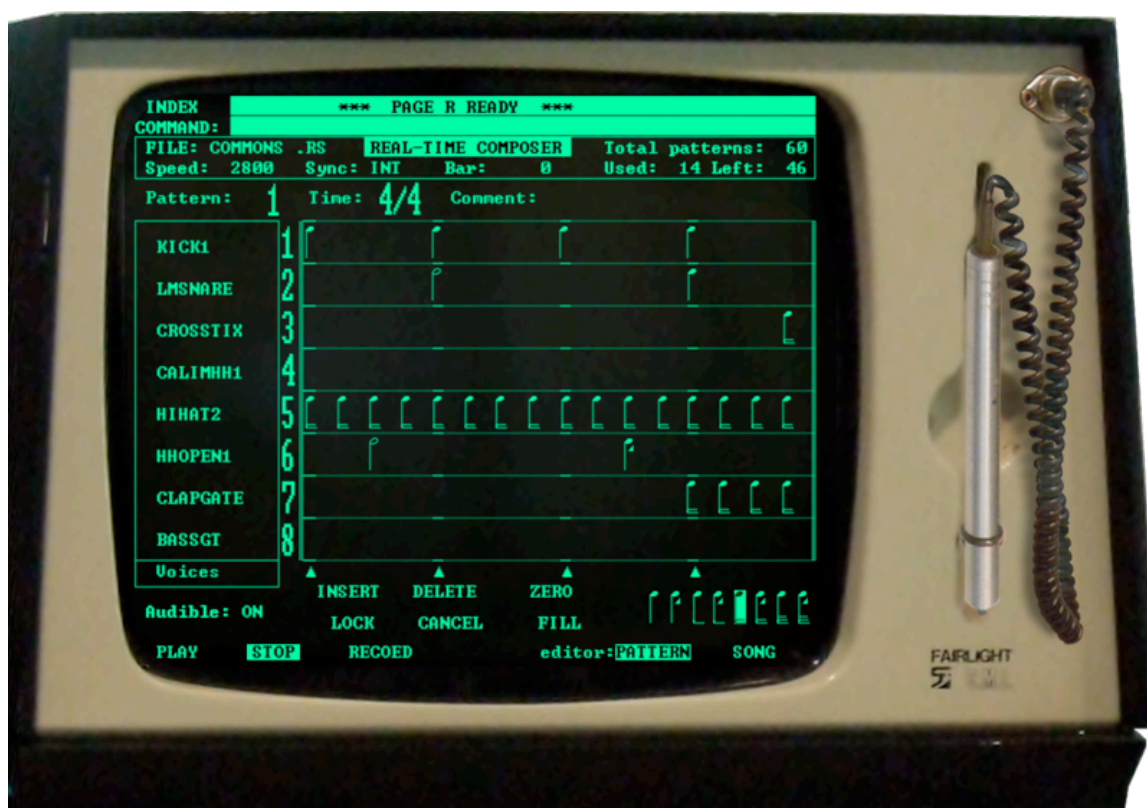
Figure 5 Page R on the Fairlight CMI Series II

Following the Fairlight CMI Series II and IIx: The Real-Time Composer (Page R)

The Fairlight CMI Series II and the Series IIx both contained three compositional programmes: a real-time multitrack sequencer (Page 9), a non-real time Music Composition Language (Page C), and a Real-Time Composer (Page R). An advertisement in the US for the CMI Series II described Page R as 'revolutionary':

> The Real-Time Composer is our most recent development, and continues to cause considerable excitement among CMI users. This high-speed function allows rapid development of complex phrases, making it particularly suitable for rhythmic compositions. All pitch, timing and dynamic information is recorded and displayed while an automatic quantizing facility corrects playing inaccuracies. Editing may be performed live or through the typewriter keyboard (Fairlight 1983c).

Enabling users of the Fairlight CMI to build rhythmic patterns using a number of different instruments, Page R has been described as 'the first ever graphical pattern-based sequencer' (Leete 1999, p. 255). Synthesizers with MIDI sequencing started to become available in 1983 after MIDI was agreed upon as a Universal Synthesizer Interface (USI) and it enabled instruments using digital technology to be connected together and connected to computers.[18] Machines were beginning to speak to each other digitally.[19] As well as being able to sequence sounds using Page R on the Fairlight CMI Series II and IIx, another significant development was the design of an interface board called a Conductor, which made it possible to connect the Fairlight CMI IIx with other technologies such as drum machines.[20] Trevor Horn explains that 'at that time there was a device called a Conductor which enabled you to synchronise a Linn drum machine with a Fairlight, and to us it was the most incredible thing ever' (quoted in Buskin 1994, p. 40). While users of the Fairlight CMI Series I like Richard Burgess and Kate Bush were restricted to recording and playing back short samples in real time using one of the two piano keyboards, it was possible using Page R on the Fairlight CMI for sounds to be digitally sampled and then sequenced. Using a device like the Conductor, digitally

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[18] Paul Théberge writes that MIDI is 'widely regarded as one of the most significant innovations in electronic instrument design since the invention of the synthesizer itself' (1997, p. 74).

[19] When asked how MIDI came about, Dave Smith, who was president of Sequential Circuits in the early 1980s, said: 'microprocessors were becoming standard in musical instruments. We figured out that it ought to be easy for them to talk to each other digitally. Everybody had their own digital interface, but none of them could communicate with each other' (quoted in Hamer 2005, p. 51). For more on the history and development of MIDI, see Moog 1983, Moog 1989.

[20] The Conductor was designed by a Fairlight CMI user in London called Steve Rance who went on to work for Fairlight Instruments in Sydney and is currently the President of Fairlight US. They were sold by Syco Systems and cost £800: 'I…used to hang around Syco Systems all the time. Having access to all of the 'other' equipment that at that time could not be synchronised easily, pushed me into designing something to make them all talk to each other' (Rance 2015).

sampled sounds could be sequenced with the digitally recorded sounds of 'real' drums as

programmed on a drum machine rather than using 'real' drummers playing in real time.

(i) Digital Sampling, Drum Machines/Computers, and Sounding like Machines

The use of Page R to connect sounds that had been digitally sampled with the Fairlight

CMI together with sounds from drum machines was integral to the sound of 'Relax' by

Frankie Goes to Hollywood (1984), a number one single in the UK produced by Trevor

Horn. The kick drum sound was created by combining a bass sound from the LinnDrum

and an E note from a bass guitar sampled into the Fairlight CMI.[21] Horn describes how:

> It was a combination of Page R and the Conductor and locking it to a Linn drum
> machine. So the basic track was eights [eighth notes] running in a Fairlight ('eh
> eh eh eh eh eh eh eh'), fours [quarter notes] on a bass ('ee ee ee ee') and a set of
> Linn drum machine patterns locked to Page R played on top of each other. It was
> an amazing feel (quoted in Peel 2005, p. 53).

Jeczalik's account of what was going on in the studio during the making of 'Relax'

explains why both sequencing and sampling were important to the rhythmic sound of the

recording. It is worth quoting in full as it demonstrates that the final version approved by

Horn was the result of neither accident nor design but the principle of 'goofing around':

> By then we'd got the sequencer on it, Page R, which was an eight track
> monophonic sequencer. You could put eight notes on at one time. That's all.
> What happened was we tried recording this track with a band and with Ian
> Dury's backing band and spent months on it. I was working with Andy Richards,
> keyboard player, Steve Lipson, who was engineering at the time, and Trevor
> [Horn] at Sarm Studios. Trevor went home and we were kind of getting nowhere

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[21] The LinnDrum (1982) was Linn's follow-up to the LM-1 Drum Computer and also contained
digital samples of acoustic drums. These were recorded with a higher sample rate of 35 kHz
rather than the 28 kHz of the LM-1. It was often referred to as the LM-2 or Linn 2 but Linn has
pointed out: 'There never was a product called the LM-2. It was called the LinnDrum. It's funny
– it says "LinnDrum" in huge letters on the front and "LM-2" appears nowhere on the product,
yet for some strange reason people like to call it the LM-2' (quoted in Coleman 2013a, p. 131).

really. It just didn't feel right. I remember saying and I think the others would probably agree to this: 'Let's just put an eight bar loop together'. I had a piano sample and put that in doing eighth notes 'dum dum dum dum dum dum dum' so that was that. Someone programmed up the drum box just to do 'boom tack boom tack boom tack' type thing and then Steve Lipson who'd been engineering got his guitar out and turned out to be a staggeringly good guitarist, which we didn't know about. Andy was playing keyboards and I had a whole load of samples from the band doing backing vocals and we just started goofing around, literally goofing around, and cranked the volume up. We were really enjoying ourselves and sort of started to realise that we actually had something. I was putting in piano eighths and some samples of the backing vocals that come with little fills here and there. The one that goes 'gow wah who' [imitates wah wah guitar sound] that's one of mine as well. So we just built this thing up and we had this hell of a racket going. Trevor came back and said 'what the bloody hell is this?' No, he didn't swear. He said 'what on earth's going on?' or something. We turned the volume down and I think it would be fair to say we all looked round a bit sheepish and thought we'd done something wrong. Well, I did. We went 'it's just a loop'. He said 'No. No. No. It's brilliant' [Laughs]. And he sat down and programmed the drum box. We had the whole track recorded within about two hours of him coming back because we had all the bits and he had the arrangement in his head. Then we got the guys in to do vocals and it was all done in about six hours having spent three months on it. We had all the bits and I had lots of samples, like jumping into a swimming pool at Manor Studios, backing vocals, the piano. Pianos became the bedrock of the whole thing so by that time the Fairlight was an integral part of the whole track because it was being used as a sequencer (Jeczalik 2011).

While Trevor Horn claimed to be a non-user of the Fairlight CMI and other studio technologies, he returned to programme the LinnDrum after being temporarily absent from the process of recording when a breakthrough had been made. The significance of using Page R to sequence sounds that had been sampled using the Fairlight CMI or using devices like the Conductor to connect the Fairlight CMI with drum machines produced by Linn was that Trevor Horn was able to create rhythms that were strictly in time.

The quantisation of sounds that was now possible with the programming and sequencing of the Fairlight CMI assisted with the objective of ensuring drum sounds remained in time, which was one of Horn's obsessions as a producer. Gary Langan describes him as:

> The first person I knew who had a great command of machines and he had this obsession about everything needing to be strictly in time. So he was hell bent on using all the new machinery that was coming out which enabled him to achieve that (quoted in Cunningham 1998, p. 272).

Before the availability of drum machines and sampling instruments and the ability to connect them together, Horn used a variety of methods in the recording studio to elicit performances from drummers that were as metronomic as possible. This led to exhaustion for session musicians taking part in these tests of endurance. Horn states:

> I do remember that by the time we'd finished playing 'Living In The Plastic Age' [by The Buggles] Richard Burgess was pale! He was so worn out because we insisted that it sound perfect and that he played it perfectly. And the funny thing is that when you listen to it, it sounds like a drum machine. Both tracks sound like drum machines because at the time we were so manic about them having that spot-on perfect techno feel, not some sort of bullshit Elton John groovy album feel (quoted in Peel 2005, p. 51).

On the first single from the same album, *The Age of Plastic* (1980), the drums were produced differently to achieve the same effect. During the production of 'Video Killed the Radio Star' (1979) individual drums sounds were recorded and constructed using the mixing desk to sound like a machine that would be used on later Horn recordings:

> I got Paul Robinson to play his kit one drum at a time – the snare, bass drum and the hi-hat – and I recorded them on separate tracks, then used the sounds like a drum machine, punching him in and out on the desk. Paul said, "That's [*sic*] sounds fucking awful, just like a machine." I said, "Great, that's exactly how I want it to sound" (quoted in Cunningham 1998, p. 271).

While representatives of organisations like the Musicians' Union were concerned that new musical technologies like digital synthesizer/sampling instruments and drum

machines would create fewer opportunities for performers because machines were replacing humans, the ability of humans to imitate machines that could be used to create metronomic rhythms was made easier. As digital synthesizer/sampling instruments were used with built-in sequencing technologies such as Page R alongside drum machines containing digital samples of 'real' drums, performances could be recorded that were strictly in time as users rejected the option of using the swing functions or programming drum patterns with the imperfect timings of human beings playing acoustic drum kits.[22]

(ii) The Art of the Loop and the Recycling of Recordings

The introduction of Page R on the Fairlight CMI and the sequencing of sampled sounds were cited by Trevor Horn as one of the reasons for the formation of Art of Noise. As well as being shaped by the collaborations on Malcolm McLaren's *Duck Rock*, the project was also influenced by contributions to progressive rock group Yes's album, *90125* (1983), which was produced by Horn. The approach to production included the programming of sounds from the Fairlight CMI by JJ Jeczalik on tracks like 'Owner of a Lonely Heart'. The use of digital samples on this recording was different to the sounds of everyday life or 'the natural world' that Yes and other progressive rock groups like Pink Floyd incorporated into their recordings using analogue technologies in the 1970s. On *90125*, the piano keyboards of the Fairlight CMI were used by Jeczalik to organise

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[22] Roger Linn had mixed feelings about the use of the LM-1 on Human League's hit single 'Don't You Want Me' (1981): 'It was very gratifying to hear it on the radio. However, I was displeased that they programmed a very rigid, robotic part, not using the product's programmable dynamics or swing. Those were features that I had worked very hard to create and which enabled the creation of drum parts with a natural, human feel' (quoted in Coleman 2013a, p. 130).

short samples into melodic patterns or to add rhythmic effects. Jeczalik was unable to remember whether the short sampled sounds used as brass stabs or drum fills on 'Owner of a Lonely Heart' were sequenced using Page R or played using the keyboard. He is also unclear about the origins of the brass stabs but confirmed that the Yes recording sessions were important for the role they played in the formation of Art of Noise:

> It was a defining moment really because the Art of Noise came out of that whole session, well, sessions, and it had been going on for about a year I think. I used to go in and out doing bits and pieces. Let me think. Well, I sampled some of the backing vocals and back then we had a sequencer I think. Oh no, they were played. I can't remember. There's some 'dums' in there that Chris Squire sings. I sampled Alan White's bass drum snare. I sampled some of him doing drum fills. In terms of 'Owner of a Lonely Heart' itself, Trevor put a cassette on and said 'I want to sample these drums', which I did. We kept listening and I said those sounds that came up, the kind of stabs that came along. I said they work really well because knowing by then what the Fairlight sounded like and what it would do to them I said 'I think those are really cool'. That's where I got those sounds from. I have no idea to this day what the origin of those kind of orchestral stabby big band stabs came from (Jeczalik 2011).

The sampling of drum fills by 'real' musicians playing acoustic drum kits formed the basis of looped drum patterns on recordings by Art of Noise. According to engineer Gary Langan, this was the unintended consequence of overwork and overtime in the recording studio during the recording sessions with Yes. He describes how:

> After about seven months of working virtually every day of every week at a variety of studios, I was beginning to see green men climbing the walls. We had been up at AIR in Oxford Circus to cut a track but it was scrapped. I kept the multitrack though because the drum sound on this track ['Leave it'] was just phenomenal. A month later, when the band had gone home one night, myself and JJ had the idea for putting the drums from this multitrack into the Fairlight as a complete sample. The idea wasn't to have separate samples of the bass drum, snare and hi-hat, like everyone was beginning to do with AMSs, but have it as a composite of the whole kit. So that's where the drum sound on 'Close (To The Edit)' came from. JJ and I effectively recorded the first Art of Noise single that night, although to us it was a demo. We just looped the drum sample and added a few other things on top (quoted in Cunningham 1998, pp. 309-10).

It is unclear how this was possible with only one second of sample time on the Fairlight

Series II or IIx but Jeczalik confirms Langan's version of events in the recording studio.

Rather than a light bulb moment, he also describes the drum loop on 'Close (To the Edit)

as the result of a mistake caused by a lack of concentration rather than skill or expertise:

> It evolved basically because we used a lot of the sounds from the Yes sessions, notably the drum sound, which became the bedrock of what The Art of Noise was all about. By then I'd been working on hundreds of sessions and had, I dunno, about a hundred discs of sounds. So one day we'd finished a session and Gary had an idea to stick around. We stayed and he got the drum sound from a Yes session. We put it in the Fairlight and basically off we went. It evolved again because basically it went in as a loop. What happened was I wasn't paying attention and I sampled it on the snare beat so rather than going sample 1-2-3-4 in the bar, I went sample 2-3-4. We used to call the sample tack boom boom because that was the sound it made. It was snare drum, bass drum, bass drum. Interestingly, when we started looping it, because it worked as a loop, it still made a bar of four or whatever. It had the most amazing feel because it was working across the bar line in the sequencer because the line in the sequencer was the 2 in the sample. So when the loop started happening it just had this incredible feel. It was complete luck or misjudgement on my part and so that became the backing track for 'Close to the Edit' I think (Jeczalik 2011).

At this point, Jeczalik and Langan were sampling (and recycling) sounds from

recordings they had been working on rather than sampling sounds from pre-existing

sound recordings. Armed with a theoretical scaffolding about raiding the sounds of the

twentieth century, Art of Noise began to sample sounds from pre-existing recordings as

well as more 'natural' sounds: the sounds of everyday life and its modes of transport.

As well as using the Fairlight CMI to construct loops from pre-existing studio

recordings, other digitally sampled sounds on 'Close to the Edit' included the sound of a

car starting at the beginning of the song, which was also used on Frankie Goes to

Hollywood's first album, *Welcome to the Pleasuredome*. Jeczalik is happy to admit this

was part of a process of recycling rather than trying to find new or original sounds:

> We were always recycling and chopping up. For example, [on] 'Paranoimia' by Art of Noise, we had some kids in from a local drama school and we had them say things like 'the Art of Noise are paranoid'. I took the sound 'paranoid' and then flipped the middle bit, got a section and reversed it and [it] came out as paranoimia. I created a word and that became Paranoimia. Para-, Para-, Para-, Paranoimia. That was where we were going in terms of recycling stuff. We'd chop a bit out, reverse it. You know, for example, the car starting. It's backwards and it's all over 'Ferry Over the Mersey' by Frankie Goes to Hollywood (*ibid.*).

Jeczalik's library of samples was a palette of sounds and distinctive samples appeared on

a number of tracks by Art of Noise. For example, the loop from 'Close to the Edit' was

chopped up and the individual sounds used in other recordings such as 'Beat Box'. This

recycling process created incongruity between the recorded sounds of acoustic

instruments and sounds that had been digitally reproduced using the Fairlight CMI:

> I then chopped that loop up into bass drum and snare and then we had some fills so we had the other tracks like 'Beat Box' where we programmed individual sounds - bass drum snare bass drum snare hi-hat. They would be going in individually and then using the sequencer rather than looping one sound, which was the tack-boom-boom as we used to call it. So it was all just serendipity really. Gary [Langan] understood very well how the Fairlight operated and what it was good at. He had an incredible way of making the drum sounds sound much huger than they actually were. When Anne came in and started putting keyboards on which were real, we often used real pianos and so on, the contrast and the sonic quality was just extraordinary because you had a very low bandwidth drum track thrashing away in the background and then these real sounds played over the top that had incredible high-definition. It created an incredible soundscape, which I didn't really appreciate at the time. I understand now what happened and why the keyboard sounded so good. It was because the Fairlight sounded so awful [Laughs] (*ibid.*).

For Kate Bush and members of the BBC's Radiophonic Workshop, the Fairlight CMI

was a way of reproducing 'real sounds'. For Jeczalik, there is a distinction between the

'real sounds' of acoustic instruments like the piano and the digitally sampled sounds that were reproduced by the Fairlight CMI, which had much lower levels of sound quality.[23]

While digital synthesizer/sampling technologies were designed and marketed to create the sounds of the future, they could be used to re-create the sounds of the past. One of the consequences of the fidelity levels on the Fairlight CMI Series II was that digital synthesis/sampling technologies could be used to create distorted sounds like the production of 1950s or 1960s rock 'n' roll. In an interview in 1993, Jeczalik mentioned:

> The interesting thing about the Fairlight Series I and II is that your samples come back radically different. They sound as if you've put them through a 100-watt Marshall amp. For me that adds an element of rock 'n' roll which I've always valued and exploited (quoted in Tingen 1993, p. 52).

The sound quality of the Series II was a problem for Jeczalik, though, and he describes buying a Fairlight CMI Series III because 'the quality [of the Series II] was doing my brain in' (Jeczalik 2011). However, the newer version did not become a replacement for the Series II and Jeczalik admitted to deliberately using a lower sample rate of 15 KHz instead of 44.1 KHz when programming the Series III to make it sound like the Series II. This was because of the 'grunginess it gives you' (quoted in Tingen 1993, p. 52) and to 'make things sound dirty and distorted, and rock 'n' roll' (quoted in Tingen 1996b, p.

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[23] Timothy Warner draws attention to the combination of high-definition sounds and the 'poor' quality of the sampled sounds in his analysis of Art of Noise recordings. He writes: 'Sounds produced by the Fairlight Series II are often described as 'grainy': a quality which at the time was regarded as a deficiency but which nevertheless has a particular charm and character...This is especially noticeable when these samples are mixed with sounds of a higher resolution and sound quality. The Art of Noise often contrast the grainy samples of the Fairlight Series II with bright, clear sounds produced by synthesizers' (2003, p. 98).

98). Jeczalik also appreciated the unpredictability of the Fairlight CMI compared to the

digital samplers that were introduced by companies like Akai in the mid-1980s:

> I bought an Akai sampler, which I'd never really got on with actually but they had more time on them. I always liked the sound of the Fairlight and for me that was part of what I did. It was part of turning up and plugging this thing in and sampling it. It was like a giant guitar effects. You'd put your thing in but you weren't really sure what would come out. When the Synclavier came out and the Fairlight Series IV [*sic*][24] by that time it didn't interest me because they sounded too good. There was no modification going on there and I always liked the slight mystery. You put something in and it would sound fantastic. You put something else that you thought was going to work really well and it didn't work at all. There was a bit of a dark art and mystery to it all whereas if you have a high quality sampler that just throws back what you've got then you have to start work on making it different (Jeczalik 2011).

Users of the Fairlight CMI did not necessarily want the same control over sounds its

designers aimed to provide: Jeczalik was keen to avoid both digital 'perfection' and

predictability. The designers of digital synthesizer/sampling technologies at Fairlight

Instruments and New England Digital continued to strive to improve the quality of the

sounds that could be digitally recorded and reproduced by their instruments. However, a

user like Jeczalik preferred older models of the Fairlight CMI to the newly released one

precisely because of the lower levels of sound fidelity and the timbres they produced.

(iii) Raiding the Twentieth Century: The Sounds of the Futurists and the Art of Noises

One of the theoretical ideas constructed for Art of Noise by journalist Paul Morley was

his concept of 'raiding the twentieth century' and this was shared by other members of

the group who wanted to create collages of high and low culture.[25] In an interview with

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[24] The Series III was the last Fairlight CMI designed and manufactured by Fairlight Instruments.
[25] The term 'raiding the twentieth century' was to be used by Art of Noise as the title of the album after *Who's Afraid of the Art of Noise?* (1984). However, the album never appeared and

No. 1 magazine in February 1985, Anne Dudley described how 'everything is available to us. We're influenced by anything. JJ has a passion for Mahler. I have a passion for Stravinsky and Holst. And Nat King Cole' (quoted in Husband 1985, p. 20). All the members of Art of Noise appeared to subscribe to the idea of raiding the twentieth century but tensions existed between these ideas relating to modernism (noise as music) and post-modernism (collapse of high and low) and the processes of music making:

> It always started with the sound. It always started with music and it would be safe to say that I didn't consider the futurist manifesto and all that side of it at all when creating the music, personally. I just wanted to create stuff that sounded good and exciting and interesting and challenging and taking the kind of Malcolm McLaren mould of going 'why not?' Some of the Art of Noise tracks there were 50 different elements in there. We were just getting stuff to sound interesting and exciting to us. My view was if you provoke a reaction then there will be an awful lot of people who will love it and it's got to be exciting. Although on the other hand, 'Moments in Love' we made that as boring as we could and then it became a de facto love song and it's still going in the charts in America thirty years later (Jeczalik 2011).

At more than ten minutes long, 'Moments in Love' may have been part of Morley's objective of 're-defining what a pop group is' (quoted in Martin 1984, p. 35) and what they were allowed to do within the confines of sales chart rules. Continuing the theme of recycling, it is also interesting for its use of sounds from a previous recording by Art of Noise called 'The Army Now'. One aim of Art of Noise, according to Jeczalik, was to 'juxtapose odd and wondrous things in different ways' (quoted in Mico 1985, p. 15) and this extended to the use of the Fairlight CMI to sample pre-existing sound recordings.

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the band split up somewhat acrimoniously with Dudley, Jeczalik, and Langan continuing as a trio after leaving Horn, Morley, and ZTT Records.

'The Army Now' from the 'Into Battle' EP (1983) contains elements that were used on 'Moments in Love' and 'Close to the Edit'. It lasts approximately two minutes and contains a sampled phrase of the three words in the title. The phrase is repeated, as are the individual words 'army' and 'now', which are manipulated in different ways using the Fairlight CMI. This is a sample of a pre-existing recording but Jeczalik was reticent in talking about or explaining its source due to the fear of legal action: 'To this day, I'm still nervous about all that. I'll probably die being nervous about it' (Jeczalik 2011). The sampling of pre-existing recordings did not become a major part of Art of Noise's aesthetic and the raid on the twentieth century was theoretical: based on the idea of theft rather than the actual plunder of sounds. Jeczalik explained that there were a number of reasons why any digital samples used from pre-existing recordings were unrecognisable:

> There are several issues here. One that the audio quality was so poor that unless it was laid bare and in the open a bit like the thing ['The Army Now'] you're talking about now. Funnily enough, 'now' is the thing I'm thinking of. For example, in 'Moments in Love' 'now now now' comes from 'The Army Now'. I chopped that out and that comes from a record allegedly (*ibid.*).

While this *is* identifiable from a pre-existing recording, there are other samples employed by Art of Noise that are unrecognisable. Unlike the use of digital sampling technologies to take extracts from pre-existing recordings as a form of re-contextualisation or appropriation where it is important to acknowledge the original recording, Art of Noise made it difficult to identify the source of their samples. This was done using different recording studio techniques, partly to disguise the sound from the pre-existing recording and presumably to avoid detection for the unauthorised copying of sound recordings. It was also to create more 'interesting' sounds in the recordings:

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It was very much there was no clearing of samples. It was so new and I was putting things backwards and sideways and putting them in reverse echo. Even now probably I could listen to some of that stuff and I couldn't tell you where it came from because we disguised it so well. Gary used to do weird and wonderful things to the sound that you couldn't tell [where it came from]. It wasn't necessarily to disguise it. It was just to make it interesting. It had to stand or fall on what it sounded like at that moment. Nothing else (*ibid.*).

A raid on the sound recordings of the twentieth century had been proposed and was underway. However, issues over the quality of sounds that could be reproduced using the Fairlight CMI Series II and IIx because of its low sampling rates, the maximum sample time of only one second, and the threat of legal action as a result of infringing copyright laws ensured it was restricted to small fragments of pre-existing recordings.

Figure 6 Peter Vogel (left) and Kim Ryrie with the Fairlight CMI Series III

The Fairlight CMI Series III and the Commercial Failure of Fairlight Instruments

With up to 14Mb of RAM (Random Access Memory), the Fairlight Series III was launched in 1986 and offered users over two minutes of sample time at 50 kHz (Fairlight 1986). The monitor that came with the Series I and II was replaced with a 12" Video Display Unit (VDU) and the software was moving closer to a WIMPS (Windows, Icons, Mouse, Pointers, Systems) interface. Instead of a light-pen, waveforms were edited with a graphics tablet and stylus that was attached to an alphanumeric keyboard. Now with one six-octave keyboard and one 8-inch floppy disc drive rather than two, the Series III used 16 bit digital-to-analogue converters and contained twelve microprocessors - two 68000 and ten 6809 processors – running Motorola's OS-9 operating system. The cost was £25,950 (Gilby 1987b).[26] A review in *Sound on Sound* described the Series III as 'a unique instrument that is sure to have a long-term place in the development of music technology' (Elen 1986, p. 55). However, by 1987 Stephen Paine of Syco Systems had stopped acting as the UK distributor of the Fairlight CMI due to slow sales and in the last few months of 1988 Fairlight Instruments went into receivership (Tingen 1996a). When the Fairlight CMI Series III was launched, Kim Ryrie had expected approximately half of its users to employ them for producing film soundtracks.[27] After the demise of Fairlight Instruments, a new company was started in April 1989 called Fairlight ESP

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[26] An article written in 1999 for *Sound on Sound* suggested the Series III cost £60,000 (Leete 1999). As an example of information circulating at the time, it may be one of the reasons for Arthur Baker's overstatement about the Fairlight CMI being a '$100,000 of useless space thing'.

[27] Ryrie stated: 'Until we looked at people using the Fairlight [CMI] in this application, I didn't realise just how little of the soundtrack is recorded during the original filming. All those footsteps, gun shots and screams are all synced to film afterwards. This obviously takes weeks on a long film. Here, Jan Hammer is showing how he can turn an episode of 'Miami Vice' around in *five days* [original emphasis]' (quoted in Gilby 1987a, p. 52).

(Electric Sound and Picture) and a decision made to abandon its emphasis on digital synthesizer/sampling instruments and move its focus to the post-production industry.[28]

The successful invention of electronic musical instruments is judged by the commercial availability of these music technologies and their subsequent adoption by musicians and users. The failure rate, though, is high. Paul Théberge speculates on the reasons for this:

> In some cases, the failure of these [electronic musical] instruments may have been due to a simple lack of business acumen on the part of their inventors. Inventors seldom possess the business skills required to manufacture and market a musical instrument successfully, even one superbly designed (1997, p. 41).

The designers of the Fairlight CMI, Peter Vogel and Kim Ryrie, admitted to possessing little in the way of business skills or understanding the music industry but were initially successful with connecting the worlds of design and use. They won an award for the Qasar Dual Processor Microcomputer System from the Industrial Design Council of Australia in 1980 and contracts to market the Fairlight CMI in territories such as Japan. In 1982, Fairlight Instruments signed an agreement with Matsushita Electric Industrial Company and the company was lauded for its success in launching and exporting its microprocessor technology around the world.[29] Kim Ryrie explained in May 1987 how in the earlier stages of the company: 'it was really just an ad hoc growth. Neither Peter

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[28] Its managing director, David Hannay, explained: 'there was little point in Fairlight carrying on in the sampling market. Fairlight's business is not to compete with the high volume, mass-produced consumer products, and it never has been. It's to be leading edge with the latest technology, improve processing speed, and provide a high level of sophistication for the professional user' (quoted in Tingen 1996a, p. 53).

[29] Matsushita manufactured products under the brand names of Technics, Panasonic, JVC, and Victor and became the Panasonic Corporation in 2008. The deal between Fairlight Instruments and Matsushita was reported in *Electronics Australia* magazine with the headline 'Australian synthesizer cracks the world market' (Williams, N. 1982).

nor myself had business management experience and so we were basically just running the company on whatever finances we could find, and when we sold an instrument the profits were ploughed right back into the company to help develop the next step' (quoted in Gilby 1987a, p. 52). Part of the problem experienced by Fairlight Instruments related not to the manufacturing and marketing of the Fairlight CMI but the distribution of the instrument and the difficulties of selling to users in a geographically vast country like the USA.

After Bruce Jackson's initial attempts to demonstrate the Fairlight CMI to potential users and owners by flying prototypes of the instrument around the US, branches of Fairlight Instruments were set up in Los Angeles, New York, and Nashville but Vogel described this as 'a financial disaster' (Vogel 2011b). Ryrie explained how:

> Our biggest market was Europe – specifically the UK and Germany. Japan was next. We had a lot of trouble in the US. In fact, the US has always been Fairlight's biggest trouble, which led largely to the downfall of the original company at the end of '88. Our US subsidiary had lost almost $2 million in the previous two years, and the main company wasn't able to cover that during that post-crash period. We had three offices in the US, and the overheads there were extremely high. We've always found the US a very expensive place to sell into and support, because it's so physically large. It's very expensive to get out to all the population centres compared to, say, Europe (quoted in Vail 2000c, p. 219).

Vogel drew attention to the company's lack of funding and explained that: 'we were reliant on sales to pay the wages and it was a horrendously expensive business. It was costing us something like $20,000 in components in each unit, so our market was rich pop stars. Our sales were good up to the last minute, but we just couldn't finance the expansion and the R&D' (quoted in Hamer 2005, p. 50). Despite their wealth, the decision to focus on selling expensive music technologies to a small number of rich pop

and rock stars proved to be a problem for Fairlight Instruments and other companies like New England Digital (NED). Vogel told me he would have liked to have developed a less expensive product aimed at a larger market of users but 'lacked the capital and market penetration of our competitors' (Vogel 2011b). The designers of digital synthesizer/sampling instruments like New England Digital and Fairlight Instruments were impacted by the cheaper availability of new digital synthesizers, digital sampling keyboards, and rack-based digital samplers developed by US companies like E-mu and Ensoniq as well as Japanese companies like Akai, Casio, Korg, Roland and Yamaha.[30]

Figure 7 Akai S612 MIDI Digital Sampler

As the price and size of microprocessors fell, more compact, cheaper digital sampling instruments were designed in the early 1980s. The first dedicated sampling keyboard, E-mu's Emulator was launched in February 1981 at a cost of $9,995 [US] and this was reduced to $7,995 in 1982. Mark Vail described it as 'the first affordable sampler' (Vail 2000d, p. 220) but its relative expense was highlighted when Ensoniq introduced the

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[30] For more on the development of Japanese synthesizers and keyboard instruments and the increase in sales and exports of synthesizers to the US in the early 1980s, see Doerschuk 1985.

Mirage sampling keyboard in December 1984 for $1695 [US].[31] Launched in 1985 at a cost of £948 in the UK, Akai's Midi Digital Sampler S612 (Figure 7) has been described as 'the sampler that pioneered the low-cost market' (Gilby 1987b, p. 57).[32] In 1986, Casio launched the SK range of sampling keyboards with the SK-1, an 8-bit device that is reputed to be the first digital sampler to sell more than one million devices across the world (Gilby 1987b). This figure contrasts with the small numbers of instruments being sold by Fairlight Instruments and New England Digital. In 1987, Casio launched the FZ-1, a 16-bit sampling keyboard costing £1899 with a sample time of 29.1 seconds at 18kHz or 14.5 seconds at 36kHz, which could be expanded with additional RAM memory. The extended sample time led to one reviewer declaring: 'you could practically use the FZ-1 as a digital recorder for jingles, let alone as a sampler' (Jenkins 1987, p. 65). As cheaper digital sampling instruments became available, more expensive 16-bit machines like the Fairlight CMI Series III and the Synclavier had technical advantages over many of the newer cheaper sampling devices that were either 8-bit or 12-bit. However, the higher quality instruments were now judged too expensive compared to low-cost devices offering users similar amounts of sample time and sound quality levels.

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[31] Bruce Crockett, Albert Charpentier, and Bob Yannes founded Ensoniq in 1982. Crockett had been Vice President of Systems Manufacturing at Commodore International Ltd. Charpentier and Yannes had been part of the design team for the Commodore 64 home computer. They used their knowledge of VLSI (Very Large Scale Integration) technology to design the Q-chip, which enabled Ensoniq to produce a much less expensive digital sampling keyboard. For more on the history of the company, see Anderton 1988b, McBride 1988, Poe 1988, Théberge 1997.
[32] An S612 cost £749 plus £199 for an Akai Sampler Disk Drive MD280 to store samples (Gilby 1985). It was a 12-bit device offering 1 second of sample time at 32 kHz or 8 seconds at 4 kHz.

With the arrival of 16-bit digital samplers like the Fairlight CMI Series III and the Casio FZ-1, the perception increased that 8-bit digital samplers like the Fairlight CMI Series I and II were unable to reproduce sounds with satisfactory levels of realism. Yet like JJ Jeczalik, the lo-fi aspect of the technology was part of its appeal for users such as Richard Burgess. He explained: 'the limitations of machines are a positive factor by the way. I used to feel that about the Fairlight a lot. I used to think that the grungy, crunchy nature of the Fairlight was actually a cool factor. Even at the time I thought that' (Burgess 2011). There is a desire among some users of digital synthesizers for a return to the limitations of analogue technologies. Pinch and Trocco write: 'For some people, the digital sound is too perfect, too clean, too cold – they long instead for the imperfections of the warm, fuzzy, dirty analogue sound' (2002, p. 319). Nick Prior points out that:

> Like rock, electronic music has its own ideology of authenticity. This is, at first sight, less the romantic purity of unfettered human creativity and more an electronic hierarchy reconceptualised around given binaries - material over non-material, warmth over coldness, analogue imperfection over digital perfection (2007).

Despite claims about the fidelity of its digitally sampled sounds, the Fairlight CMI provided its users with forms of *digital imperfection* and there is now nostalgia for the technological limitations of early digital synthesizer/sampling instruments. When the Fairlight CMI-30A (Figure 8) was released in 2011 to celebrate the thirtieth anniversary of the Series I, the promotional literature described it as: 'a unique instrument, combining the latest technology with the look and feel of the original Fairlight CMI. It achieves the classic Fairlight sound that defined the music of the eighties' (Fairlight 2011a). Unlike the digitally modelled PC version that is available, this version promises

Figure 8 Fairlight CMI-30A 30th Anniversary Edition: The Legend Returns

to bring 'a little eighties magic to the cold, hard digital world of 2011' (*ibid.*). As Peter Vogel Instruments sell Fairlight CMI apps for mobile phones and tablet devices, those who can afford a Fairlight CMI-30A may prefer the old digital 'warmth' of 1980s hardware to the software samplers used for digital sampling in the twenty-first century.

Conclusion

The focus in this chapter on the relationship between the owner and non-user of the Fairlight CMI Series II, IIx, and III (Trevor Horn) and the user who became a recognised expert in the field of digital sampling technologies (JJ Jeczalik) highlights the 'interpretative flexibility' of the Fairlight CMI. It continued its move away from being a musical instrument designed to emulate the sounds of acoustic instruments to one that was used for a number of different purposes in recording studios, including the sequencing and looping of sounds recorded using magnetic tape. After early users of the Series I like Peter Gabriel, Kate Bush, and Richard Burgess experimented with the sampling of external or 'natural' sounds, the launch of the Fairlight CMI IIx was accompanied with promises about the way it could be used to sample 'the sounds of the world' and 'any sound you can imagine' (Fairlight 1983b). With the introduction of Page R on the Series II and IIx, users and non-users like Jeczalik and Horn sequenced a range of sampled sounds and combined these with rhythms from drum machines containing digital samples. While the designers at Fairlight Instruments had sampled sounds from pre-existing recordings to include in the sample library of instrumental sounds, they did not foresee that the sampling technology on the Fairlight CMI would be used to sample pre-existing recordings or that copyright infringement would become a

legal issue around the use of sampling instruments.[33] The re-use and appropriation of compositions and recordings by hip-hop producers led to lawsuits and court cases in the 1980s and was the result of using analogue technologies, electric instruments, *and* digital sampling technologies. One of the companies who designed these digital sampling technologies was E-mu Systems, who began developing synthesizers in the 1970s before abruptly changing the focus of their instrument design in the early 1980s.

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[33] Vogel told me: 'We didn't think about copyright at all. The vast majority of the library was stuff we sampled ourselves, we did a lot of hiring of session musicians. Some of it was contributed by users…I think it's a long way short of the sort of sampling that artists do these days, where they take whole phrases. The technology of the day was so limited we were hard pushed to sample more than one note anyway!' (Vogel 2011b).

3. Technologies of Hip-Hop: The E-mu Emulator, SP-12, and SP-1200

Introduction

The designers of the Emulator never set out to manufacture a digital sampling instrument. Dave Rossum and Scott Wedge set up E-mu Systems in the 1970s to develop analogue synthesizers.[1] Faced with financial problems at the beginning of the 1980s, they decided to develop a new instrument using the digital sampling technology that was of secondary importance to the designers of the Fairlight CMI. Users of the Emulator were encouraged by E-mu's advertisements to make music by sampling the sounds of everyday life. However, one of the ways the digital sampling keyboard began to be used was by hip-hop producers sampling the sounds of drums from pre-existing recordings on vinyl. The Emulator is often referred to as 'the first affordable digital sampler' and hip-hop the genre of popular music most closely associated with digital sampling in the 1980s. Yet ownership of the Emulator and other digital sampling technologies designed by E-mu like the SP-12 and the SP-1200 drum machines was still restricted by price; analogue technologies like turntables and magnetic tape continued to be used as ways of reproducing and repeating recorded sounds. Some of the research questions driving this chapter are: What technologies were being used in the production of hip-hop in the 1980s? What digital sampling instruments were being used? Who was using them and how were they being used? The story of hip-hop and technology in the early 1980s is a story about the use/non-use of digital sampling instruments and drum

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[1] The company was initially called Eμ Systems, pronounced 'Ee-myoo' and short for Electronic Music Systems. This was later changed to E-mu Systems when the company became a corporation because Californian law stated names must use the Roman alphabet (Grandl 2015a).

machines containing digital samples. This chapter also tells the story of how hip-hop became synonymous with the use and *mis-use* of digital sampling technologies. It is told using mainly secondary sources such as historical and recent interviews with the designers at E-mu Systems, which have been published in magazines and on websites about music technology. There is also primary source material including an interview with a user of music technologies in hip-hop. Trevor Pinch and Frank Trocco argue that:

> the way to understand musical instruments is not from their essences – what their theoretical possibilities are – but from the way people who actually make the music put them into practice. Although instrument designers may have dreams and aspirations for the sorts of music to which their instruments can be adapted, the way to find the meaning of an instrument is in its use by real musicians – in state-of-the art recording studios and home basements, on the stage and on the road (2002, p. 10).

This thesis is less interested in trying to locate a single specific meaning of a musical instrument. It is focused more on understanding the multiple contexts of use and the diverse uses of musical instruments. This chapter continues the theme of contingencies that occur during the design of digital sampling technologies and develops the argument that instruments are not only used in ways unimagined by their designers but in ways that are perceived to conflict with their principles, values, and marketing strategies.

Following the Designers and the Instrument: E-mu Systems and the Emulator

Like Peter Vogel and Kim Ryrie at Fairlight Instruments, Dave Rossum and Scott Wedge were high school friends who began designing synthesizer technologies in a domestic environment. Rossum started E-mu Systems in 1970 and rented a house at 625

Water Street in Santa Cruz, California the following year.[2] He developed an interest in synthesizers as an undergraduate student at the California Institute of Technology (Caltech). As a graduate student of Microbiology at the University of California in Santa Cruz (UCSC), he was introduced to a newly acquired Moog modular system, The Synthesizer 12, in the University's Electronic Music Studios. With friends from Caltech, Steve Gabriel and Jim Ketcham, Rossum built a small prototype of a synthesizer called the Black Mariah with a tin foil keyboard; a second prototype called the Royal Hearn was built in the summer of 1971 with fellow UCSC students, Paula Butler, Marc Danziger, and Mark Nilsen. Wedge, who studied at the University of California in Berkeley before dropping out, joined the company after suffering a back injury in a skydiving accident and they developed a synthesizer modelled on The Synthesizer 12 and ARP 2600 synths with a three-octave keyboard called the Eµ 25. In November 1972, Rossum and Wedge formed E-mu Systems as a legal entity and moved to the City of Santa Clara in Silicon Valley. They began manufacturing and selling their own Modular system with a five-octave monophonic keyboard, which was launched in 1973 and cost between $3000 and $5000 (Keeble 2002). Over the next few years, Rossum and Wedge experimented with using microprocessors to control synthesizers and, in 1977, were commissioned by Peter Baumann of Tangerine Dream to build the Audity Level I System. This was a smaller, more portable 'workstation' that was launched in May 1980 at the Audio Engineering Society (AES) convention in Los Angeles. The projected cost was $50,000 but the final price ended up closer to $70,000. Realising this was too

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[2] Rossum explains: 'In the early days, E-mu was just located wherever I lived – in my dorm room at UCSC, the house we rented at 625 Water Street during the summer of 1971, and spare bedrooms at other houses' (quoted in Grandl 2015a).

expensive and faced with a legal dispute with Dave Smith of Sequential Circuits over royalties owed for consultancy work on the design of the Prophet-5 synthesizer,[3] Rossum and Wedge moved into the design of digital sampling instruments and focused on developing a cheaper music technology than the Fairlight CMI by using less memory.

Rossum and Wedge had worked with Roger Linn on the design and development of the LM-1 Drum Computer. While at the AES show in May 1980, they saw demonstrations of this and other instruments that used digital sampling technology such as the Fairlight CMI and the Publison DHM 89 B2. Rossum was largely unimpressed by the digital synthesizer and computer music instrument that had been designed in Sydney, Australia:

> Scott Wedge, [E-mu's general manager] Marco Alpert and [head technician] Ed Rudnick had been talking on the drive back from the show, and thought that the Fairlight [CMI] had one and only one good feature – sampling. We had also seen a Publison Digital Delay that had a capture mode, and the captured (sampled) sound could be played with a control voltage/gate type synthesizer keyboard. The guys came to me with their ideas, and we had the need for a new MI [Musical Instrument] product quickly to replace the lost Sequential revenue stream (quoted in Abildgaard 2012).

Where the Fairlight CMI used a separate Central Processing Unit (CPU) and Random Access Memory (RAM) for each of its eight voices or samples, Rossum realised there was a less expensive way of doing this and wanted to use one CPU to deliver an eight-voice polyphonic instrument. In order to increase the available memory, the solution Rossum found was to use Direct Memory Access (DMA) chips and FIFO data buffers.[4] He describes the process as 'revolutionizing the state of the art – building what was in

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[3] With an engineer called Ron Dow, Rossum developed Solid State Micro (SSM) integrated circuits that were used on the Prophet-5 and other analogue synthesizers. For more on E-mu and Rossum's relationship with Oberheim Electronics and Sequential Circuits, see Lee 1981.
[4] FIFO is an acronym for First, In, First, Out, a way of organising data in a queue-like structure.

my mind, not duplicating something that I'd seen' (*ibid.*) but he also admitted to wanting

to emulate competing technologies like the Fairlight CMI that used digital sampling:

> We knew that all of these products were fairly hot, and of interest to most musicians, most of whom couldn't afford them. Being the sort of people who didn't mind borrowing other people's ideas, we said, 'It sounds like this digital sampling idea is ripe. Someone should come in and do it right' (quoted in Vail 2000d, p. 221-222).

The move by E-mu Systems from designing digital synthesizers like the Audity towards

developing the first dedicated digital sampling keyboard and a more affordable sampling

instrument was borne out of financial necessity. Their decision to focus on digital

sampling, which had also been of secondary importance to the synthesizer designers at

Fairlight Instruments, demonstrates the contingency of the instrument design process.

Figure 9 E-mu Emulator

The work on the hardware and software for E-mu's Emulator began in June 1980 and

the prototype was launched and demonstrated at NAMM's Winter Market in February

1981. With a four-octave keyboard and a 5 ¼ inch disc drive for storing sounds, it

offered users two seconds of sample time. Ten diskettes were supplied with the

Emulator with eight containing pre-programmed sounds and the remaining two blank for

users to record their own sounds or what would subsequently be referred to as sampling.

The Emulator, though, might not have been called the Emulator. Wedge explained:

> Whenever we do a project, we have an in-house name for it. Then, as we get closer to the time that it goes to market, we go through a formal process of actually naming the product. The in-house product name for the Emulator I was the 'Sampler'. For us, that was kind of a pun between Nyquist's sampling theorem – which is an obscure piece of mathematics that underlies the whole genre – and the Whitman Sampler, a box with a whole bunch of different flavours of chocolates in it, because this was an instrument that could have a whole bunch of different sounds (quoted in Vail 2000d, p. 224).

To test the prototype in December 1980, musicians were invited to E-mu's base, which was now a 'commercially zoned house' (E-mu 2015) at 417 Broadway in Santa Cruz, to sample their instruments using the Emulator and check its fidelity levels. The Emulator was also tested by Rossum's then girlfriend who recited the same nursery rhyme Thomas Edison had recorded with a tinfoil phonograph more than a century earlier:

> the first loop was [Rossum's future wife] Karen speaking into the instrument, saying 'Mary had a little lamb'. And I could simply hold down the key and it would play 'Mary had a little little little little lamb'. (The next loop I made, after Karen left, was me peeing in the toilet adjacent to the lab. It made it sound like I had the world's largest bladder) (quoted in Abildgaard 2012).

A fascination with sampling the sounds of the lavatory rather than the laboratory extended to E-mu's marketing campaign for the Emulator, which imagined users would use the instrument to record and loop sounds of their own. As well as promoting its digital sampling keyboard as a way of imitating and manipulating the sounds of acoustic instruments, E-mu encouraged Emulator users to sample 'the sounds of everyday life'.

Imagine . . .

Imagine being able to play any sound you can hear— polyphonically.

Imagine a computer-based instrument that can record *any* sound into its digital memory—either live from a microphone or from a line level source—and then allows you to play that sound at any pitch over the range of its keyboard. With up to eight note polyphonic capability. An instrument whose split keyboard allows simultaneous control of two independent sounds. Any sounds. Instruments. Voices. Sound effects. Animals. Machines. Anything.

Imagine having realtime control over any sound.

Imagine being able to sustain a sound indefinitely—regardless of its original length. Or using performance oriented effects wheels to add frequency modulation to any previously stored sound. Turn a single trumpet note into a brass section. Add true vibrato to a grand piano. Play barking dogs. Polyphonically. With pitch bend.

Imagine an instrument that's incredibly simple to use.

Imagine an instrument that requires no special programming skill. An instrument that allows you to store and recall sounds in a matter of seconds with its built-in floppy disk drive. An instrument that is completely self-contained and portable, with no bulky external computer or CRT terminal to carry around.

Imagine an advanced digital instrument that you can afford.

Imagine this instrument available in two, four, and eight voice versions with suggested prices ranging from $6000 to under $10,000.

On February 6 at NAMM E-mu Systems will introduce the Emulator polyphonic digital keyboard instrument.

Then you won't have to imagine.
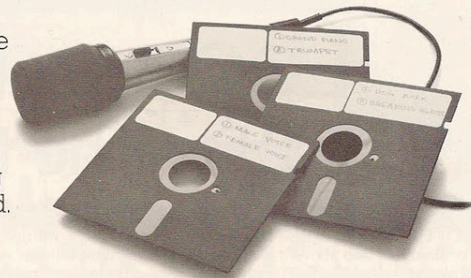
E-mu Systems, Inc.
417 Broadway, Santa Cruz, CA 95060
(408) 429-9147

Come to booth 1435 at NAMM. Hear the future.

Figure 10 'Imagine…' advertisement (*Contemporary Keyboard*, February 1981)

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Like the initial adverts for the Fairlight CMI, which presented the instrument as a revolutionary new musical technology that enabled users to create 'tomorrow's music today', E-mu wanted potential owners and users of the Emulator to 'hear the future' (Figure 10). Rossum believed the company 'had an instrument that would revolutionize how music was made' (quoted in Abildgaard 2012) and its approach to marketing the instrument focused on fun as well as futurism and fidelity. One advertising slogan in the UK read 'FROM FARTS TO PHILHARMONICS' (quoted in Milner 2009, p. 321) and an advertisement published in the May 1981 issue of *Contemporary Keyboard* magazine (Figure 11) contained a pun on the US term for an unsuccessful cultural product:

> Play a Turkey. Or a dog. Or violins, drums, voices, sound effects, machines, or, in fact, anything. Not synthesized simulations but the actual sounds. With the E-mu Systems Emulator, *any* sound you can hear can be digitally recorded and then played back at any pitch over the range of its keyboard… (E-mu 1981).

E-mu were keen to stress that any sound could be digitally sampled in the process of making music and were more playful in their approach to marketing than the focus in advertisements for the Fairlight CMI on 'ANY type of music' or 'ANY type of sound'. As with the emphasis in advertisements for New England Digital's Synclavier and the Linn LM-1 Drum Computer on the possibility of reproducing 'real sounds' using these instruments, E-mu's marketing employed a discourse about authenticity and unmediated sounds. An advertisement published in *Keyboard* magazine in October 1982 read:

> Finally there's nothing standing between you and the sounds you want. *Any* sound you want [original emphasis]. Instruments. Voices. Sound effects. Animals. Machines. Anything. Sounds that sound real because they *are* real [original emphasis] (E-mu 1982).

Figure 11 'Play a Turkey' advertisement (*Contemporary Keyboard*, May 1981)

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Claims around realism and fidelity were central to the attempts by E-mu to sell a digital sampling keyboard that could be used to reproduce sound as a 'vanishing mediator'. According to its advertisements, the Emulator could be used to reproduce 'actual' sounds or 'real' sounds rather than produce digitally synthesized sounds. Yet these were not 'actual' or 'real' sounds but digitally recorded samples of 'actual' or 'real' sounds.

Despite offering users the opportunity to sample the sounds of everyday life and the lower cost of buying a digital sampling instrument, sales of the Emulator were slow. Starting in July 1981, the business plan was to sell five instruments a month. According to Rossum, 'We sold about 20 of our first units, but sales just hit the wall at the end of '81' (quoted in Vail 2000d, p. 225). The poor sales of the Emulator were attributed to technical issues with E-mu's marketing director, Marco Alpert, concluding users were unsure how to use a musical instrument that enabled any sound to form part of a song:

> People didn't know what to make of it. People who had Fairlights knew, but there weren't that many people who had Fairlights. And there wasn't a paradigm yet that everyone was familiar with. It had a slow build. It took about a year, and it was really our introduction of a sound library that you could get along with it that helped out. So you could take it out of the box, put a few discs in, and have a bunch of useful sounds right then and there, rather than having to go out and figure out how to do it yourself (quoted in Milner 2009, p. 320).

The designers at E-mu expected the users of the Emulator to record and produce sounds of their own, but a convention of sampling the sounds of everyday life and playing them on a keyboard had not yet been developed or remained the preserve of professional musicians and users of the Fairlight CMI such as Peter Gabriel and Kate Bush. To make it more affordable and user-friendly, E-mu lowered the price of the Emulator to $7,995 [US] in January 1982 and increased the number of diskettes with pre-programmed

sounds to twenty-five. However, the inclusion of a sample library of pre-set sounds was ignored by at least one user in the world of hip-hop who discovered the keyboard instrument could be used to sample the sounds of musicians and, more specifically, the sounds of drummers on old vinyl recordings. Understanding African-American cultural and musical practices, such as the focus on rhythm, repetition, and rupture (Rose 1994), is important for understanding the production of hip-hop and the technological practices of the genre and I want to re-introduce the concept of 'relevant social groups' from the fields of Science and Technology Studies (STS) and the social construction of technology (SCOT) to examine how digital sampling technologies were used by hip-hop producers and how they became associated with the reproduction of sounds from pre-existing recordings. Having presented a short history of E-mu Systems with an emphasis on the design and marketing of the Emulator, I turn my attention towards a user who sampled sounds from pre-existing recordings rather than the sounds of everyday life and focus on the wide range of music technologies used to produce hip-hop in the 1980s.

Following the Users (and Non-Users) of the Emulator: The Marley Marl Moment

The recipient of the first Emulator was Stevie Wonder who visited the E-mu stand at NAMM in February 1981. In an example that illustrates the gap between promises contained in magazine advertisements and the experiences of using the prototypes of instruments when launched, he began to sample sounds on the Emulator in ways that its designers felt highlighted the instrument's limitations. Wedge explained how he:

> walked up to the instrument, sort of hugged it to get the feel of it, and then started playing it…Stevie sampled his voice into the Emulator and played it back on the keyboard. That drove us all crazy because we knew that voice didn't work

very well on it. Voices ended up sounding funny. 'Munchkinized' was what we called it. We thought there were much more interesting things to sample. To top it off, when Stevie sang into the microphone for the sample, it really overloaded the inputs and distorted the signal. It was a bad sample and a bad example, but when he played it, I guess it was just enough of a mindblower to turn him on to it (quoted in Vail 2000d, pp. 224-5).

Ownership of the first Emulator had been promised to Daryl 'the Captain' Dragon of the husband-and-wife duo Captain & Tennille but Stevie Wonder was thought to be a more high-profile customer and Dragon had to settle for serial number 002. (The latter's initial use of the Emulator included the creation of sound effects such as sleigh bells and reindeer hoofs at a Christmas concert with the Glendale Symphony Orchestra in Los Angeles (Vail 2000d)). For those who could not afford to buy an Emulator one of the ways to become a user was to hire one. This was the option chosen by Paul Hardcastle who used an Emulator on his 1984 hit '19', which contained the repetition of a single note by de-pressing one key on the keyboard to create a stuttering effect: 'N-N-N-Nineteen'.[5] The user of the Emulator I will discuss was not an owner either: Marley Marl worked with the producer Arthur Baker and this professional relationship placed him in the privileged position of having access to digital sampling technologies like the Fairlight CMI and E-mu Emulator at a time when they were both exclusive and scarce.[6]

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[5] Hardcastle explained: 'I got hold of an Emulator 1. It was one of the first samplers and I had hired it for the day for something else. I just started mucking about and recorded me saying, 'Nineteen'. I was fooling around and doing something rhythmic on one key with that sample, going, 'N-N-N-N' and thought this would be a good idea' (quoted in Cunningham 1998, p. 316).
[6] Marley Marl was an assistant to Arthur Baker at Unique Recording Studios in New York: 'I was an intern, and I'd just hang around sessions for the Force MDs, [Afrika] Bambaataa, Jazzy Jay and 'em' (quoted in Nelson 1991, p. 38).

When digital synthesizer/sampling technologies like the Fairlight CMI first became available in the late 1970s and early 1980s, record labels made recordings of hip-hop performances using the skills of musicians to replay breakbeats (or breaks).[7] On recordings like 'Rappers Delight' by Sugarhill Gang (1979), musicians replicated the sounds of pre-existing recordings that the producer, Sylvia Robinson, wanted to use. A member of the house band at Sugarhill Records, drummer Keith LeBlanc, told me:

> What they used to do was, the DJs would come in with a bit of a record and we had an arranger named Jiggs Chase who would write an arrangement of it and then we would play [it]. There [were] no samplers around and we would have a chart written and I'd add little things to it. Everyone would add little things to it (LeBlanc 2008).

LeBlanc described how the technical process of making records for the label changed with the introduction of synthesizers and drum machines containing digital samples. Rather than synthesizers and sample-based instruments replacing the house bands, these technologies were programmed and played by the same musicians. The use of a synthesized keyboard sound can be heard on Grandmaster Flash and the Furious Five's 'The Message' (1982). LeBlanc supplied some technical information about its production when I asked him whether he played on the recording of 'The Message' that became a hit single: 'I played on a [different] version of 'The Message'. There were two versions cut. I didn't play on 'White Lines' either. Reggie Griffin did the drum machine

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[7] Mark Katz defines a break as 'a brief percussion solo, typically found towards the end of a funk song, though it may show up anywhere in a song, and really, anywhere in music (2012, p. 14). Drum breaks in recordings by soul and funk artists such as James Brown and The Jimmy Castor Bunch were used by DJs and producers in the early years of hip-hop before breaks began to be sourced from a wider range of musics and did not consist of only percussion or rhythm. Joseph Schloss explains: 'today, the term "break" refers to *any* segment of music (usually four measures or less) that could be sampled and repeated…In contemporary terms, a break is any expanse of music that is *thought of as a break* by a producer' [original emphasis] (2004, p. 36).

on that. A[n Oberheim] DMX' (*ibid.*). As the use of synthesizers and drum machines began to change the sounds of hip-hop, and popular music more generally in the early 1980s, sounds were also beginning to be digitally sampled by the producers of hip hop. As well as using drum machines like the Oberheim DMX, which contained digital samples of acoustic drums, digital sampling instruments like E-mu's Emulator were used for digitally sampling the sounds of acoustic drums from pre-existing recordings.

Figure 12 Oberheim DMX Programmable Digital Drum Machine

The discovery that digital samplers could be used to record and re-use sounds from pre-existing recordings is associated with hip-hop producer, Marley Marl. In an interview with *The Source* magazine in 1991 he explained this was a recording studio accident:

> One day in '81 or '82 we was doin' this remix of a Captain Rock record for [indie label] Nia. I wanted to sample a voice from off of this song with an [E-mu] Emulator and, accidentally, a snare went through. At first I was like, 'That's the wrong thing,' but the snare was soundin' *good* [original emphasis]. I kept running the track back and hitting the Emulator. Then I looked at the engineer

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and said, 'You know what this means?! I could take any drum sound from any old record, put it in here and get the old drummer sound on some shit. No more of that dull [Oberheim] DMX shit.' That day I went out and bought a sampler, a little cheap bullshit sampler I still use to this day. 'Marley's Scratch' was the first record to use sampled drums, but [the innovation] really got noticed [when it appeared] on 'The Bridge' and 'Eric B is President'. I had made my own patterns with the 'Impeach the President' snare and kick. That was the shit, I was excited (quoted in Nelson 1991, p. 38).[8]

What might be referred to as 'the Marley Marl moment' is problematic because it suggests the use of digital samplers in hip-hop was becoming widespread in the early 1980s when, in fact, they were not widely adopted until the arrival of less expensive devices like Akai's S900, Casio's SK-1, and E-mu's SP 1200 in the mid-to-late 1980s. Joseph Schloss suggests Marley Marl's discovery 'almost immediately ended the era of live instrumentation' (2004, p. 35) but the production of hip-hop in the early 1980s involved a diverse range of musical and technological practices. The recording of performances using acoustic and electric instruments such as guitars, bass, and drum kits did not come to a sudden halt: the types of musical instruments changed as musicians began to learn how to use new digital synthesizer and sampling technologies alongside more familiar instruments. Hip-hop producers realised they could sample drum sounds from pre-existing recordings but were limited by the two-second sample time of the Emulator. For Tricia Rose, the consequence of this accidental discovery was that 'real drum sounds could be used in place of simulated drum sounds' (1994, p. 79). However, what Marley Marl described was a preference for a particular sound: the digital samples

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[8] The Captain Rock record Marley Marl was remixing was either 'Cosmic Blast' or 'Capt. Rock to the Future Shock', which were both released by NIA Records in 1984 so it is unlikely he would have been working on these mixes in 1981 or 1982.

of acoustic drums on pre-existing analogue recordings rather than the digital samples of acoustic drums stored in the memories of drum machines like the Oberheim DMX.

While musical instrument designers like Linn and Oberheim advertised the importance of 'real' sounds that had been digitally sampled during the making of their drum machines, the ownership and use of these instruments was restricted by price: Linn's LM-1 Drum Computer cost $5,000 [US] when it was released in 1979 and the Oberheim DMX cost $3000 [US] when it became available in 1981.[9] As an intern working in a Manhattan recording studio, Marley Marl had access to both an E-mu Emulator and an Oberheim DMX but was critical about the timbre of the digitally sampled sounds stored in the memory of the DMX. Others in the world of hip-hop became key users of the machine with one even adopting the name of the instrument. David Reeves, for example, a bassist, guitarist, and DJ for the artist Kurtis Blow, became known as Davy DMX. When asked in an interview why he named himself after the drum machine, he replied:

> It was the hottest thing out back then. There was the Linn [LM-1 Drum Computer and LinnDrum] but once the DMX hit, you just had to mess with it. It was one of the first machines that came out that had a decent drum sound (quoted in Coleman 2013b, p. 148).

In the early 1980s, the digital samples used in hip-hop were more likely to be pre-programmed sounds contained in the Oberheim DMX or the Fairlight CMI (as on 'Planet Rock', for example) rather than sounds recorded externally using digital synthesizer/sampling instruments or digital sampling keyboards like the Emulator. While a hip-hop producer such as Marley Marl who had access to a DMX preferred the

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[9] The spec sheet section of *Keyboard* magazine in August 1981 contains information and prices for Oberheim's DSX sequencer and DMX drum machine. The cost of the DSX was $1700 [US].

digitally sampled sound of acoustic drums on pre-existing recordings, other producers in

hip-hop favoured drum machines like the Roland TR-808 and their analogue sounds.[10]

Until they became more affordable in the mid-to-late 1980s, digital sampling

instruments were scarce because of their exorbitant price. Reproducing pre-existing

sound recordings occurred mainly through the use of analogue technologies such as the

turntable practices of DJs and the cutting and splicing of magnetic tape by producers in

recording studios. LeBlanc explained how he used magnetic tape and drum machines to

create a 'sample'-based collage, 'Malcolm X – No Sell Out' by Sugar Hill All-Stars:

> I programmed it with a drum machine. I edited out bits of Malcolm X's voice
> and put them on 2" tape and flew them in, which is basically you run the multi-
> track and then you try and start the tape at the right time so we did the whole
> record like that. It was before samplers. It was a lot harder to do. The tape
> machine was hit and miss but you could play it like an instrument after a while.
> Samplers made it easier. I was one of the first guys to do a sample-type record
> then Paul Hardcastle copied me because I was working with ABC. They said 'we
> asked Paul Hardcastle where he got his idea and he goes 'I was trying to do a
> Keith LeBlanc thing'' so I got accused of being the first groundbreaking
> sampling record but it wasn't even a sampler because they didn't even have them
> then (LeBlanc 2008).

In a compilation released by Sanctuary Records in 2005, the liner notes describe how

this 'celebrated electro classic from '83 was one of the first to use new sampling

technology, repeating sections of Malcolm X speeches into a heavy beatbox groove'

(Sanctuary 2005). However, any digital sampling technology used in the making of 'No

Sell Out' related to the construction of the rhythm track rather than the repetition of

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[10] Kurtis Blow re-programmed the drum machine to create a particular sound: 'The 808 is great
because of the bass drum. You can detune it and get this low-frequency hum. It's a car speaker
destroyer. That's what we try to do as rap producers – break car speakers and house speakers and
boom boxes. And the 808 does it…' (quoted in Dery & Doerschuk 1988, p. 34).

Malcolm X's words. Until the arrival of sampling drum machines like the E-mu SP 1200, which contained enough memory to store samples of complete breaks from vinyl recordings, using drum machines containing digital samples and analogue technologies like magnetic tape and turntables remained the primary way of creating the loop-based approach to record production that was central to hip-hop's aesthetic of appropriation.

Following the Instruments: The Drumulator, the Emulator II, and the SP-12

E-mu's decision to re-introduce the Emulator in 1982 by reducing the price, adding new features such as multi-sampling, and increasing the number of sounds in the sample library was successful. Seventy-five keyboards were sold at NAMM that year and sales of the instrument remained steady with twenty-five instruments produced each month until the product was discontinued ahead of the introduction of the Emulator II in 1984. Rossum locates the Emulator as a revolutionary stage in the history of digital sampling:

> we didn't realize until years later that the Emulator 1 was the true beginning of the sampler revolution. While we certainly can credit Max Matthews for the first work in digital synthesis, and instruments like the Fairlight, Publison, and even the LM-1 for initial forays into sampling, I believe that the many innovations in the Emulator – the shared memory, looping, enveloping and multi-sampling to name a few – are what made sampling keyboards practical. As Marco [Alpert] said in 1993, 'We changed the way the world makes music' (quoted in Grandl 2015a).

While the Fairlight CMI was a digital synthesizer and music computer with sampling as a secondary feature that became successful with users and competitors, the Emulator was the first dedicated digital sampling keyboard to be designed as a sampler and used as a sampler. Rather than the music of the world being changed by a digital sampling keyboard, the designers of the Emulator introduced a more affordable digital sampling

technology with new design features. Its users stumbled across and accidentally discovered new musical practices relating to the re-use of pre-existing sound recordings.

Just as the Emulator was designed and manufactured as a cheaper alternative to an expensive digital synthesizer/sampling instrument like the Fairlight CMI, E-mu produced a less costly drum machine containing digital samples to compete with Linn's LM-1 and LinnDrum products. The suggested retail price of the LinnDrum was $2995 [US] (Linn 1982). The Drumulator was introduced at NAMM in January 1983 with a retail price of $995 [US] and E-mu's advertisements emphasised its 'affordability'.[11] An eight-bit Z80 microprocessor stored information in RAM memory and the owner's manual supplied with the Drumulator explained to users:

> The Drumulator is a rhythm/drum machine that features twelve digitally recorded drum sounds stored on computer chips, and extensive solid-state recording capabilities. You may record up to 36 individual rhythm patterns (called *segments*), and then combine these segments in just about any order imaginable to create up to 8 songs (E-mu 1983b, p. 4).[12]

Like the Linn LM-1 Drum Computer, the Drumulator did not have a user sampling function and some users were frustrated with the limited number of pre-programmed sounds. Two of these users, Peter Gotcher and Evan Brooks, who had been students of electrical engineering and computer science at University of California Berkeley, wanted

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[11] An advert in the February 1983 issue of *Keyboard* magazine stated: 'you have a digital drum computer that would be an [*sic*] amazing value at $1990.00. But what's even more amazing is that for $1990.00 you would get something that you probably wouldn't expect. Two Drumulators' (E-mu 1983a). For a review of the Drumulator, see Aikin 1983b.

[12] The instructions in E-mu's manual for the Drumulator reflected the counter-cultural attitudes of the designers and their playful approach to business: 'You can use this manual to line bird cages, as kindling when starting a fire in the fireplace, as the raw material for creating paper gliders, or most importantly, as a guide to help you get the most out of the Drumulator' (E-mu 1983b, p. 1).

Figure 13 E-mu Drumulator

to increase the number of available drum samples. Gotcher and Brooks contacted E-mu

for advice about how to re-design the instrument and, to their surprise, were encouraged

by Alpert, Wedge, and Rossum, who sold them an Emulator to digitally sample their

own drum sounds.[13] The duo began designing chips with drum sounds to sell to

Drumulator users and started a company called Digidrums: the users of a drum machine

containing digital samples of acoustic drums became the designers of digital sample

libraries of alternate drum sounds. These included electronic drum sounds, Latin and

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[13] Gotcher recalled: 'I was doing a lot of recording at the time and didn't really like the sounds I was getting from my drum machine. Evan figured out how the sounds were mapped on the ROMs, E-mu helped a little, and we produced about five alternate sets of sounds. We played them to the folks down at E-mu and they thought that our sounds were much better than their existing ones' (quoted in White 1995, p. 36).

African percussion, and a heavy metal rock drum set. The designers of these digitally sampled sounds later became the designers of Digital Audio Workstations (DAWs).[14]
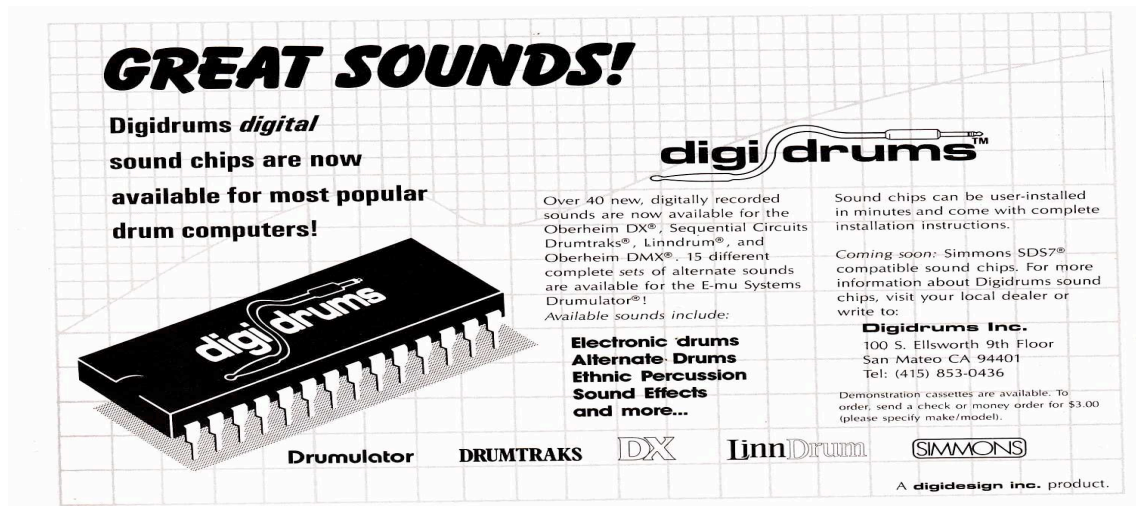
Figure 14 'Great Sounds!' Digidrums advert

For E-mu, the Emulator was important to the development of the company because it was the first instrument that could be distributed and sold in music retail stores. The Drumulator was important because of its commercial success with sales of nearly 10,000 units in a two-year period (Keeble 2002).[15] Wedge explained: 'What actually made E-mu wasn't the Emulator. It was the Drumulator. But the Emulator made the Drumulator, and the Drumulator then made the Emulator II, which really was our first truly

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[14] Brooks and Gotcher purchased an Apple Macintosh and used it to edit samples on screen. They developed a program called Sound Designer that was used with the Emulator II. Brooks described it as: 'an editing environment that allowed you to view, edit, and process sounds' (quoted in Milner 2009, p. 335). The follow-up, Sound Tools, was demonstrated at NAMM in January 1989 as a 'tapeless recording studio'. The company was renamed Digidesign and the first version of Pro Tools released in 1991.

[15] According to Rossum, sales of the Drumulator slowed after Sequential Circuits released their first digital drum machine, Drumtraks, in 1984 (Abildgaard 2012). It was part of the Traks Music System, which also included a multi-timbral synthesizer with built-in digital recorder called Six-Trak and a Model 64 MIDI Sequencer that connected to a Commodore 64 computer. Drumtraks was more expensive than the Drumulator. The suggested retail price of Drumtraks was $1295 [US] (Sequential Circuits 1984a) and £950 (Sequential Circuits 1984b) in the UK.

successful instrument' (quoted in Vail 2000d, p. 225). However, this was not a straightforward story of business growth and financial success. The Emulator II was introduced at NAMM in January 1984 but Rossum admits: 'we showed a prototype that was barely completed and was nowhere near ready for production' (quoted in Grandl 2015b). With no revenues from the Emulator, which had been discontinued, E-mu

Figure 15 E-mu Emulator II

licensed a product called the ddrum from a company called Clavia in Sweden and launched the E-drum Digital Percussion module, an electronic drum pad using digitally recorded drum sounds. Rossum described it as 'a complete catastrophe. It was plagued by reliability problems' (*ibid.*). With poor sales, E-mu were forced to make redundancies among its workforce and a deal agreed with their distributor in the UK, Syco Systems, which enabled the company to stay in business.[16] When E-mu finally started to distribute the Emulator II, more than three thousand units were sold over a three-year period.[17] It

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[16] As well as the Fairlight CMI, Syco Systems distributed products by E-mu, Kurzweil, PPG, Quantec, Linn, and Yamaha. Syco paid E-mu an advance of $100,000 in return for the first forty Emulator II keyboards being shipped directly to the UK for sale to their customers (Cole 2015).

[17] The Emulator II was purchased by a long list of well-known pop and rock musicians including Stevie Wonder, Herbie Hancock, Paul McCartney, David Bowie, Vangelis, Jean-Michel Jarre, and Stevie Nicks as well as groups like Genesis, Yes, Depeche Mode, Talking Heads, Orchestral Manoeuvres in the Dark (OMD), and Ultravox (Rossum, quoted in Grandl 2015b).

was an 8-bit device with a sample rate of 27.777 kHz and 17.6 seconds of sample time (Keeble 2002). The use of what the engineers at E-mu called the 'sigma-delta encoding scheme' or '8-bit companded' increased the fidelity levels to 12-bit or higher. The Emulator II also included features such as analogue synthesizer filters, envelope generators called VCAs (Voltage Controlled Amplifiers), and an SMPTE-based multitrack sequencer.[18] The use of Small Computer System Interface (SCSI) meant the keyboard could be connected to an Apple Macintosh II computer and used with Digidrums' Sound Designer software. Its fans celebrated the realism of its sounds – Paul Wiffen writes that 'the EII [Emulator II] was the first sampler I ever came across which could even get close to a piano' (2000). But with a price tag of $7,995 [US], there is little evidence the Emulator II or E-mu's next commercially available product was widely used in the production of hip-hop music.

E-mu Systems SP-12 twelve bit sampling percussion system was not always called the SP-12. In February 1985 at Frankfurt Musikmesse trade fair, E-mu launched the Drumulator II, which combined features from the Drumulator and the Emulator II. When it was distributed later that year, its name had been changed to the SP-12. In the UK, the recommended retail price was £2995 plus an additional £500 for a Turbo version (Wiffen & Scott 1985). In the US, it was $2745 for the standard version and $3550 for a Turbo version (Oppenheimer 1986). A 12-bit device that enabled users to sample their own drum sounds or any other sounds that could be used for percussion, the

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[18] SMPTE is an acronym for the Society of Motion Picture & Television Engineers who developed a time code in 1967 for the synchronisation of visual and audio information.

standard version included 1.2 seconds sampling time and the Turbo version five seconds. With a similar interface to the Drumulator, added to the eight velocity-sensitive programming buttons were sliders for adjusting the volume or pitch of any of the sounds. Now describing the company as 'pioneers in affordable professional sampling

Figure 16 E-mu SP-12 Twelve Bit Sampling Percussion system

technology', E-mu explained how the SP-12 set a 'new standard of fidelity for digitally sampled drum machines' (E-mu 1985). Reviewers agreed. Paul Wiffen and Annabel Scott wrote that 'next to a Linn 9000, the SP 12 makes its competitor sound dull, muffled and uninspiring. *And* [original emphasis] the factory sounds are refreshingly modern: deep, powerful toms, a sharp, clicky bass drum, a good selection of electronic

kit sounds, plenty of realistic ethnic percussion' (Wiffen & Scott 1985, p. 45).[19] To store

sampled sounds, the SP-12 was designed to be used with a JL Cooper MIDI Disk Drive

and could also be used with a Commodore 1541 disc drive (Oppenheimer 1986).

Applying the discourse used to sell synthesizers to the marketing of digital drum

computers, E-mu stated: 'Virtually anything you can imagine can be sampled into

battery backed up memory' (E-mu 1986). Joseph Schloss reports how 'hip-hop artists

were soon using the machine to sample not their own drumming, but the sound of their

favourite recorded drummers, such as Clyde Stubblefield from James Brown's band or

Zigaboo Modeliste of the Meters' (2004, p. 35). However, until the launch of a later

version of the device, the SP-12 was not widely used in the making of hip-hop records.

Following the Non-Users and Users of the SP-12: Run DMC, Beastie Boys, Boogie Down Productions (BDP)

Hip-hop writers often refer to the period from 1984-86 as the beginning of the new

school of hip-hop as older or 'old school' ways of making music began to be replaced.[20]

The use of drum machine technologies was altering the sounds of hip-hop from its

origins in the cutting, repetition, and replaying of rhythmic patterns from pre-existing

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[19] The Linn 9000 Integrated Digital Drums/MIDI Keyboard Recorder was launched in 1984 with a price tag of £4500 plus VAT and distributed in the UK by Syco Systems (Wiffen 1985). It was designed for drum sounds to be loaded from cassette or floppy disk and to digitally sample external sounds but this was not possible until software updates were made available in 1985.

[20] Journalists and scholars divide the history of the genre into a number of different eras. According to James Peterson (2012, p 607), there are three: Old School (1979-1987), The Golden Age (1987-1993), and The Platinum Present (1994-present).

recordings.[21] New school acts like Run DMC were celebrated for returning hip-hop to the 'essential' qualities encapsulated in live performance: the irony is that the music was produced with technologies like Roland TR-808 drum machines as well as the older analogue technologies of turntable and magnetic tape. David Toop identifies Run DMC's album *Raising Hell* (1986) as 'one of the first hip-hop records to prominently feature an old-school break, Bob James's 'Mardi Gras' on 'Peter Piper'' (2003, p. 145). A biography of Run DMC's Jam Master Jay suggests the track was constructed using a drum machine and a turntable rather than any digital sample-based technologies:

> That is exactly how one of their biggest hits, 'Peter Piper' came together. Using his drum synthesizer and turntable, Jay composed a beat he liked and, as he explains, 'I scratched and Run and DMC said a couple of rhymes. We would rhyme and stop, rhyme and stop. They said the first thing and then I scratched on top of it' (quoted in Thigpen 2003, p. 65).

In the case of Run DMC's 'Walk This Way' (1986), the idea of using a DJ to cut and extend the break from a pre-existing recording by Aerosmith into a new recording was rejected. Rick Rubin, the record's producer, recommended the involvement of the rock group as real-time collaborators. In March 1986, Aerosmith joined Run-DMC in Magic Venture Studios in New York and this collaboration of rock musicians and DJs was crucial in providing the basis of one of hip-hop's most important crossover recordings. The playing of acoustic and electric instruments in hip-hop was not a practice consigned to history and they continued to be used in studios alongside the use of turntables, drum machines, and digital sampling instruments. However, E-mu's SP-12 was largely absent.

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[21] Peter Shapiro writes: 'with a few stunning exceptions…it had proved almost impossible to capture in the recording studio the excitement generated by a DJ cutting tracks live on twin turntables. In the mid-80s, with only the occasional sighting of breaks such as '[Take me to the] Mardi Gras' and 'Genius of Love', HipHop's solution to this conundrum was drum-machine minimalism (1997, p. 50).

Hip-hop albums like Beastie Boys' *Licensed to Ill* (1986) contained drum breaks from pre-existing recordings such as Led Zeppelin's 'When the Levee Breaks'. Rather than using an SP-12 or other digital sampling technologies, these were reproduced using analogue technologies like tape alongside the use of analogue drum machines like the Roland TR-808. Many journalists assumed sounds on *Licensed to Ill* were reproduced using a sampling drum machine like the E-mu SP-12. Angus Batey, for example, writes:

> Musically, *Licensed to Ill* is basic. Like much of the hip-hop of the time, it relies on a selection of beats concocted on machines like the legendary SP-12, a drum machine that allows the programmer to construct original percussive patterns using sampled drum sounds. For instance, 'Rhymin & Stealin', the opening track, uses a mixture of deck techniques and drum machine programming to turn a sequence of sampled John Bonham drums into a slow, loping, lazy hip-hop rhythm. Still a relatively new tool in the mid-80s, the SP-12 was behind most of the major stylistic advances in hip-hop music prior to the advent of cheap samplers with long sample times (which, oddly, merely facilitated a return to the "live" sounds a DJ could create by mixing records on a pair of turntables), and its distinctive sound underpins much of the rest of the album (1998, p. 40).

In fact, the drum sounds from Led Zeppelin's 'When the Levee Breaks' were reproduced using magnetic tape. MCA of the Beastie Boys explains:

> On *Licensed to Ill*, we didn't even have any samplers. So the stuff that's looped, we actually made tape loops. We'd record 'When the Levee Breaks' beat onto a quarter-inch tape, and then we'd make the loop and that tape would be spinning around the room, dangling on mic stands, going around in a big loop. And then, in order to layer that with something else, we'd have to actually synch it up, physically (quoted in Brown 2009, p. 45).

There is an assumption the E-mu SP-12 was employed in the making of *Licensed to Ill* because it became available in 1985 and the album was released the following year. However, those involved in the engineering and production of the album were relying more on established skills that had been part of the process of record production since the 1960s than on the new sets of skills required to programme digital sample-based

technologies emerging in the 1980s.[22] The repetition of excerpts from pre-existing

recordings using magnetic tape was still an important practice in hip-hop at this time:

using digital drum computers like E-mu's SP-12 and other digital sampling instruments

had not yet become the dominant way of trying to loop pre-existing sound recordings.

To understand if, and how, digital sampling instruments like the E-mu SP-12 were being

used by hip-hop producers in the mid-1980s, it is important to work out who had access

to these new digital technologies and whether they had, in reality, become more

affordable. The introduction of digital sampling technologies by companies such as E-

mu as well as Akai, Ensoniq, and Casio resulted in lower prices but the extent to which

the use of instruments like the E-mu SP-12 and the Ensoniq Mirage had become

widespread may have been exaggerated. In 1985, Bob Moog wrote: 'like the

democratized polyphonic synthesizers that influenced the musical instrument market

because of their attractive prices, the Mirage brings basic sampling capabilities to

thousands of eager musicians at a price where no such instrument had existed before.

And costs continue to plummet' (1985, p. 46).[23] Affordability is relative, though, and

applies differently to 'relevant social groups' including African-Americans living in less

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[22] Engineer George Drakoulias lists the technologies used in the making of *Licensed to Ill* as
Oberheim DMX and Roland TR-808 drum machines, digital reverberation devices produced by
AMS, and magnetic tape. The album was recorded in Chung King Studios, New York, which
was 'a 16-track, 2-inch, analog studio. [T]he songs were handmade with no automation and the
records were really simple: a drum machine, a rapper yelling, and a DJ scratching. It was very
simple and basic' (quoted in Brown 2009, p. 45). His claim represents a residual idea about the
craft of sound engineering prior to its transformation into an art in the late 1960s (Kealy 1979).
[23] More recently, Justin Morey has argued that 'with the launch of equipment such as the
Ensoniq Mirage, Akai S900 and E-mu SP-12 in 1984, 1985 [*sic*] and 1986 [*sic*], access to digital
sampling became a reality for aspiring musicians and producers' (2012, p. 21).

affluent inner-city areas in the 1980s. At least one scholar has explained how these technologies were still too expensive for many, particularly those hip-hop DJs and producers living in housing projects in the boroughs of New York City such as the Bronx, Brooklyn, Queens, or Staten Island.[24] Joseph Schloss writes that the E-mu SP-12 was 'well beyond the budget of most inner-city teens' (2004, p. 30). The availability of cheaper sampling instruments like E-mu's SP-12 or Ensoniq's Mirage made digital sampling technologies more accessible to a larger number of users. However, the argument that this represented a form of democratisation because the technologies were now available to everyone is too simplistic and not supported by empirical evidence.[25]

Interview material from hip-hop musicians such as KRS-One (Kris Parker) from Boogie Down Productions suggests ownership of the E-mu SP-12 was still uncommon within specific socio-cultural communities during the period between 1986-1987. He highlights this when describing how 'South Bronx' from *Criminal Minded* (1987) was produced:

> I performed it [the verses] for Scott, he played the 'Funky Drummer' and started in on the song, and it blew his mind. So we ran over to Ced-Gee's house and were like: 'Yo, Ced, we need that SP-12.' Keep in mind that at that time Ced-Gee was the only person in the Bronx with an SP-12, and he was the absolute man. So he lent us the sounds, the kick, the drum, the snare, the hi-hat. Scott took his records over to Ced and Ced sampled them and made the beat for 'South

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[24] See chapter two of Rose 1994 for a detailed discussion of the urban context of hip-hop production. These include social policies and events in the 1960s-1970s that led to New York and the South Bronx being defined in the US as 'national symbols of ruin and isolation' (p. 33).
[25] Bob Moog wrote that synthesizers like the Korg Poly 800 becoming available in parts of the USA in the 1980s where they had not previously been stocked in music stores was a form of 'democratization' (1985, p. 44). Paul Théberge writes: 'the 'democratization' that Bob Moog refers to is related to little more than the breaking of the early price barriers that had kept the synthesizer from becoming a broad-based consumer item until the 1980s' (1997, p. 73).

> Bronx,' and Scott did the drums and Ced chopped it up (quoted in Coleman
> 2007, p. 82).[26]

It is impossible to know *how many* SP-12s existed in the Bronx at this time but this evidence suggests they were quite scarce as users in hip-hop borrowed them from owners who possessed significant cultural capital (Bourdieu 1984) and social capital (Bourdieu & Wacquant 1992) including legendary status in the local area. What was also in limited supply was specific knowledge about how to sample sounds from pre-existing recordings, which is why particular producers like Ced Gee were also relied upon to programme the instruments. The limited amount of sample time and memory available in the SP-12 meant individual drum sounds from classic breakbeats, such as Clyde Stubblefield's drum solo on James Brown's 'Funky Drummer', were reproduced by users but complete breakbeats could not yet be digitally sampled and looped.[27] The difficulty of sampling a breakbeat or melody lasting more than 1.2 seconds using the standard version of the E-mu SP-12 explains the short length of sampled sounds on hip-hop albums such as *Criminal Minded*. Some tracks contain samples from the drum solo of a James Brown recording ('South Bronx') but, rather than the looping of complete breakbeats from pre-existing recordings, the majority feature rhythmic patterns produced by programming individual sounds on the SP-12. On other tracks, the scratching of vinyl

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[26] Ced Gee or Cedric Miller was also the producer of hip-hop group, Ultramagnetic MCs.

[27] Along with 'Amen, Brother' (1969) by The Winstons, 'Funky Drummer' (1970) by James Brown is one of the most sampled recordings in the recent history of popular music. It was recorded at King Studios in Ohio on 20 November 1969 and originally released in two parts on both sides of a 7" single. A longer nine-minute version was released in 1986. Artists such as N.W.A. and Public Enemy have sampled the drum break by Clyde Stubblefield. For more on 'Funky Drummer' and its use in hip-hop, see Stewart 2000, Danielsen 2006, Danielsen 2010, Scannell 2012. On the sampling by hip-hop and jungle producers of Gregory Coleman's drum break in 'Amen, Brother', more commonly known as 'the Amen break', see Butler 2006, Whelan 2009, and Nate Harrison's audio installation/short film, 'Can I Get An Amen?' (2004).

on turntables is accompanied by snatches and shrieks of recordings by James Brown ('Poetry') or feature guitar riffs from rock recordings such as AC/DC's 'Back in Black' ('Dope Beat'). Schloss writes that 'the SP-12 was created to allow a producer to build rhythm tracks from individual drum sounds that had been previously sampled' (2004, p. 35) but its designers encouraged its users to sample any sound. Hip-hop producers used it to construct drum patterns from the sounds of pre-existing recordings but those using the standard version did not yet have enough sample time to loop complete breakbeats.

While the suggested retail prices of digital sampling instruments were continuing to fall during the 1980s, the increasing use of digital sampling instruments by hip-hop producers had as much to do with the advances paid to hip-hop artists after signing contracts with record labels. Ice T (Tracy Marrow) has explained how the purchase of an E-mu SP-12 used on *Power* (1988), one of the first rap/hip-hop albums to be released on a major label, was paid out of the $40,000 advance from Sire Records/Warner Bros:

> We got the forty thousand, bought an SP-12 [the E-mu SP 1200 sampler/drum machine], and fucked off some of the money. The record probably cost about twenty-five thousand dollars to make, total. We made that whole album with one drum machine, the SP 1200, using the sounds that were in the machine (quoted in Coleman 2007, p. 238).[28]

These advances were recouped from royalties for record sales if albums were commercially successful and provided hip-hop musicians who had become recording artists with the ability to buy digital sampling instruments *and* time in recording studios. In the case of *Power,* the digital drum computer was operated by Afrika Islam, a

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[28] It is not clear from Coleman's transcription which of E-mu's sampling drum machines Ice-T was referring to. The use of in-built sounds suggests it was the SP-12 rather than the SP-1200.

member of Afrika Bambaataa's Zulu Nation organisation, who implies he was using to it to sample from pre-existing recordings: 'I had never used an SP 1200 before. I knew all the beats that I'd have to program – I knew all the loops because I was a DJ who was down with Bambaataa. My supply of material was infinite. I just had to learn how to translate it onto that machine' (*ibid.*). The difficulty was translating the skills of a disc jockey who could use a turntable to cut and loop breaks from pre-existing recordings into those of a programmer using digital technologies to sample breaks from recordings.

The E-mu SP-12 and other digital sampling instruments were beginning to be deployed in the production of hip-hop music during this period but excerpts from pre-existing recordings continued to be incorporated into new recordings through the scratching skills of DJs. On *Paid in Full* (1987), by Eric B. & Rakim, brass sounds were scratched in by Eric B. Rhythms were produced using the pre-set sounds of an analogue drum machine along with the digital sampling of sounds from pre-existing recordings.[29] Rakim explains the process of making 'I Ain't No Joke', the first track on *Paid in Full*:

> That sample was just another James Brown record that I used to rhyme off. At first we was going to sample more of it, but then we decided to leave Eric just scratch [the horn riff] in…With the drum programming on the album, our engineer Patrick Adams did a lot of that. I'd just basically take my break beats and ideas in, and he'd sample it up and put the [Roland TR-] 808 on it. Patrick was the guy who first turned me on to the 808 (quoted in Coleman 2007, p. 206).[30]

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[29] Marley Marl remixed two of the tracks on *Paid in Full* ('My Melody' & 'Eric B. is President'). As referred to earlier, 'Eric B is President' uses/samples 'Impeach the President'.

[30] Oral histories of hip-hop are useful for drawing attention to the role of hidden actors like Adams and other engineers who were responsible for the programming of drum machines and digital sampling instruments in recording studios. Others include Charlie Marotta (EPMD), Shane Faber (A Tribe Called Quest), Schlomo (DJ Premier), and Steve Ett (Public Enemy).

As well as using the pre-set sounds of a drum machine on *Paid in Full* and drum sounds sampled from pre-existing recordings, musicians using acoustic instruments were still employed when performances on recordings could not be digitally reproduced. On the title track of the album, the bass line from 'Don't Look any Further' by Dennis Edwards (1984) can be heard but it was not digitally sampled. Rakim recalls that 'with that track, I always used to rhyme off that Dennis Edwards ["Don't Look Any Further"] in the park. Eric put that beat up under the bass line. I think that was Patrick Adams [their engineer] replaying the bass line' (quoted in Coleman 2007, p. 208). Rather than a revolutionary process in which the introduction of digital samplers and sampling drum machines like the SP-12 radically changed the way in which hip-hop recordings were produced, records were produced using digital sampling technologies, analogue technologies like turntables, *and* acoustic instruments that had been used in hip-hop since the late 1970s. As devices with more memory, more sample time, and lower prices became available, digital sampling became the primary way of reproducing sounds from pre-existing recordings as part of a more gradual process of socio-technological change.

Figure 17 E-mu SP-1200 Sampling Percussion system

Following the Instruments: E-mu SP-1200, Emulator III, and the Acquisition of E-mu

The designers and marketers at E-mu realised users of the SP-12 were disregarding its built-in drum sounds and wanted more RAM memory to sample their own sounds. Marco Alpert states: 'Everyone was ignoring the built-in sounds and going, 'We want more memory do it ourselves'' (quoted in Milner 2009, p. 331). An updated version, the SP-1200, was released in 1987. Advertisements referred to 'the formidable and ever-expanding SP-1200 library of sounds' (E-mu 1987a). The user's manual encouraged users to sample acoustic and electronic drum sounds as well as sounds from 'records,

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CDs, and tapes' (E-mu 1987b).[31] Where the SP-12 required an external drive for storing

sampled sounds, the SP-1200 included an internal drive and came with five 3½-inch

floppy disks containing pre-programmed sounds. Available in the UK for £2199 (Mellor

1987), E-mu's advertisements promised 'a full 10 seconds of sampling time' with a

sample rate of 26kHz. As sample time was distributed across four banks that each stored

eight sounds, the maximum sample time was only 2.5 seconds. Based on the same user

interface as the SP-12, the SP 1200 had seven modules: Set-up, Disk, Sync, Sample,

Programming, Performance, and Master Control. Alpert was responsible for its design

and its use by hip-hop producers was the result of contingency rather than E-mu's

marketing strategy:

> I designed the user interface for the SP-1200, and while I would like people to
> think I was prescient as to think it would be a cool tool for rap and hip-hop
> people, it was totally by accident. None of us had any idea that what we were
> doing would be used in that particular way. But people loved that interface. The
> SP-1200 was very approachable and intuitive and immediate. And then we
> couldn't even kill it (quoted in Milner 2009, p. 332).

Hip-hop producers like Pete Rock and Hank Shocklee who adopted the SP-1200 valued

its 12-bit fidelity levels at a time when 16-bit sampling instruments like the Fairlight

CMI Series III and the Casio FZ-1 were available. They also discovered ways of

overcoming the affordances or technological constraints of these sample-based

instruments. Technological fixes were developed so that, where possible, users were not

prevented from sampling an excerpt from a pre-existing sound recording because the

length of a particular break was longer than the available sample time on the instrument.

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[31] One reviewer praised the reader-friendly and tutorial-based manual as a template for other
instrument manufacturers to follow: 'Congratulations with first class honours must go to the
manual, written by Craig Anderton. Would all you other manufacturers please look at this one
and see how it should be done' (Mellor 1987, p. 22).

Hip-hop producers like Hank Shocklee of Public Enemy's Bomb Squad increased the amount of available sample time on the SP-1200 by digitally sampling the sounds of pre-existing recordings at the wrong speed. LPs that were designed to be played at 33 1/3 revolutions per minute (rpm) were played at 45 revolutions per minute (rpm) so that a longer excerpt could be sampled and the pitch of the sampled recording then shifted downwards afterwards. Shocklee described how 'the way we stretched time, you lose a little fidelity that way. But back then, who cared about fidelity?' (quoted in Milner 2009, p. 334). The designers of the SP-1200 were concerned about what they perceived to be the poor quality sounds of its 12-bit device. Scott Wedge of E-mu admitted: 'It was okay for a drum machine, but it had cheesy pitch shifting. It got away from the fidelity and quality we aimed for' (quoted in Milner 2009, p. 332). Ignoring fidelity, hip-hop producers were more interested in increasing the amount of available sample time. Referring to recordings he produced in the late 1980s, RZA of Wu Tang Clan explained:

> If you lower your sample rate – from forty-four [kHz] to seventeen or twenty [kHz] – it increases your sample time. So you get to have longer samples, but with lower resolution. That gives more of a grindy sound, because the sound breaks up. If you lower the sample rate, that means you're missing some of the frequency of the sample. Years later, I heard people call it 'lo-fi', but I just thought it sounded more ghetto and it let me use more sounds (2005, p. 197). [32]

Using sampling drum machines with more sample time and memory like the E-mu SP 1200 as well as other digital samplers and sampling keyboards enabled hip-hop producers to use longer samples from pre-existing recordings. Quick fixes were found so

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[32] RZA used sampling keyboards including Ensoniq's EPS, EPS 16 Plus, and ASR-10 in the late 1980s and early 1990s and also owned an SP-1200. He used credit facilities to pay a deposit for the device but did not keep up with the repayments: 'that machine changed my life. Once again, I got it from, you know, malfunctioning – I got it maliciously. I put some money down on it and never continued to pay. I got it without an instruction manual or anything' (2005, p. 196).

that even longer excerpts could be digitally sampled and 'inferior' levels of fidelity that

were the result of using low sample rates became part of a specific hip-hop aesthetic.

While there are continuities with earlier musical practices in hip-hop and both analogue

and digital technologies were used in the early 1980s, the development of digital

sampling technologies with more sample time in the mid-to-late 1980s *did* enable

producers to manipulate recorded sound in ways not possible previously. Schloss writes:

> As the 1980s wore on, the potential of digital sampling to go beyond the mere
> replication of deejaying techniques led to an increasingly sophisticated aesthetic
> for hip-hop music. In particular, producers made use of samplers' ability to play
> numerous samples at the same time (a technique which would have required
> multiple deejays and turntables), to take very short samples (which would have
> required very fast deejays) and to assemble these samples in any order, with or
> without repetition as desired (which could not be done by deejays at all) (2004,
> p. 39).

As well as albums like *Paul's Boutique* (1989) by Beastie Boys, Public Enemy's *It*

Takes a Nation of Millions to Hold Us Back (1988) and *Fear of a Black Planet* (1990)

were made using digital sampling technologies and contained more excerpts from pre-

existing recordings than had been employed on earlier albums, which had been

reproduced using magnetic tape. In an interview in 1990, Public Enemy's Chuck D said:

> We approach every record like it was a painting. Sometimes, on the sound sheet,
> we have to have a separate sheet just to list the samples for each track. We used
> about 150, maybe 200 samples on *Fear of a Black Planet*. 'Fight the Power' has
> 17 samples in the first ten seconds. For example, there's different drum loops
> that make one big drum loop: One is a standard Funkadelic thing, another is a
> Sly [Stone] thing, and I think the third one is the Jacksons. Then we took some
> sounds from a beat box. The opening lick is the end of a Trouble Funk record,
> processed with doubling and reverb. And the chorus is music going backwards.
> Our music is all about samples in the right area, layers that pile on each other.
> We put loops on top of loops on top of loops (quoted in Dery 1990, p. 92).

Descriptions of recording 'Public Enemy No. 1' in 1984 and re-recording it in 1986 for inclusion on the debut album, *Yo! Bum Rush the Show* (1987), provide evidence about the process of using magnetic tape to create a single loop where the repetition of a break was the basis for a new recording. In 1984, a Roland CompuRhythm CR-8000 drum machine and two cassette decks were used by Chuck D to splice together sounds from 'Blow Your Head' by Fred Wesley & the JB's and create a 'pause tape'.[33] In 1986, the production process involved organising large sections of magnetic tape around microphone stands in the recording studio.[34] On 'Fight the Power' and other tracks from *Fear of a Black Planet*, the layering of large numbers of loops from pre-existing recordings were made possible by the use of digital sampling technologies and could not have been produced using only analogue technologies like turntables and magnetic tape.

The success of the SP-1200 was a surprise to its designers at E-mu who could not understand why users embraced an instrument with levels of fidelity they considered unsatisfactory. For hip-hop producers, Hank Shocklee and Pete Rock, the technological limitations of the instrument contributed to its unique 'feel' and the SP-1200 became their digital sampling instrument of choice. Speaking in 2008, Pete Rock explained:

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[33] For more on Chuck D's production and the use of pause tapes in hip-hop, see Coleman 2007.

[34] In his autobiography, Chuck D explains: 'After…signing [to Def Jam], we spent the month of July 1986 rerecording 'Public Enemy No 1'. We had to figure out how to keep the original loop, and keep the raw sound. Back then they didn't have samplers that would create a loop. What Steve Ett, the engineer at Chung King…did was take the two-inch tape and cut into a ten- or twenty-foot piece of tape, which he ran through a two-inch stutter machine wrapped around a microphone stand in the middle of the room. Then we recorded the DMX drum machine beat over the loop. Hank and Eric suggested that, instead of using the programmed drum machine over the loop, Eric play the drums by hand, which gave the recording the rawness and imperfection of the original' (1997, p. 85).

I've done everything you've ever heard from me on the SP [1200] except for this new album where I'm using the [Akai] MPC2000XL, and the SP [1200]. In the beginning I was working with the [E-mu] SP-12 and the [Roland TR-] 909. I liked the feel of the SP-12, and once the SP 1200 came out I basically just fell into it (quoted in Mason 2008, p. 57).

For Shocklee, problems with features such as quantisation became a positive: 'It quantized sound very abruptly. It gave the SP-1200 its soul' (quoted in Milner 2009, p. 334). Despite this positive relationship between the instrument and these hip-hop users, the SP-1200 was expensive to produce because of the difficulties of finding parts and E-mu eventually discontinued the product in 1990 (Keeble 2002). Alpert explained:

We'd have to hunt around on the after-market and go through discontinued-parts brokers to get the pieces to keep building them. But every time we announced we were discontinuing it, there would be this hue and cry, with people offering twice as much as [the recommended] retail [price] for them (quoted in Milner 2009, p. 332).

As well as problems manufacturing the instrument and concerns over the fidelity of a 12-bit sampling technology that were of less relevance to hip-hop producers, the designers at E-mu were not pleased with the SP-1200 being associated with hip-hop and controversies surrounding the genre at the end of the 1980s. Scott Wedge explains:

We tried to stuff it back in the closet. Rap had a bad [reputation]. Politically, it was really ugly stuff. We kind of pulled [the SP-1200] out of retirement, but then we learned that what it was being used for was this rap music, we went, 'Well, let's discontinue it, maybe that'll stop it' (quoted in Milner 2009, p. 332).

This might not be another example of a digital sampling instrument being used in ways unforeseen by its designers: the manual for the SP-1200 encouraged users to sample sounds from pre-existing sound recordings on tape, CD, and vinyl. It is, however, an

example of the instrument being used in ways that conflicted with the countercultural image and hippie values that E-mu had tried to cultivate as a company since the 1970s.[35]

While the SP-1200 was one of E-mu's commercially successful products, the company continued to experience technological difficulties with other sample-based instruments. In the same year the SP-1200 first became available, E-mu launched the Emulator Three Digital Sound Production System in June 1987 at NAMM in Chicago. Dave Rossum explained: 'we wanted to give our E2 [Emulator II] customers the additional features they had requested: true 16 bit fidelity; stereo samples; more channels; more, user installable, memory; and a richer feature set. While we accomplished that, there was one fatal problem: reliability' (quoted in Grandl 2015b). At a cost of $15,000 [US] or £8,000 plus VAT in the UK (Wiffen 1988), the Emulator III sampling keyboard offered users 40MB of hard disk space and 4MB of RAM, which could be expanded to 8MB. A sample rate of 44.1 kHz provided CD-levels of sound quality and 47.2 seconds of sample time. Sampling at the lower rate of 33.1 kHz offered users 67.6 seconds, with these times halved when sampling using what advertisements for the Emulator III described as 'true stereo' (Syco 1988). However, owners started to report problems caused by a defect in the SIMM (Single In-line Memory Module) sockets used for the sample memory. These had been designed and discontinued by a company called Molex who failed to inform E-mu of the design flaw (Abildgaard 2012). Owners returned

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[35] In 1994, E-mu relaunched the SP-1200 with a marketing campaign targeted specifically at hip-hop consumers and producers: 'Notice how the major Rap and Hip-hop producers always seem to come up those 'signature' grooves that rattle your bones? Check out the SP-1200 sampling drum machine from E-mu – those grooves start right here. That's right, the machine that you thought was gone is back by popular demand and as BAD [*sic*] as ever' (E-mu 1994).

keyboards to E-mu who issued a recall and replaced all products. Rossum adds: 'the EIII's reputation had been ruined. It took us years to recover' (*ibid.*). E-mu again had to make members of staff redundant and was on the verge of bankruptcy but a licensing deal with Matsushita/Technics provided the company with enough capital to release another product called Proteus/1 at Winter NAMM in 1989.[36] The following year, the EMax II all-digital sampler was launched and a rack-based sampler, the Emulator IIIx, became available in 1993. However, financial problems persisted and after entering discussions with Creative, a Singapore-based company that made soundcards for PCs, E-mu was part of an acquisition deal signed in March 1993. Dave Rossum remained with the company, Scott Wedge stepped down as CEO, and Marco Alpert joined Akai as a marketing consultant in 1994. Rossum admits that E-mu 'didn't worry much about the competitive entries from Casio, Akai, and Roland' (quoted in Grandl 2015b) but the company's failure to focus on selling less expensive digital sampling instruments to a mass market and a larger number of users was one reason for its financial instability.[37]

Conclusion

The designers at E-mu Systems in California who set out in the 1970s to design analogue and digital synthesizer instruments became the designers of digital sampling instruments by accident rather than design. Although some of its products were

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[36] Before its release, the in-house product name for the Proteus was the Plug: 'we had a big hole in our revenue due to the EIII [Emulator III] reliability problems, and needed something to plug into the product map as soon as we could' (Rossum, quoted in Grandl 2015c).
[37] In 2011, Rossum left E-mu and Creative to work on mobile phone voice technologies for a Silicon Valley-based company called Audience. In 2015, he was re-united with Marco Alpert when they started a company called Rossum Electro-Music. E-mu remains part of Creative.

advertised as 'affordable', the decision of the designers at E-mu to focus on high fidelity sounds and professional users was one of the reasons for commercial problems experienced by the company. Dave Rossum explained: 'one of my biggest mistakes was not to use crappy technology. When the Ensoniq Mirage came on the scene, it used 'drop sample' pitch shifting – a technique I'd first seen in the PPG Wave – I figured there was no way that serious musicians would use it, 'cause it sounds awful. Boy was I wrong…' (quoted in Abildgaard 2012). Many users of digital sampling instruments were more willing to accept lower levels of fidelity than the designers of digital sampling instruments. As with users of the Fairlight CMI Series I and II who favoured its 'grungy' and 'grainy' sounds over newer versions, hip-hop producers using the SP-1200 were willing to accept lower sample rates and lower levels of fidelity so they could sample longer excerpts from pre-existing sound recordings. E-mu's first sample-based technologies like the Emulator and the Drumulator were used in ways that had not been imagined by the designers. Marley Marl used the Emulator serendipitously to sample the sounds of drums from pre-existing recordings and E-mu referred to this practice in the instruction manuals of later products. In the case of Peter Gotcher and Evan Brooks of Digidrums, they were actively encouraged by E-mu to re-design the Drumulator by digitally sampling *more* drum sounds. The designers at E-mu Systems were less relaxed about their instruments being associated with the genre of hip-hop and discontinued the SP-1200 before re-launching it and specifically targeting the producers of hip-hop. The use of the Emulator, the SP-12 and the SP 1200 to sample pre-existing recordings was not foreseen by the designers at E-mu but it was not discouraged either – the marketing of the Emulator, for example, encouraged the sampling of *any* sound. As the SP-1200

became the favoured sampling drum machine of many hip-hop producers and a number of high-profile court cases relating to sampling and the infringement of copyright took place in the late 1980s and early 1990s, the use of digital sampling technologies and the practice of sampling became synonymous with the sampling of pre-existing recordings.

Interlude: Case Study Methodology/Rationale

The four case studies in the thesis explore the use of digital sampling technologies by musicians and producers operating in and across a variety of different genres: (1) the technique of microsampling is traced to the work of two producers (Akufen and Todd Edwards) who are allied with two different genres of dance music – microhouse and UK garage; (2) Found are a pop group and art collective influenced by folk, rock, hip-hop, and electronic musics. Their use of digital sampling/sequencing instruments like Akai's MPC2000 is examined to see if they continue an art school tradition of adopting experimental approaches to pop music using new technologies; (3) as a leading member of a loose alliance of musicians called The Fence Collective, King Creosote is associated with new styles of folk but rejects the term when applied to his own music. The use of samples in his home-studio recordings is achieved using a guitar pedal as a device for looping sampled sounds from random sources; and (4) Matthew Herbert is treated by critics and fans as an *auteur* of digital sampling who moves between the worlds of dance, jazz, and art musics. His case study is situated differently to the others because he completely rejects popular culture and adopts a position that places him more closely within the musical worlds of field recording and sound art than those of popular music.

The early chapters of the thesis about the design, development, marketing, distribution, and use of instruments like the Fairlight CMI were based on a combination of archival research and interviews to understand the shifting historical practices of digital sampling. The case studies are based on empirical evidence gained from interviews

about the contemporary practices of musicians, which have sometimes been ignored in the field of popular music studies in favour of a focus on texts, consumption, and audiences.[1] The reason for choosing multiple case studies as the research method for this thesis was to explore the diversity of contemporary approaches to the use of digital sampling technologies. The reason for choosing users like Akufen and Matthew Herbert was because they completely reject the idea of sampling as the use of pre-existing sound recordings while users such as King Creosote and the members of Found have been influenced in different ways by the 'looping aesthetic' (Schloss 2004, p. 33) of hip-hop. The decision to focus on microsampling in the first case study is to begin with a non-loop-based approach to the use of digital sampling technologies and might be described as the 'pilot case study' (Yin 2009). Email interviews were conducted with Marc Leclair (aka Akufen) and Todd Edwards, who are both based in North America. These yielded less data than the focused interviews with users, which lasted between an hour and two hours and form the basis of the remaining three case studies. Found were chosen for a case study because digital sampling/sequencing technologies and hardware devices like Akai's MPC 2000 and laptops were central to both their live performances and their recordings, King Creosote because samples from pre-existing recordings were being used in a genre of popular music – folk - with which it was not usually associated. Both were partly chosen for their geographical convenience – Found are based in Edinburgh, King Creosote in Fife. It was also important to focus on users considered influential in

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[1] On the influence of cultural studies on the study of popular music, see Frith 2007b: 'musicians and their intentions became less interesting than audiences/consumers and the use of music, the notion of the musical text was broadened to include extra-musical and inter-textual elements, there was less interest in history and tradition than in the immediate, the present, the fashionable, etc. [and] there developed a populist suspicion of claims to 'art' or 'excellence'' (p. 11).

the field of digital sampling and a face-to-face interview was conducted with Matthew Herbert during a flying visit to Edinburgh rather than talking to him over the telephone.

In order for this to be a self-reflexive study of music technology users, I want to make clear my position in the field of study. Although this is not an ethnography, the interviews with users of digital sampling technologies are part of a wider and longer process of fieldwork and participant observation prior to this research starting in 2007. While living in London from 2000-2004, I met Todd Edwards briefly in a West End nightclub where he was deejaying, bought vinyl imports of his in Soho record shops, and listened to these records being played and mixed on pirate radio stations. The interview with Edwards was carried out in 2008 by sending questions via email to his management/record company who I had previously contacted while self-employed as a music publisher. After moving to Fife in 2004, I travelled along the coast to the Fence Collective's Homegame Festival in Anstruther, met King Creosote at a music industry charity dinner in Glasgow, invited him to speak about his experiences of running a micro-label to music students, but have not seen him use a delay pedal for sampling. I first saw Found perform live in August 2006 during the Edinburgh Festival Fringe, met them through mutual friends, worked informally on their behalf to promote their first two albums to A&R scouts, and received a short tutorial on using an Akai MPC after interviewing Kevin Sim of the band. With Matthew Herbert, I first saw him use a sampler on the stage of the Queen Elizabeth Hall in 2003. During an interlude, members of his big band read the *Daily Mail* and he recorded/reproduced the sounds of its pages being torn. His visit to Edinburgh to talk about music technology as part of a Hackathon

at an arts venue called Summerhall gave me an opportunity to sit down with him and ask some questions about sampling. Formerly a School of Veterinary Studies, we searched for a suitable space and found a large laboratory-like room with uncomfortable stools. Opting instead to record the interview in an outside bar area, we were distracted by background noise and light rain that threatened to disrupt the recording by forcing us to move indoors. One of the themes in this thesis is the role of accidents in the design of musical instruments and how users of music technologies deal with mishaps that occur during the recording process. The interviews for these case studies were similarly shaped by affordances (the battery time of ageing minidisc recorders) and slips (not being able to use technologies confidently) that impacted on the social practices of gathering data.

One of my arguments in the thesis is that digital sampling technologies are best understood within locally-situated practices of music making, the changing contexts of recording studios (mixing desks, laptops, and software samplers), and the shifting histories of recording and sound reproduction technologies. The use of the term 'sampling' and its definition by users of music technologies is also subject to shifting meanings and changing musical practices. One of the members of Found, Tommy Perman, explained that his definition of sampling had changed along with the shifting ideas and practices of his musical collaborations: 'it started off for me as stealing bits of other people's music and now it's definitely become a way of manipulating a sound' (Perman 2008). Kenny Anderson (aka King Creosote) was happy to accept the definition supplied by detractors of digital sampling that it is a form of theft while Matthew Herbert was willing to admit he did not have an adequate definition of sampling because

practices relating to digital sampling technologies are still developing and changing. Despite the lack of a definitive answer, the case studies are based around diverse approaches to the question itself, which led to further subsidiary research questions: What does sampling mean to these musicians and producers? Why do they define sampling this way? What does it mean to sample music? What does it mean to use samples in music? What technologies are they using to sample? The process of gathering data for the case studies was influenced by Timothy Taylor's question: 'what are these social actors doing in this time and place, and why?' (2001, p. 37) This might be rephrased: how are these social actors using digital sampling technologies and why?

The cultural history of hip-hop presented in the previous chapter was an attempt to shine a sceptical light on some of the claims and orthodoxies in the academic literature on hip-hop and technology. Rather than accepting arguments about the origin points of particular musical practices or the democratisation of music technologies, my aim was to introduce a more nuanced historical account of how technologies were used in the development of hip-hop as a musical genre. This tends to be in more complex and contingent ways than myths that develop around music making suggest: assumptions about the 'affordability' of digital sampling technologies and the widespread use of instruments like E-mu's SP-12 are contradicted by empirical evidence. Synthesizers and samplers did not necessarily replace session musicians in recording studios in the early 1980s; these musicians were often the ones learning how to use synthesizers, drum machines, and samplers. Existing technological and musical practices were not immediately displaced; acoustic instruments and analogue technologies like magnetic

tape and turntables continued to be used alongside new digital sampling technologies. Rather than an abrupt or revolutionary shift from analogue to digital, the introduction and use of new digital sampling technologies was part of a longer and more gradual process of socio-musical change. As Paul Théberge argues, the 'digitalization [of music] has been…a relatively long, transformative process of economic, technological, social and cultural change that has taken place over a half-century or more' (2015, p. 329). However, it may be more appropriate to refer to the entanglement of analogue *and* digital technologies as they continue to co-exist in the production of music. Music is not, and is unlikely ever to be, completely digital. Analogue technologies - tape, turntables, vinyl - continue to play an important role in the production and consumption of music.[2]

As well as myths relating to processes of democratisation and digitalisation, a nostalgic argument about the 'golden age of sampling', which was disturbed by the intervention of copyright law and court cases, has been presented by some hip-hop journalists and academics.[3] A series of lawsuits in the US over the use of digital sampling technologies is assumed to have begun in 1987 with Jimmy Castor's action against the Beastie Boys and Rick Rubin.[4] This was followed in 1991 by a case brought against De La Soul by

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[2] On definitions of analogue, digital, and the relationship between them, see Sterne 2016. In an earlier article, he writes: 'digital technologies are best understood as always bound up with a range of cultural practices and other 'analog' technologies' (2006, p. 95).

[3] McLeod & DiCola describe the golden age of sampling as 'a moment in time in the late 1980s and early 1990s when artists had more freedom to create sample-based music' (2011, pp. 5-6).

[4] Beastie Boys and Def Jam were sued over the use of Castor's 'The Return of Leroy (Part One)' (1977) on 'Hold it Now, Hit it' from *Licensed to Ill*. It is wrongly described as one of the first legal disputes over the use of digital samplers to reproduce the sounds of pre-existing recordings (Fernando Jr. 2004; Demers 2006; McLeod & DiCola 2011). For more on the Manhattan federal district case, *Castor v Rubin*, 87 Civ. 6159, which was settled out of court, see Marcus 1991.

The Turtles for the use of an excerpt from a song called 'You Showed Me' on the album, *Three Feet High and Rising* (1989).[5] These were settled out of court before a legal judgement was delivered on Biz Markie's use of Gilbert O'Sullivan's song 'Alone Again (Naturally)' (*Grand Upright v. Warner* 1991) with a decision that made clear any extracts from pre-existing recordings (or samples) should be cleared with the copyright owner.[6] There were, however, disputes over the ownership of copyright as soon as hip-hop began to be recorded in the late 1970s and early 1980s.[7] The appropriation of songs and the use of pre-existing sound recordings in hip-hop did not begin with digital samplers: as outlined in the previous chapter, the Beastie Boys used magnetic tape to loop extracts from pre-existing recordings on *Licensed to Ill.* The clearing of samples used in hip-hop records became a more expensive and bureaucratic exercise but it would be wrong to conclude that these court cases resulted in a reduction in digital sampling.[8] A loop-based approach to using digital sampling technologies continued to be important to the aesthetic of hip-hop throughout the 1990s and producers like The RZA, DJ Premier, and Dr Dre were forced to be more inventive in their hunt for obscure sample sources, which were manipulated in ever more creative ways to avoid legal detection.

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[5] In the UK, a series of disputes relating to the use of digital sampling technologies to reproduce sounds from pre-existing recordings included JAMS v Abba 1987, SAW v M/A/R/R/S 1987, and Hyperion Records v The Beloved 1991. See Sutcliffe 1987, Beadle 1993, and Frith 1993b.

[6] For more on *Grand Upright Music, Ltd. v. Warner Bros. Records,* 780 F. Supp. 182 (S.D.N.Y. 1991), see Falstrom 1994.

[7] The release of records such as 'Rapper's Delight', 'White Lines (Don't Do It)', 'No Sell Out', and 'Planet Rock' resulted in disputes and lawsuits. Some of these were settled out of court, some involved nefarious activities. See McLeod & DiCola 2011 and Nile Rodgers' (2011) autobiography for examples of intimidation over legal cases brought against Sugarhill Records.

[8] Referring to the consequences of the *Grand v. Warner* case, copyright scholar Siva Vaidhyanathan wrote that 'rap music since 1991 has been marked by a severe decrease in the amount of sampling' (2001, p. 143). According to Joanna Demers, though, this is to 'oversimplify a complicated situation' (2006, p. 97).

What became more problematic after the case against Biz Markie was using large number of samples in recordings, such as those by Public Enemy referred to in the previous chapter. Kembrew McLeod uses the group as a case study to explain how copyright law impacted on the production and sounds of hip-hop and describes differences between albums like *Fear of a Black Planet* (1990) and *Apocalypse 91…The Enemy Strikes Back* (1991): 'Gone were the manic collages that distinguished their previous two albums, where they fused dozens of fragments to create a single song' (2007, p. 68). As well as the problems of clearing large numbers of samples, however, there were other reasons for the distinct change in Public Enemy's sound. Internal tensions within the group caused by arguments over album credits and anti-Semitic controversies meant the Bomb Squad did not produce the *Apocalypse 91* album and it is not surprising it contained a very different style to its predecessors.[9] Recordings featuring pre-existing recordings had been part of hip-hop since Grandmaster Flash's 'The Adventures of Grandmaster Flash on the Wheels of Steel' in 1981 and the threat of being sued for doing so illegally was not new. What was different in the mid-to-late 1980s was the growing popularity and commercial success of hip-hop as a genre. The old recording industry adage that 'where's there's a hit, there's a writ' meant large sums of money were now sought if a song and/or recording was used in a hip-hop recording without the permission of the copyright owner(s). Arguing that copyright law changed hip-hop is a form of *legal determinism*. It is necessary to view the history and production

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[9] *Apocalypse 91* was produced The Imperial Grand Ministers of Funk; The Bomb Squad were Executive Producers. See Myrie 2008 for an authorised biography of Public Enemy and material on its internal disputes. For Chuck D and Hank Shocklee's views on how their approach to sampling changed as a result of court cases related to use of digital sampling, see McLeod 2004.

of music as always embedded within socio-economic and legal contexts. What high-profile court cases relating to copyright infringement in the late 1980s and early 1990s made more difficult was a *particular* approach to using digital sampling technologies.[10]

The argument about the effect of legal action in the US on the musical practices of hip-hop, and the use of digital sampling technologies more generally, has been accepted by copyright scholars like Friedemann Kawohl and Martin Kretschmer who write: 'following numerous restrictive court decisions (culminating in the US case *Bridgeport v. Dimension* 2005), the aesthetics of sampling changed quite dramatically' (Kawohl and Kretschmer 2009, p. 220).[11] Some commentators and academics have been more dramatic and referred to the death of sampling.[12] However, sampling in countries other than the US and in genres of popular music other than hip-hop, where an aesthetic of appropriation is less important, was largely unaffected by these court cases. This will be demonstrated in the second half of this thesis, which contains case studies demonstrating diverse sets of practices relating to contemporary uses of digital sampling technologies. The issue of copyright was broached with the users and musicians who were interviewed for its four case studies - Matthew Herbert pointed to a possible scenario where copyright law might be used by organisations and corporations to claim ownership of sounds that are part of the public sphere and Kenny Anderson (aka King Creosote) opts

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[10] For more on the relationship between digital sampling, copyright law, and practices of re-appropriation across a range of cultural forms such as collage, montage, and remix, see Bourriaud 2002, Miller 2008, Boon 2010, McLeod & Kuenzli 2011, Laderman & Westrup 2014.

[11] For more on *Bridgeport Music, Inc. v. Dimension Films, 410 F.3d 792 (6th Cir. 2005)* and related cases, see Théberge 2004, Schietinger 2005, Mueller 2006, Morey 2012.

[12] See Kemp 1992, Marshall 2006, and Morey 2007 for further discussion of this issue.

to sample pre-existing recordings that are out of copyright – but none complained that it placed restrictions on their creative practices. As Joanna Demers has argued: 'studying the effects of IP law on music by looking only at major label talent is to ignore the vast majority of musicians who do not appropriate from famous artists or who exploit loopholes in copyright law to their artistic and financial advantage' (2006, p. 114).

The interest in legal issues developed by scholars of music and sociologists of culture in recent decades has been helpful in understanding the legal contexts of music making.[13] Too much emphasis, though, has been placed on the role of the law in the making of musical decisions. In a still very useful article on digital sampling, rap music, and the law in cultural production, Thomas G. Schumacher writes: 'current intellectual property rights articulate the limits of the cultural raw materials available for musical production as well as defining the formal boundaries of acceptable end-products' (1995, p. 254). Copyright, however, does not automatically impose limits on the creative choices of musicians in recording studios or on stages. It can, though, prevent recordings containing sounds from pre-existing recordings being distributed to a mass audience if the rights to use the samples cannot be cleared.[14] Frith and Marshall suggest it is misleading to conclude that 'what the industry does (music publishing, record making, rights management and so on) is determined by what the law allows it to do' (2004, p. 13). Copyright is also less likely to place restrictions on the users of music technologies

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[13] The key academic texts on the subject of music and copyright remain the edited collections by Frith 1993a and Frith & Marshall 2004. For a more recent collection, see Rahmatian 2015.

[14] The issuing of cease and desist letters to users of digital sampling technologies became common in the 1990s and has, more recently, been a problem for the producers of mash-ups such as Danger Mouse. For more on this, see Bergman 2005, Brøvig-Hanssen & Harkins 2012.

whose work circulates in economies that operate under the radar of major labels and publishers. This thesis contains case studies of users whose recordings contain uncleared samples from pre-existing recordings but have so far avoided legal action from rights owners because the infringing work has gone unnoticed. This diverse group of semi-professional and professional users of digital sampling technologies demonstrate that copyright is of secondary importance to their music making and technological practices.

One consequence of the concentration on copyright in the academic study of digital sampling has been an emphasis on music as text. In their study of the relationship between art schools and British pop, Simon Frith and Howard Horne argue that categories derived from literary criticism are not always helpful in understanding popular culture because literary criticism places emphasis on the text, 'when what we have to understand are the processes within which something becomes a text: production and consumption' (1987, p. 5). A related issue is the application of terms and concepts such as quotation and intertextuality to the understanding of musical practices.[15] In applying the concepts of 'intertextuality' (Kristeva 1969) and 'hypertexuality' (Genette 1982) to the study of recorded popular music, Serge Lacasse identifies problems involved in transferring concepts from one artistic medium to another. He points out that the use of quotation marks in music is not possible and recognises that 'manipulations can make it difficult to identify the recording from which the quotation has been extracted' (2000, p. 39). Quotation is a problematic concept to use in relation to music

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[15] For more on the subject of musical borrowing, see Burkholder 1994, Burkholder 1995, Bicknell 2001, Metzer 2003. On musical borrowing in hip-hop, see Williams 2013.

and digital sampling. The users of digital sampling technologies who form the basis of these case studies are involved in the manipulation of recorded sound and their approaches to sampling involve using the sounds of everyday life as well as the use of pre-existing recordings. For a user like Matthew Herbert, the sources of sampled sounds are vitally important to his musical practice having been recorded in locations such as war zones and abattoirs but they are not used (or heard) as sonic quotations. Where sounds from pre-existing recordings are inserted into new recordings by other users in these case studies, it is a different social and technological practice to the 'ancestor worship' of African-American performers like James Brown and George Clinton in hip-hop because the sources of the sampled sounds are not always important to the user.

As well as a focus on texts rather than practices, the emphasis on sampling as a form of quotation, appropriation, and musical borrowing has resulted in some of the most useful work on the subject being produced by scholars of hip-hop. Tara Rodgers writes that:

> Tricia Rose's study of hip hop culture, *Black Noise*, provides the most eloquent and detailed analysis of sampling available. Rose grounds hip hop sampling practices in Afrodiasporic expressive traditions and provides extensive evidence of how digital music tools can be employed to articulate specific cultural and musical priorities (2003, p. 314).

However, Rose's decision to concentrate on 'black cultural priorities' (1994, p. 75) is not so helpful when distinguishing, for example, between De La Soul's 'sampladelia'[16] and Public Enemy's more militant approach to using samples from the recordings of

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[16] Simon Reynolds describes sampladelia as 'an umbrella term covering a vast range of contemporary *hallucino-genres* – trip hop, techno, jungle, house, post-rock, swingbeat, and more. 'Sampladelic' refers to disorientating, perception-warping music created using the sampler and other forms of digital technology' (1998, p. 364). For Joanna Demers, sampladelia is a 'fascination with sounds deliberately drawn from outside of pop audiences' orbits' (2006, p. 98).

African-American artists.[17] De La Soul's attitude to the source of samples resonates with the indiscriminate approach of music technology users like King Creosote and the members of Found who are investigated in the case studies of the thesis. They are users of digital sampling technologies who tend to focus primarily on the textures and qualities of particular sounds. In relation to hip-hop, Joseph Schloss reflects: 'producers are not particularly concerned with using samples to make social, political or historical points. In fact, symbolic meaning is almost universally overstated by scholars as a motive for sampling' (2004, p. 146). This may overlook the use of samples by artists and groups like Public Enemy, Dead Prez, or, more recently, Kendrick Lamar to make political statements in hip-hop music. The final case study focuses on a user, Matthew Herbert, who rejects approaches to sampling based on the appropriation of pre-existing recordings but uses digital sampling technologies on most of his projects to make political statements about subjects such as capitalism, consumerism, and globalisation.[18]

By concentrating almost exclusively on hip-hop and the use of digital sampling technologies to quote from pre-existing sound recordings, there has been a failure by academics, critics, and journalists to understand the significance of other approaches to

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[17] De La Soul's Posdnuos (aka Kelvin Mercer) described some of the reasons behind the group's inclusive approach to musical appropriation in the 1980s and 90s: 'We don't exclude anything from playing a part in our music. I think it's crazy how a lot of rappers are just doing the same thing over and over – Parliament/Funkadelic/James Brown and all that. I bought Steely Dan's *Aja* when it first came out, and 'Peg' was a song I always loved, so when it came down to making my own music, that was definitely a song I wanted to use…It doesn't make any difference whether a sample is from James Brown, Cheech and Chong, Lee Dorsey, or a TV theme; if there's something that catches my ear, I'll use it' (quoted in Dery 1991, p. 70).
[18] On the use of digital sampling technologies to make political points about issues relating to copyright, appropriation, and censorship, see articles about Negativland by Sloop & Herman 1998, Sanjek 2003, Zimmerman 2006.

digital sampling and its use in other genres of popular music. In *Creative License: The Law and Culture of Digital Sampling*, Kembrew McLeod and Peter DiCola write that 'sampling has played an increasingly prominent role in the creation of popular music over the past quarter century, and it has developed in a variety of ways' (McLeod & DiCola 2011, p. 2). However, their study focuses almost exclusively on hip-hop and genres of popular music dominated by the sampling of pre-existing recordings, such as mash-ups. In his study of sample-based hip-hop, Joseph Schloss admits 'there continue to emerge sample-based genres – such as drum and bass – that are not considered hip-hop, either by their own practitioners or by those who consider themselves to be bearers of a hip-hop aesthetic. These genres will not be addressed here' (2004, p. 199). The focus on digital sampling as collage and quotation by McLeod and DiCola and the focus on a single genre by Schloss neglect the diverse ways in which digital samplers have been used and continue to be used by musicians and producers working in a variety of musical genres. One of the aims of this thesis is to understand the ways in which digital sampling technologies continue to be used as musical instruments and compositional tools to shape both the practices and sounds across a range of different popular musics.

Part Two:
Following the Users

4 - Microsampling: Akufen and Todd Edwards[1]

Introduction

This case study investigates a specific style of sampling known as microsampling and is situated within two sub-genres of electronic dance music (EDM): microhouse and UK garage. It focuses on the musical practices of two producers who use digital sampling instruments not to loop drum patterns extracted from pre-existing recordings but to design rhythms and melodies at the micro level by manipulating recorded sound from various sources. The origins of microsampling can be traced to the music of Canadian microhouse producer Marc Leclair (aka Akufen) and is also relevant to the music of Todd Edwards and its influence on the sound of UK garage. Using data from email interviews with Leclair and Edwards as well as secondary sources, this chapter sets out to define microsampling and examine the digital sampling technologies used in the making of music with microsamples: for example, both Leclair and Edwards use hardware samplers and software samplers. This case study focuses on users for whom the digital sampler is their main musical instrument and who might be identified by fans, critics, and academics as 'auteurs who have defined the parameters of its use' (Sanjek 1994, p. 346). Producers like Leclair and Edwards are associated with a particular approach to using digital sampling technologies that has *redefined* their parameters and is an example of how the development and use of sampling instruments since the 1990s has extended creative possibilities relating to the digital manipulation of recorded sound.

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[1] A version of this chapter was published in *Musical Rhythm in the Age of Digital Reproduction* ed. Anne Danielsen (Farnham: Ashgate, 2010). I am grateful to the editor Anne Danielsen, Ragnhild Brøvig-Hanssen, Tellef Kvifte, and Graham Weir for comments at different stages.

Defining Microsampling/Macrosampling

The musical practice of microsampling is largely absent from the academic literature on digital sampling. This is partly explained by Dale Chapman who recognises that the study of hip-hop has focused on a loop-based approach to using sampling technologies. Chapman's study of 'the Timbaland sound' is useful for mapping the technological practices of microsampling because he traces how Timbaland (aka Tim Mosley) rejects

> the straightforward sampling and looping of breakbeats from 1970s funk and soul recordings, the approach that characterized most hip-hop between the late 1980s and the mid-1990s. In his wake, other producers have adopted this approach, replacing the old unbroken sequences of breakbeats with drum samples used in isolation – a short snare hit, a hi-hat click, a bass drum kick (2008, p. 156).

This is attributed to the specific properties of the Akai MPC series of sequencers/samplers and the ability to isolate particular drum sounds from a sampled breakbeat. Grooves and rhythms are constructed using small building blocks of sound rather than repeating a pre-existing rhythmical or melodic pattern. Rather than a new development, this signals a return to practices related to the use of digital samplers with small amounts of sample time like the E-mu SP-12, which could only be used to sample individual drum sounds rather than complete breakbeats. Users of technology like Marc Leclair or Timbaland highlight how sampling is a process involving any recorded sound: Timbaland's use of a baby's voice on 'Are you that Somebody?' (1997) by Aaliyah, for example. As Tara Rodgers suggests, sampling 'encompasses selecting, recording, editing and processing sound pieces to be incorporated into a larger musical work' (2003, p. 313). A case study of microsampling is, therefore, useful for shifting the focus of the academic literature on sampling away from the looping of pre-existing recordings.

As discussed in earlier chapters, one of the priorities for designers of digital sampling technologies in the 1980s was extending the amount of sample time available to users. Ironically, the availability of more sample time has coincided with the availability of hardware/software enabling the reproduction and use of very small fragments of sounds. Marc Leclair began using the term microsampling in 2001 after developing a specific approach to using digital sampling technologies in the mid-1990s. He defines it as

> borrowing a very short amount of sound matter…to a point it will not be recognisable, partly for decency and respect of the work of others and, more specifically, because the main idea behind my work is to recycle sound particles into a larger organism, which is, in this case, a musical piece. You can listen or look at it at a larger scale or you can dive deep into its complex structure and dissect it. Sampling is very three dimensional because each source is unknown to the other. Each sound has its own character and grain (Leclair 2008a).

A precursor to Leclair's idea of microsampling is John Oswald's CD *Plexure* (1993), which contains over four thousand small samples or 'electroquotes' of more than one thousand pop songs. Chris Cutler writes: '[there are] so many tiny cuts and samples on it that…their identities [are] impossible to register by listening' (1994, p. 16). According to Cutler, a 'macrosample' was John Oswald's term for the 'capture and re-use of entire recordings as opposed to extracts or snatches of existing recordings' (Cutler 2008). The method is most obvious on the copyright-infringing CD, *Plunderphonic* (1989).[2] Despite similarities in their practice and a shared Canadian background, Leclair rejects the idea that Oswald's use of 'electro-quotes' or macrosamples inspired his own approach:

> Absolutely not, even though I believe his work is very relevant, interesting and unique. John Oswald's Plunderphonic projects were more political, like Negativland's work. My approach is more aesthetic and artistic. Their sampling is intentionally obvious. They want to create a reaction by seeking the most

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[2] For more on Oswald's Plunderphonics, see Oswald 1986, Oswald 1988, Igma 1990a, Igma 1990b, Cutler 1994, Holm-Hudson 1996, Holm-Hudson 1997, Steenhuisen 2009, Sanden 2012.

straightforward sample references from the popular catalogue, which is great because they've opened a can of worms. John Oswald speaks about 'quoting other music', which I think is very well phrased. I do everything but quoting other music. I want people to forget about where it comes from. I wish the elements in my work to gain a new life and become part of a new piece of music as if it was for the first time ever. This fraction of [a] second is now a note, a sound recontextualized. If an organ donor gives his lung to a recipient, it will now be part of this new recipient. This is how I see it (Leclair 2008a).

Continuing the process R. Murray Schafer refers to as schizophonia, which began with sound recording and involves 'the splitting of sounds from their original contexts' (1977, p. 88), Leclair detaches samples from their sources so they are unrecognisable and, measurable in seconds or milliseconds, are more accurately referred to as microsamples.

Microsampling Technologies: Sampling Keyboards, Software Samplers

The technologies used by Leclair as part of his sampling practices began with hardware samplers and one of the 'affordable' sampling keyboards developed in the 1980s. The first sampler he used was an Ensoniq Mirage, which 'changed my whole perception of making music. And it changed the face of electronic music forever' (Leclair 2008a). Here, both the discourses of technological determinism and ANT are reproduced; agency is attributed to the technology and the role of users elided. Leclair went on to use

> the phenomenal Casio FZ-1 sampler on which I did most of my homework and training. I loved the raunchiness of its filter and the grain it added to the sound. It was the favourite of artists such Richard D. James aka The Aphex Twin. I can understand why. It was built to be creative, more than for just recording. Akai also were notable pioneers of sampler development but they never built a machine that suited my needs. It was more a straightforward digital recorder. It never topped Casio or [Ensoniq's] creative possibilities (*ibid.*).

For Leclair, his use of digital sampling technologies is based on an ethical position and associated with a specific ideology of creativity and authenticity, which explains his lack

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Figure 18 Ensoniq Mirage Digital Sampling Keyboard (DSK-8)

of interest in re-using pre-existing recordings as source material for his own recordings:

> I've been always very respectful of the work of others. A sampler is a powerful
> and creative instrument but it has a code of ethics that should be respected. This
> is my belief. It might not be embraced by everyone and I respect that also. Sadly
> it was misused [during] a certain time in music history to rip-off artists (*ibid*.).

While keen to encourage what he refers to as the democratisation of the sampler as an

instrument, Leclair expresses distaste for the re-appropriation of pre-existing recordings

(or artworks) and explained to me: 'I will never engage in a path of voluntary thievery'

(*ibid*.). Approaches to the use of digital sampling technologies he considers *less* creative

are synonymous with stealing and a lack of respect for the work of other artists, even

though re-appropriation involves the permission of copyright owners when samples are

cleared. Rather than celebrate the ways technologies have been used in ways other than

those imagined by their designers, Leclair expresses regret about the use of hardware

technologies in the 1980s to sample pre-existing recordings as an example of *misuse*.

Having initially used sampling keyboards like Ensoniq's Mirage and Casio's FZ-1, Leclair began to use personal computers and software samplers for microsampling.[3] As the amount of RAM Memory available with PCs continued to increase, it became possible for users to store digital recordings lasting hours rather than seconds or minutes:

> When the computer made its first appearance it was like locking a child in candy store. Sampler users were to that day limited to a very restricted amount of recording time. Two megabytes, which you could upgrade sometimes, but the cost was obscene. With the PC you could now record hours of sound matter. So the possibilities became endless. The world became our sound source and with the infinite possibilities of distorting and altering the sound we were now at the dusk of a new blossoming creative explosion (*ibid.*).

Along with enthusiasm for the options available to PC users who wanted to digitally record/sample the sounds of everyday life, Leclair highlights some of the limitations of using a mouse, keyboard, and monitor when making music. When I asked if the sampler allowed sound to be sculpted in a similar way to how visual artists work, he replied:

> The difference is the direct contact with the matter. A lump of clay and a knob isn't quite the same. The rotary and redundant movement of a knob or a computer mouse isn't close to the organic movement of a drawing or sculpting hand. With a computer you are a bit limited with the movement [that] is crucial in sculpting. Or drawing. Most of the work is done internally by the machine. More and more though we will see interactive interfaces where you can hold a pencil and draw the wave of your sound [and] also have [a] screen where you can manipulate the sound with your hands. It will eventually resemble very much sculpting. But electronic [instruments are] still very static. More external devices will help mak[e them] more physical (*ibid.*).

The technologies Leclair imagines using to draw sound waves sound similar to the light-pen that could be used to draw waveforms on the monitor of the Fairlight CMI Series I.

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[3] Early software samplers like Nemesys Gigasampler v1.0 (1998) were designed to overcome the memory limitations of hardware samplers by streaming digital audio direct from the hard drive of a computer. Available for PCs at a cost of £599, Gigasampler required a minimum of 2Gb and could be used with up to 18Gb of hard drive space (Walker 1998). In comparison, the maximum RAM capacity of many hardware samplers at this time was between 8MB and 32MB.

He envisages a physical relationship between the hands/bodies of users and the production/reproduction of recorded sounds that is more active and less constrained by technologies that are viewed as interfering or infringing in an 'organic' creative process.

Along with software samplers that could now be used to record and edit digital audio, software synthesizers were developed as a way of creating virtual versions of hardware instruments.[4] As a user, Leclair is critical of hardware companies and those who design simulated versions of analogue instruments like Roland's TB-303 Bass Line synthesizer:

> I've never had such a good relation with the hardware companies. Every now and then there is, of course, a groundbreaking new technology but 90% of the products on the market are pretty much doing the same stuff: emulation of this and that. How many TB-303 emulations have been done? All of them are fairly close but none of them will ever capture the essence of the real thing (*ibid.*).

The discourse of authenticity about 'real' sounds also extends to 'real' instruments. While still using acoustic instruments - Leclair told me he plays piano for at least five hours a day – he now uses mostly software samplers and synthesizers, partly for reasons relating to domestic space: 'I do have hardware still but due to space inconvenience I have to limit my studio to my bedroom, which is about the size of my bed' (*ibid.*). Analogue synthesizers are re-introduced into his studio set-up but only temporarily:

> every now and then I do plug [in] my Doepfer modular [synthesizer] and tweak it but it's more like a child who finds a toy in the bottom of a bin and rediscovers it, until he gets bored again and trades it for something else. I get tired quickly with gear. I still can't believe that some people can buy a device that plays one or

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[4] Some of the first software synthesizers included Reality, which was developed by Seer Systems and released in January 1997. The President and Head Engineer of the company was Dave Smith, formerly of Sequential Circuits. In the same month, Propellerhead Software introduced ReBirth with simulated versions of Roland's TB-303 and TR-808 instruments. As with E-Mu in the 1980s, users were encouraged by Propellerhead to customise its products. For more on software synthesizers (or softsynths), see Ingram 2009, Vail 2014, Holmes 2016.

two sounds for obscene amounts of money when they have access to the largest sound bank at the tip of their finger: the world. I mean one can argue and speak to me for hours about the purity and fatness of the analogue kick drum of the [Roland] TR-808 but I still think that it is insane to limit ourselves to what the gear multinationals are trying to impose us. That's why a lot of the electronic music out there sounds so similar and unchallenging (*ibid.*).

This point will be developed in the case study of Matthew Herbert who expresses similar frustration with the homogeneity of sampled sounds and has developed a personal contract preventing him from using pre-set sounds in favour of digitally recording the sounds of the world. Leclair's solution is also to digitally sample the sounds of the world but, in his case, these sounds are mediated by radio broadcasting technologies. Having defined microsampling and discussed the digital sampling technologies Leclair uses, I now want to situate his music within the context of genre (microhouse), examine his academic background (the study of visual art), and discuss his musical influences. I then look at *how* he is using digital sampling technologies as well as *why* he is using them.

Akufen's Microhouse: Resuscitating and Reviving Radio Waves

With an uneasy relationship to the American roots of house, producers of microhouse like Jan Jelinek, Thomas Brinkmann, and Isolée were mainly based in German cities: Berlin, Cologne, Frankfurt.[5] Leclair, though, is from Montreal and his pseudonym, Akufen, is a verbal play on the French word for tinnitus (acouphène). Containing over two thousand samples, his album, *My Way*, was released in 2002 by Force Inc, the Berlin-based imprint of Mille Plateau – named after Gilles Deleuze and Felix Guattari's

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[5] In *The Wire* in July 2001, journalist Philip Sherburne wrote about a new sub-genre of house music called microhouse in which 'percussive elements – the thumping bass drum, ticking hi-hat, etc – have been replaced by tics and pops and compressed bits of static and hiss' (p. 22).

post-structuralist tome, *A Thousand Plateaus*. Leclair's technique for collecting

microsamples involves surfing radio stations and sampling random fragments of sound.

These might include sounds from unidentified songs or white noise from a mistuned

signal, which are then re-contextualised into new recordings. He explains his methods:

> I sample hours of radio airwaves every morning and dissect fractions or seconds of them to a point where samples aren't recognizable. Then I assemble every bit like a puzzle, or a collage if you prefer. It's a long process and I never know what I'm gonna end up with. My approach is very much inspired by the surrealistic techniques and the French Canadian automatists, like painter Riopelle and writer Gauvreau. I like the error margin and the unexpected factor, which often makes a lot of sense subconsciously, so I have to be very spontaneous in my way of working. I find a lot of essential answers in my music—it's like psychoanalysis (quoted in Herrmann 2002).

Leclair's approach to microsampling and his use of digital sampling technologies are

directed towards inner explorations of consciousness and outward expressions of

physicality. Inspired by funk as well as Freud, Stevie Wonder is as significant an

influence on his creativity as Steve Reich and Bill Evans. Uwe Schmidt, Matthew

Herbert, and Negativland are the 'sampling virtuosos' (Leclair 2008a) whose recordings

have shaped his musical practices, although it was industrial music and post-punk artists

who stimulated his earliest experiments with the use of digital sampling technologies:

> The sampler just came at a moment in my life when I needed this little extra ingredient to spice up my music ideas. I'd say a trigger to ideas. At the time I was very much listening to bands like the Residents, Severed Heads or Throbbing Gristle and they were all using samplers. I was always wondering where they'd got those abstract, and sometimes Dadaist, soundscapes (*ibid*.).

With an academic background in the study of the visual arts, Leclair refers to the canons

of modern art and literature to pay homage to the historical roots of sampling as collage.

Chris Cutler writes that 'montage, collage, borrowing, bricolage have been endemic in

the visual arts since the turn of the [twentieth] century' (2004, p.144) and the

photomontage of Dada was key in this development. For Leclair, microsampling is a musical expression of collage. Unlike the sampled-based collages of hip-hop though, his sound sources are not extracted from pre-existing recordings but from radio broadcasts that may, along with other sounds, be transmitting the sounds of pre-existing recordings.

Early recording technologies were designed for the preservation of sound, including human voices that could be listened to after the death of their owner.[6] Leclair seeks immortality for *digitally* recorded sounds while, at the same time, treating them as if they are as recyclable as glass or plastic.[7] As well as explaining how his sonic collages are inspired by the images of surrealists like Andre Breton and the literary cut-ups of William Burroughs, he refers to himself as a photographer of sound. Using digital sampling technologies is a way of taking pictures and, for him, is about permanence:

> Sampl[ing] is like taking pictures. I see myself as a photographer. I take snapshots of sound and immortalize them forever, seconds of unpredictable soundwaves crossing paths at a given time. This will never come back again, and nothing else will ever sound like it. It's unique, like everything else in nature (Leclair 2008a).

With an interest in the sounds of human/non-human environments or what might be called the 'aural public sphere' (Ochoa Gautier 2006), Leclair wants to enact the role of what Arielle Saiber calls an 'acoustic microsurgeon' (2007, p. 1618) by trying to resuscitate and revive radio sounds that would otherwise disappear into the ether:

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[6] In terms of usage, early recordings were unplayable and later forms of musical storage such as shellac were fragile and unreliable. Jonathan Sterne writes: 'If there was a defining figure in early accounts of sound recording, it was the possibility of preserving the voice beyond the death of the speaker. If there was a defining characteristic of those first recording devices and uses to which they were put, it was the ephemerality of sound recordings' (2003, p. 287).

[7] On contemporary issues relating to the abundance and disposal of recordings, see Devine 2015.

I attempt to give new life to dead airwaves caught on the very moment of their short existence. My studio has become a graveyard for those dead frequencies. I take pictures of those dying waves and immortalize them in my software sampler – hours of whatever's lying there. From there I just have to dissect parts, organs that are still usable. Whether a part was a success or a failure, there's always something to recycle in order to give it new life. A fraction of a vocal, of a pad, a glitch or interference integrated with an advertisement or a song – everything is recyclable (Leclair 2001).

As with early sound recording technologies, a tension exists between the idea of using digital sampling technologies to preserve sounds by storing them indefinitely and the malleability of sounds in sample libraries. In this case, sounds are not ephemeral but they are reorganised and recontextualised so that the origin and source is unknowable.

As an example of Leclair's recycling of recordings and his approach to microsampling, the opening of the track 'Deck the House' on *My Way* makes it difficult to detect a rhythmical pattern among the microsampled snatches of syllables and instrumental sounds that might be identified as guitar strums or saxophone bursts. Their origin is unknown, however, and impossible to locate with any certainty due to the abbreviated nature of the notes. Simon Reynolds describes the effect as 'choppily post-modern and fractured, making me imagine what it might be like to inhabit the scatterbrain of someone who's eighteen and has barely known a world without videogames, an infinity of TV channels, [and] MP3s' (2003). Leclair uses digital sampling technologies to construct musical collages and melodies using a juxtaposition of random microsamples that may cause feelings of disorientation. In other tracks on *My Way*, the approach to rhythm is more metronomic. It is strictly in time and, in this sense, different to the skip and swing associated with the drum programming in the recordings of Todd Edwards.

While Leclair expresses disdain and distances himself from the re-use of preexisting recordings as sound sources, I now focus on the use of microsamples in the music of Todd Edwards who, unlike Leclair, admits to searching for sounds on pre-existing recordings. Rather than using microsamples that create a dizzying sensation for listeners, Edwards uses them to create chord arrangements that are pleasing to his ears. However, the melodies he constructs may still cause some confusion due to their lack of meaning.

Todd Edwards and his Sample Choirs

While Leclair began using 'microsampling' to describe his musical practices at the turn of this century, Todd Edwards was unaware of the term when I interviewed him: 'I was unfamiliar with the term microsampling until I searched for it online. I don't know if it relates to my work. I can say that samples in my tracks can range from blips that are usually unrecognizable to vocal phrases and musical riffs' (Edwards 2008). Like Leclair, Edwards samples sounds so that the source is not recognisable but is more likely to sample and manipulate vocal sounds compared to Leclair's largely instrumental tracks. Although Edwards was unsure whether his musical and technological practices might be described as microsampling, critics have drawn comparisons between his music and the arrangement of microsamples on *My Way*.[8] When I interviewed Leclair, he was sensitive to accusations of plagiarism and frustrated with the inability of music journalists to see the subtle differences between his use of microsamples and that of Todd Edwards:

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[8] In a review of albums by both artists, Michaelangelo Matos drew attention to their similarities: 'Both Edwards and Akufen (né Marc Leclair) make house music from dippled 'n' dappled microsamples, creating collages from dozens of sources per track: concatenated horn bursts, a quarter of an inhaled breath, half an mmmm, dewdrop keys, clicky stuff, glorious syllable-splashes, instrumental Alka Seltzer fizz, hybrid micro-melodies, vowel needlepoint' (2003).

> I like and respect his work very much, but it's nothing like mine. We're working differently and we're coming from different backgrounds. He uses mainly the cutting technique on vocals, while I use it on the whole song and get my sources from all over the place: radio, TV, movies, field recordings (Leclair 2008b).

Leclair and Edwards are both part of the broad church of house music but are attached to different denominations. While Leclair is more closely aligned with the European glitch of microhouse, Edwards began his career duplicating disco music rooted in African-American traditions before developing the vocal cut-up style that had a major impact on producers and DJs who were part of the UK garage scene in London.[9] Having discussed Todd Edwards' relationship with microsampling, I want to situate his music within the context of genre (house/garage) and outline some of the influences on his approach to the use of digital sampling technologies. I also go on to look at *what* digital sampling technologies Edwards uses as well as questions relating to *how* and *why* he uses them.

Within the UK garage scene, the New Jersey-born producer Todd Edwards is granted special status as the 'godfather of UK garage' and referred to as 'Todd The God' by followers (Read 2001).[10] He began making what he calls 'club music' in 1989 and a few years later began to experiment with the sounds of cut-up samples used by another US-

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[9] The roots of UK garage can be traced to 1992-93 when US garage was being spun by DJs in the second rooms of clubs where jungle was the main attraction. As a darker side of the jungle scene alienated upwardly mobile young ravers, and females in particular, promoters and DJs began to focus on garage and opened clubs to cater for those looking for an escape from drug-related violence and dance music without vocals and melodies. For more, see Reynolds 1999.

[10] In the US, Edwards has a lower profile and, according to one journalist, was 'recognised as just another producer in the enormous house pantheon, paling in hype to the prolific Todd Terry and the extremely in-your-face Armand Van Helden' (Host 2002, p. 19). A contributor to Daft Punk's album *Discovery* (2001), his profile has grown since the release of their album *Random Access Memories* (2013) on which he performed and co-wrote the song, 'Fragments of Time'.

based producer, Mark Kinchen or MK. When I asked about his musical influences and any producers he admired for their use of digital sampling technologies, he told me:

> It started and ended with MK (Marc Kinchen). He was best known for his dub remix of 'Push The Feeling On' by Nightcrawlers. It had a haunting bassline with a vocal hook that sounded like something was being sung over and over but, in actuality, the hook wasn't singing anything. They were just syllables that MK pieced together from the original song (Edwards 2008).

In one magazine interview, he described this as a moment when 'a light bulb went off in my head' (quoted in Host 2002, p. 20) because he realised short samples of vocal sounds could be arranged to create a melody without forming words to make any literal sense. The idea of meaningless melodies was also inspired by a more unlikely source: the Irish singer, Enya, whose synthesized vocal style is achieved by multitracking her voice on hundreds and sometimes thousands of tracks to create the sound of a virtual choir or what she calls 'the choir of one' (quoted in Barrett 2008, p. 18). Edwards explained:

> Listening to the works of Enya, I started using vocals as musical instruments. I love the way certain voices sound. It's like the way a flute is different from a clarinet. One singer differs from another. Different sounding voices add different elements to a track, and to a song as well. Voices have different textures. Some are smooth, some are rough, and some are angelic. Certain syllables and words give different effects in a track. I don't try to sample the same things all the time, but I know what is pleasing to my ears. There are words that I enjoy hearing for there rhythmic qualities. Using vocals as musical elements also made my work more identifiable (Edwards 2008).

Rather than sampling the sounds of a piano or stringed instruments and in contrast to the sampling practices of hip-hop producers more likely to search for rhythmic sounds - the perfect beat, break, or bassline - Edwards realised he could sample the voice as a musical instrument. It is this sampling of the human voice and the manipulation of microsamples to form new melodic phrases that differentiates Todd Edwards' style from the microsamples of Leclair, which are drawn from a random range of sources on the

radio and re-arranged into a more fragmentary and dislocated form of sound design. Edwards creates a choir of microsampled voices, which rely on the integration of divergent syllables and sounds to construct new sonic textures, melodies, and chords.[11]

Edwards finds voices not by scanning the radio airwaves for hours but searching through pre-existing recordings for individual sounds. He explained this while highlighting the central role that digital sampling technologies play as part of his music making practices:

> The sampler is the most important instrument I use to make my music. I go through records, CDs, and MP3 albums searching for musical notes, chords, and riffs. They may be instrumental samples, but I prefer voices. I build libraries of these [and] one sample goes on each key of the musical keyboard. I look for different chord types, primarily major, major 7ths, minor, and minor 7ths. They can then be manipulated into chord arrangements. Singular sounds and voices help build the patterns as well (*ibid.*).

Having developed an interest in the texture of vocals by artists like Joan Baez, The Carpenters, and Crosby, Stills, and Nash, Edwards used digital sampling technologies to re-arrange microsampled sounds from pre-existing recordings into new melodic patterns. However, the voices on 'Saved My Life' (1995), a track that had a significant impact on the early UK garage scene, came not from any folk, rock, or pop icons but the vocal cords of Edwards and his father. When asked in an interview about the strangest thing he had ever sampled, he said '[Laughing]... my father's voice! When I did 'Saved My Life', I sang half of the samples myself, but I needed a baritone voice to go in the little choir

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[11] Nick Prior explains how digital sampling technologies are used to disrupt, dislocate, deconstruct, and de-contextualise the human voice: 'Filtered, chopped, stuttered, looped, repeated, mashed, reversed, pitched-up, pitched-down, degraded, resampled, sliced, quantized, warped, garbled, glitched, bit-reduced, time-stretched, synced, mapped and tracked. These are just some of the actions and states that vocal samples undergo as a result of their transcription into binary code' (2015).

sound, so I had him come in and sing an 'ooh' for me!' (quoted in Read 1999, p. 55).

While digitally sampling sounds from pre-existing recordings without permission is an

infringement of copyright, recording the voices of family members is unlikely to lead to

legal problems. Even when he does sample sounds from pre-existing recordings,

Edwards does not clear these and has not yet been the subject of legal action, primarily

because he is working with short samples where the sources are unrecognisable.[12]

'Saved My Life' begins as a house *track* before the introduction of a sampled voice

repeating a short 'uh' sound along with Hammond organ-sounding stabs.[13] This is

followed by the repetition of four lines where the words sung by female voices are very

difficult to decipher apart from the last phrase, which relays the title of the track. A crash

introduces the microsample choir with its angelic sounding 'oohs' and an individual

voice enters with much clearer lyrics ('You gave me love, I just can't get enough').[14]

The second phrase ('I just can't get enough') is isolated in the second half (the *song*) and

any intended message may have been lost as it crossed the Atlantic: an interpretation of

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[12] In US law, *de minimis non curat lex* ('the law cares not for trifles') is a principle applied in court cases relating to the unauthorised use of pre-existing recordings. It is the idea a small amount can be sampled from a recording or composition without copyright being infringed and has been interpreted differently by US judges. See Théberge 2004 for a discussion of this issue in the *Bridgeport v. Dimension Films* (2002) case and Latham 2003 in the *Newton v Diamond* (2002) case. On the subject of sample clearance and copyright, Edwards told me: 'It would be impossible to clear the samples I use. One track can have up to 100 small samples in it' (2008).

[13] The two-part structure of 'Saved My Life' reflects twin tropes within US house: 'the metal machine music of the 'track' and the gospel humanism of the 'song'' (Eshun 2000a, p. 78).

[14] Lyrics refer to love but Edwards describes the movement from track to song as a metaphor for spiritual awakening: '[The] track is about a man who's going on a spiritual journey and he finds God. In the beginning in the music it's very chaotic sounding and then all of a sudden there's this crash and a gospelly sounding choir comes in. That's the point where he found God. He starts to say the phrase 'You gave me love, I just can't get enough' (quoted in Host 2002, p. 21).

insatiable sexual and/or chemical desire may have been more likely among UK garage audiences. Along with 'Saved My Life', remixes by Todd Edwards are also key to the influence of his vocal cut-up style on the sound of UK garage. His vocal remix of St Germain's 'Alabama Blues' (1995) is a radical reorganisation of the original version, with the insertion of a bridge and chorus with microsamples. It transforms a downbeat story about racial alienation into a vocal expression of overwhelming joy and invites readings of overcoming such adversity.[15] As Edwards explains: 'I improvised the song; if I think something needed a bridge, I'd make one' (quoted in Matos 2007). This inverts the idea of the remix as a deconstruction of the song and shows that digital sampling technologies did not lead to 'the death of the song' (Reynolds & Stubbs 1990, p. 171). It also proves that while digital sampling technologies can be used to deconstruct the sounds of the human voice, they can also be used to re-contextualise and *re-construct* voices in ways designed to appeal to listeners and dancers rather than to disrupt or disorientate.

Using the Ensoniq EPS and Akai S6000: Skip and 'Bumpy Swing' in UK Garage

As well as his use of microsampled voices, the skip and swing in the drum sounds of recordings by Todd Edwards were crucial to their appeal to UK producers and ravers.[16]

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[15] Kodwo Eshun describes the original as: 'a sombre, down-home blues sample with a vibrant hook of gospel chorale. Todd Edwards' remix was U.K. underground garage before it had a name, extracting vowel sounds that were stretched enough to register but so transient that they teased and tugged, then crosshatching them with curlicues of guitar that licked your ear' (2000a, p. 80).
[16] DJ and producer Matt 'Jam' Lamont has explained the role of Todd Edwards's music in the development of UK garage: 'The most popular producer (American – it was almost all American then) was Todd Edwards. He put more *skip* [my italics] into his drums, changed the vocals round

When I asked how he used digital sampling technologies to achieve this, Edwards said:

> There were originally two ways this was done. The first was my early attempts of trying to imitate Kenny 'Dope' Gonzalez's drum programming.[17] The second ingredient was the 16 t[riplet] quantizing on my Ensoniq EPS sampling keyboard.[18] This was my first sampler. I used it to sequence my tracks as well. It had a really hard 16 triplet quantize. The two concepts gave my drum programming a bumpy swing (Edwards 2008).

The quantisation of sounds was first made possible with sampling and sequencing technologies like Page R on the Fairlight CMI.[19] While this is valued by producers working in some genres of music,[20] the programming of 'perfectly' timed rhythms made possible by using digital technologies is what Edwards decided to try and avoid:

> I used to quantize a lot. When I upgraded my sequencer from the Ensoniq [EPS] to an actual computer, the software that I used did not quantize the same way. I started doing the 'skipping beat' style patterns by ear. That was followed by programming the musical elements by ear as well. I think it gives my tracks a more organic feel… less robotic (*ibid.*).

Using the Ensoniq EPS sampling keyboard to sequence sounds with swing is what made them appealing to the ears, hips, and feet of UK garage producers and ravers. Upgrading from a hardware device to sequencing software resulted in programming sounds without the use of quantisation. As with JJ Jeczalik's use of the Fairlight CMI, digital

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and cut them up…When British producers started making their own music, they'd take the drums and the cut-up vocals, and push the bassline up a bit' (quoted in Benson 2000, p. 58).

[17] Kenny 'Dope' Gonzalez is most well known as one half of Masters at Work (MAW) with 'Little' Louie Vega. Along with Todd Terry, Gonzalez was one of the few producers working in US house and garage music during the 1990s to merge elements from house and hip-hop music.

[18] The Ensoniq Performance Sampler (EPS) was introduced in 1988 and cost £1695 in the UK. At the highest sample rate (52.1 kHz), the sample time was 4.95 seconds. See Anderton 1988a.

[19] Schloss describes quantisation as the process that 'automatically moves samples to the nearest appropriate beat within a scheme that the producer chooses. For instance, if the producer chooses a framework of straight sixteenth notes in a particular tempo, the quantize function will set the beginning of every sample to the nearest sixteenth note. While this has the benefit of precision, it could, in fact, make the sequence overly precise or mechanical sounding' (2004, p. 140).

[20] One of the interviewees in Joseph Schloss's study of hip-hop production values criticises RZA of Wu-Tang Clan for his failure to use quantise features that create 'sloppy' beats (2004, p. 141).

technologies are employed by Edwards to retain 'imperfections' associated with 'real'

musicians playing acoustic instruments and recorded using analogue technologies.[21]

The digital technologies used by Edwards as part of his sampling practices when I

interviewed him still included hardware samplers. As well as switching to using

software to sequence his sounds, he had also moved from using the Ensoniq EPS

sampling keyboard to a rack-based sampler, Akai's S6000.[22] Rather than being part of a

narrative of technological progress, this introduced new problems for Edwards to solve:

Figure 19 Akai S6000 Stereo Digital Sampler

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[21] Edwards has spoken about retaining 'imperfections' of 'live' instruments: 'If you truly want to make your stuff sound like its not sequenced – like some computer just did it – it doesn't hurt to go in and do it by ear. Don't just let the computer quantise it, move it yourself. Sometimes it sounds good when something's off. It makes it sound like you're playing a live instrument, which I'm all for. I use all technology in my style but I still like it to sound imperfect. Imperfection is what makes it come across as pleasing to the ear' (quoted in Host 2002, p. 20).
[22] Akai's S5000 and S6000 samplers were upgraded versions of its S-series samplers with a larger monitor-like interface. Containing 8MB of RAM memory, which could be expanded to 256MB, the S5000 cost £1799 and the S6000 £2799 (White 1999).

I presently still use an Akai S6000. Changing equipment has its pros and cons. It allows for growth and the ability to work faster. It can allow you to explore new ideas and add new elements to the creative process. However, it can also become overwhelming. My original Ensoniq EPS had, I think, thirty seconds of sampling time. The simplicity of it challenged me to use what I had to its full potential, improvising and [performing] tricks to cover up the lack of equipment that I needed at the time. For example, instead of an echo or a delay, I looped a sample, and set it to fade slowly as it looped. Also, the sound quality of the Ensoniq EPS (or lack of quality) became as much an element of the music as any other piece of equipment. What makes music recorded before the 1980s so enjoyable is the imperfection of it. It was human, warm, crackly, hissing, muffled, etc. Most of my sampling is from works created before the 1980s (*ibid.*).

A 13-bit device like the Ensoniq EPS is considered to have low levels of fidelity, which became part of the appeal for Edwards. In the same way that judgements relating to fidelity and sound quality shifted with the development of new digital sampling instruments in the 1980s, so too do perceptions about sample time. Thirty seconds of sample time is now viewed as restrictive and such limitations led to creative fixes. As a user of digital sampling technologies, Edwards prefers to sample from analogue recordings made using magnetic tape and expresses nostalgia for *non-digital* sounds.

As with Leclair's use of software samplers, the Akai S6000 gave Edwards more sample time. For Edwards this introduced problems that resulted from having *too* many options:

Switching to the Akai S6000, gave me a greater amount of sample time, thirty minutes instead of thirty seconds. But it doesn't sound the same. It's cleaner. I was able to broaden the scope of what I could do but it becomes overwhelming at times. There are more samples to choose from. More can be added to one track. I developed [a] tendency to be extremely complicated in the sample arrangements, and at the same time fell victim of becoming formulaic and having trouble creating outside the box (*ibid.*).

To explain the difference between using the Ensoniq EPS sampling keyboard and an Akai S6000 digital sampler, Edwards drew an analogy with the process of painting.

Although he does not have a background in the study of the visual arts, Edwards had

mentioned in an interview that having a bank of samples is 'almost like having your

paints ready to paint on the canvas, instead of mixing them as you're painting' (quoted

in Matos 2007). I asked him the same question I had asked Leclair about whether digital

sampling technologies allow sound to be sculpted in a similar way to how artists paint:

> How I compose now is closer to having a blank canvas with an array of paints
> ready to use in front of me. Composing with a sampler that only gave me thirty
> seconds of sampling time would be like being a painter that has to look through a
> numerous amount of boxes filled with old paints. The painter has to go through
> the paint containers one by one. Most of them are dried out. He then finds one,
> and it has a little yellow in it…enough for one brush stroke. So, he brushes a
> little yellow on the canvas. What did he paint? He doesn't know yet…it's just a
> brush stroke. He will search and find a few more colours he likes and the
> painting develops. A couple of weeks later the painting is finished. Of course the
> painter never got a 'reboot error' before he finished saving his work, and then
> had to start all over on the painting!??? (Edwards 2008).

The contingencies of musical practices are mediated by the unpredictabilities of the non-

human. Users matter but so do technologies and the bugs or glitches in machines. Where

Leclair positions himself in an artistic field of production by referring to his many

influences, Edwards shows less interest in art history and is more likely to reflect on his

marginal position in US house and garage scenes. With more sample time and a larger

library of digital samples, he has more options available to him with the Akai S6000 and

is able to paint with sound using a greater range of colours and shades. And yet the

introduction of newer digital sampling technologies into his workflow involves

negotiating more choices, new challenges, and a nostalgia for displaced technologies.

Conclusion

As well as musical styles that vary greatly, Marc Leclair and Todd Edwards have

different relationships to the term microsampling - Leclair claims to have coined it, Edwards was unaware of it – but they share a common approach to making music that extends beyond the functional priorities of dance music. Each of their tracks or songs can contain a hundred or more small samples that would be very difficult to clear if they followed the legal guidelines relating to copyright, though this appears to be of little concern to either producer. For both Leclair and Edwards, digital sampling technologies are not used to loop pre-existing recordings. Nor are they used as a way of replicating the sounds of acoustic instruments. As Leclair explains: 'Of course it will never replace my piano or any other instruments, and it is not the purpose of the sampler as far as I am concerned. If you want to emulate strings, why don't you ask someone who actually plays the violin?' (Leclair 2008a). For Edwards, the sampler is crucial to his compositional processes and has changed the way he works with other instruments:

> My work would not exist if there were no samplers. I could compose music now without the use of a sampler, but even the way I compose music with standard instrument sounds has been impacted by what I learned through using a sampler. There are certain rhythmical patterns that I do that developed as I continued composing with samples over the years. I don't know where I would be if I never purchased a sampler (Edwards 2008).

Digital sampling technologies including hardware and software samplers have enabled these artists to isolate small pieces of recordings and create audio collages using more sample time and a larger palette of sounds. Akufen's are more random and experimental, based as they are on his Dadaist influences, whereas Edwards crafts structured songs with melodies based on his love of certain chord progressions. One creates choirs of microsamples while the other is seeking immortality for lost sounds. This case study shows how digital sampling technologies are used to shape and digitally reproduce

rhythms, melodies, and voices at the micro level. Some of these may have been extracted from pre-existing recordings but are organised and manipulated in different ways to the looping of pre-existing sound recordings. It also highlights the 'interpretative flexibility' of digital sampling technologies, as musical instruments – PCs, sampling keyboards, rack-based samplers – continue to be used in ways that are too diverse for digital sampling to be synonymous with any one musical practice or approach.

5 – *Appropriation, Additive Approaches, and Accidents: Found*[1]

Introduction

In this case study, I use material from an interview with a group of Edinburgh musicians and visual artists called Found who combine the writing of pop songs with the sampling of found sounds. I wanted to find out how Found use digital sampling devices like the Akai MPC2000 and whether they continue an art school tradition of making pop music by experimenting with new technologies.[2] My aim was to explore how Found's musical priorities have moved away from the appropriation of pre-existing recordings towards a recontextualisation of found sounds that is influenced by their study of art as well as their interest in hip-hop. Expanding on themes explored in the previous case study, I was keen to discover if the core song-writing partnership of Ziggy Campbell and Tommy Perman used digital sampling instruments to sculpt sound in a similar way to how they paint or express their ideas in visual art. As well as examining *what* digital sampling technologies they use and *why* they use them, I wanted to find out how artists who are also musicians use digital sampling technologies. Subsidiary research questions were developed before I interviewed Campbell and Perman to gather data about contexts of use and the process of using found sounds: What does the artist's studio look like - if it is a single place - and how important is sampling to the song-writing process? What is

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[2] For more on experimental practices in art school education, their influence on pop musicians in Britain since the 1960s, and the use of technologies by art-school trained musicians like Brian Eno, see Frith & Horne 1987: 'in the 1960s art school students became rock and roll musicians and in doing so inflected pop music with bohemian dreams and Romantic fancies' (p. 73).

prepared beforehand in terms of melody, lyrics and song structure or is everything constructed in the studio? Are digital sampling technologies used as compositional tools that form part of what Brian Eno (1983a) describes as 'an additive approach to recording' (p.57)? Before answering these questions, I begin with some contextual information about the band, focus on what digital sampling technologies they use, and outline some of the influences that have shaped their approach to how they use them.

Finding Influences, Defining Sampling

Found began making music together in 2001 or 2002 depending on whether you read the biography on the band's website or their own record label's website and a few years later were described as making music that 'blends bubbling dancefloor introspection with textured folk pop' (Robertson 2006). Formed by friends, Ziggy Campbell, Tommy Perman, and Kevin Sim, while studying at Gray's School of Art in Aberdeen, the band have undergone a number of changes in personnel and been involved in a variety of art/music projects: catalogue numbers extend to launch parties, documentary films, exhibitions, and performances.[3] One event called 'Flight Path' involved members of the audience throwing paper airplanes through a laser beam to trigger sounds. Other projects include Cybraphon, a custom-built musical instrument and 'emotional robot band', which responded to the amount of online chatter about it on social media sites by performing songs expressing its emotional state. What makes this case study different

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[3] Found's merger of art school experimentalism and pop music aesthetic can be heard on their first two full-length albums, *Found Can Move*, released in 2006 on their own label, Surface Pressure Records, and *This Mess We Keep Reshaping*, released in 2007 by Fence Records. The latter is the micro-label run by a loose collective of musicians in Fife, which has included artists such as James Yorkston and King Creosote, who is the focus of the case study in chapter six.

from the others in this thesis is that rather than working as individual producers or artists like Marc Leclair, Todd Edwards, Kenny Anderson, or Matthew Herbert, Found use digital sampling technologies as part of a more collaborative process of music making.[4]

As individuals in a small group, Campbell and Perman have approached digital sampling from different perspectives and this became apparent in answers about the digital sampling technologies they use and their admiration for particular users/musicians. For Perman, a love of hip-hop provided an introduction to sample-based music and, like the pause tapes referred to in an earlier chapter, he talks of early attempts to use cassette decks and four-track recorders to 're-create that sampling aesthetic of looping stuff up' (Perman 2008). He moved on to using Cubase software[5] before pooling financial resources with his brother, Bobby (aka S-Type), to buy an Akai MPC2000[6] (Figure 20):

> I bought an MPC2000 with my younger brother. We went halfers on one. I learned my way around it then he basically took ownership of it somehow. I think he bought me out. I also had a [Boss] Dr. Sample [SP-202] for a while but I've used things like Cubase then Ableton after that and there was a really good software sampler in Cubase, which I totally got into and then Ableton Live is really an advanced sampler itself.[7] Everything that you do in that I consider

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[4] 'Individual' artists collaborate too. As Howard Becker writes: 'All artistic work, like all human activity, involves the joint activity of a number, often a large number, of people' (1982, p. 1)

[5] Cubase is a music software package developed by Steinberg to record and sequence audio and MIDI data. In 1996, Cubase 3.02 was released with the Virtual Studio Technology (VST) interface and plug-ins. Thom Holmes writes: 'the VST specification encouraged the widespread development of plug-in instruments, effects processors, and MIDI controllers' (2016, p. 509).

[6] Akai's range of sampling drum machines with MIDI sequencing was launched in 1988 with the MPC60 MIDI Production Center. Designed by Roger Linn – his company Linn Electronics had closed in 1986 – it was modeled on the Linn 9000. An updated version, the MPC60 II, was launched in 1991. It was followed by the MPC3000 in 1994 and the MPC2000 in 1997.

[7] In 1999, Gerhard Behles and Bernd Roggendorf started a company called Ableton in Berlin. Robert Henke, who produced electronic music with Behles as Monolake, had been developing hardware controllers for live performance and they began working together on the music software package, Live, released in 2001. For an interview with Henke on Live, see Kirn 2011.

sampling and manipulation. There is a software sampler in it called Simpler and a drum machine sampler called Impulse but the entire programme is just one big sampler as far as I'm concerned because of the way you can trigger loops and sounds and all the manipulating capabilities. They're all derived from things like the MPC and the [E-mu] SP-12 (*ibid*.).

Figure 20 Akai MPC2000 MIDI Production Center

Perman maps a relationship of continuity between the development of software samplers like Simpler and hardware sampling devices like those designed by E-mu in the 1980s. When I asked him why he chose an MPC2000, the answer partly related to contingency:

Just [be]cause somebody was selling it and needed to make some money quickly and me and Bobby got it for a good price but I had used one before and at that point Kev [Sim] was using the MPC2000. Although it's a bit of a behemoth in terms of size and weight it's a really rugged, solid machine and it's just really user friendly. The thing that the Akai samplers are known for [are] the drum pads and that kind of instant touch to it is really conducive to programming nice drum

beats and drum patterns. They've got a few features, which once you start playing around with them you realise that's how some of your favourite producers were doing things. You're just like, that note repeat thing, you're like 'no way, that's so good'. And just pitching the 16 pads on the MPC2000, just pitching the notes, one sound over the 16 pads, you don't play it like you would play a keyboard. It opens up new kind of ways of writing a melody or a bassline or something that you wouldn't do on a guitar or keyboard just because of the way it's laid out so I find that quite interesting (*ibid.*).

With an MPC2000, the relationship between the user and the interface of the technology is more akin to programming and using a sampling drum machine like E-mu's SP-12 or SP-1200 than playing a digital sampling keyboard like an Ensoniq Mirage or Casio FZ-1. Campbell added: 'It's really playable. The velocity sensitive pads are unparalleled. It just really feels like you're playing an instrument' (Campbell 2008). A distinction is drawn here between a digital sampling technology - a non-keyboard based hardware device like the MPC2000 - and a musical instrument. The MPC2000 is perceived by Campbell as a technological device rather than a musical instrument but the physical relationship between the user and the MPC2000 transforms a technology that is interpreted as something to be *used* into a musical instrument that can be played *with*.[8]

As well as using hardware sampling/sequencing technologies like the MPC2000 as part of the music making activities of Found, the laptop is also important to their practices. Perman explained why he enjoys the process of using software samplers to make music:

we use a lot of software sampling now in Ableton Live. They'll have filters on them and as soon as you start playing around with the frequency filter you'll bring out [sounds] you didn't realise w[ere] in the recording you just made. That's when you start playing around with the attack and decay of where your

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[8] On the transformation of an object - the turntable - into a musical instrument by hip-hop DJs, Mark Katz describes this as 'a process, and this process requires not a single individual, but an entire community' (2012, p. 62). Objects have to be *socially accepted* as musical instruments.

little looped sample is and suddenly within seconds you've created an entirely new sound you didn't think of before. I get really excited about that so that's the process that I love. And even doing that sometimes with things I've sampled off a record or stolen online you originally hear a horn sample or something but by the time you've put it in and played it on the keyboard it's become something completely different (Perman 2008).

For Perman, one of the advantages of using software like Ableton Live is the way that sounds from pre-existing recordings from vinyl or online sources can be transformed. As with Marc Leclair and Todd Edwards's microsampling practices, the identity of samples are often unimportant and may end up as unrecognisable. Drawbacks are also experienced, however, when using software on a laptop or computer to organise samples into new recordings because of affordances relating to the quantisation of sounds:

On the computer you're using a combination of your eyes and ears, which is interesting and it's faster for some things but it also means that you make music slightly differently. On something like the MPC it's probably more intuitive, it's more about what feels right in terms of looping something up or like patterns that might be little bits that are slightly out of time which just works better whereas on the computer there is a tendency to lock things into a quantised grid (*ibid.*).

In the same way Todd Edwards programmes his drum sounds so they sound 'less robotic', Perman wants his music to *swing* like the music of hip-hop producers Jay Dilla or Madlib and discovered this could also be achieved using software samplers:

A lot of the best programs these days have swing settings, swing quantization or Live's got a master swing level that you can set up which is so interesting listening to the difference that moving a drum hit a micro millisecond makes to the character of the rhythm. It can suddenly make something sound infinitely more cool than it did when it was just like that kind of military effect (*ibid.*).

Using a computer is deemed to be less intuitive than using an MPC2000 even though both processes involve using eyes, ears, and fingers. Looking at a monitor makes it *feel* more like a visual exercise than a physical one. However, software samplers can be used

to create the swing associated with hardware samplers like Akai's MPC range.[9] Users

can avoid the rigidity associated with quantisation by editing and re-arranging sounds at

the microrhythmic level. While 'perfect' timing is made possible through quantisation,

digital sampling technologies like the MPC2000 and software samplers are still being

used to replicate the sounds of humans playing acoustic instruments 'imperfectly'.

As Perman's approach to the musical practices of sampling has shifted from looping pre-

existing recordings on cassette tapes to using digital sampling/sequencing technologies

like the MPC2000 and editing sounds using software such as Ableton Live, his approach

to the use of these technologies has been shaped by particular hip-hop producers as well

as other users whose music is based less around the re-use of pre-existing recordings:

> In terms of sampling it would be people like Geoff Barrow and the Portishead sound, which I discovered at the same time as a lot of hip-hop. DJ Premier and everything that he did I loved. DJ Shadow is another obvious one to say but what he was doing on *Entroducing* and the records leading up to that were hugely influential on me in terms of listening to music and it opened my ears up to a lot of pretty weird prog rock and stuff. Then latterly people like Matthew Herbert who I find very interesting musically because he writes very highly structured melodic songs but always has a very detailed approach to his production method and he's got his own manifesto. It's very conceptual and obviously very learned. And then Prefuse 73 was a huge influence with his *One Word Extinguisher* album, which I listened to to death. [It] is so melodic and built entirely on an MPC. That was a real eye opener as to what that technology could do (*ibid*.).

Having being initially inspired by loop-based sampling in the genres of hip-hop and trip-

hop, Perman has also been influenced by the music and ideas of a producer like Matthew

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[9] Akai's MPC series are associated with the use of swing settings to programme non-quantised rhythms in hip-hop and electronic music. Roger Linn attributes these 'natural, human-feeling grooves' to a number of factors including the drum pads and note repeat function on the MPC range. The swing settings were first developed on the LM-1 Drum Computer and referred to as 'shuffle'. For an interview with Linn on the topic of microtiming and MPCs, see Scarth 2013.

Herbert who has spoken of his frustration with approaches to sampling based around re-appropriation.[10] What Herbert may underestimate is the listening skills involved in identifying a small segment of music with the potential to be looped and manipulated to form part of a new recording. With producers like DJ Premier and Pete Rock, Perman believes: 'Their ear is like a good photographer, for finding that loop which is five minutes into a rare jazz tune and suddenly there's a lick that was in an improvised solo, never repeated and for whatever reason they've [sampled it]' (*ibid.*). Its dismissal as a lazy form of plagiarism ignores the complexities of an approach to the use of digital sampling technologies that began to frustrate Perman. He describes how he

> fell out of love with the idea of stealing other people's stuff, partly because it's so difficult. You have to really work a sample to turn it in to your idea or manipulate a drum pattern, which can be great fun, but then you start working with a drummer and we sample our own drummer and chop it up. Getting Alan to play in the studio, then I go away and process that drum component a hell of a lot to achieve half way between a live recording and half way towards paying homage to my favourite hip-hop producers or dance music producers (*ibid.*).

Frustration with the difficulties involved in the recontextualisation of sampled sounds led to a process of recording 'real' musicians and what is considered to be a hybrid of live and recorded music. This and the ideas of Matthew Herbert around the use of pre-existing recordings are some of the reasons Perman moved away from sampling pre-existing recordings to looking for other sound sources as the basis for musical material.

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[10] In an interview in 2006, Herbert stated: 'With a sampler there's no distinction between sound and music, or noise and music, and I think that's a liberation that musicians have struggled to find for years. We finally have it and instead people are using it to rip off their record collections, which confuses the hell out of me' (quoted in O'Neil 2006).

While Perman was moving away from an appropriation-based aesthetic, his fellow band member, Ziggy Campbell, was moving closer towards one. When first introduced to digital sampling by the third member of Found, Kevin Sim, he began experimenting with sampling his own guitar playing but moved towards sampling pre-existing recordings and started buying second-hand records deliberately for this purpose:

> I'm not really from that same [hip-hop] background so the first I knew of sampling was when I met Kev and he was telling me about this box he had which was just for DJs. It was a really simple sampler, a Vestax one. It didn't do that much, you could pitch with it. The first thing I started thinking of was how you could play, how you could sample yourself. I wasn't that interested in sampling other people. I've actually become much more interested in that (Campbell 2008).

Rather than the loop-based use of digital sampling technologies in hip-hop, one of the influences on his music making practices is an interest in the music and ideas of artists like John Cage and Steve Reich, which he was exposed to while studying at art college: 'I like the concepts and I like reading about these guys. Sometimes more than I like the music' (*ibid.*). While Reich's tape loops are often cited as a precursor to the looping of recordings using digital sampling technologies, it is Cage's ideas relating to the non-distinction between music and everyday sounds that are more relevant to the musical practices of Found. They are interested in incorporating the sounds and noises of everyday life into their music but, unlike the radical avant-garde, want to retain the rhythms, melodies, and harmonies of pop music. Campbell and Perman converged on the position that digital sampling technologies did not have to be used solely for the re-appropriation of pre-existing recordings and began using them to record, manipulate, and loop sounds from any sound source, including sounds from pre-existing recordings.

Having shifted their focus away from the appropriation of pre-existing recordings, one of the ways in which Campbell and Perman use digital sampling technologies is in line with the early design objectives of technologists at Fairlight Instruments and E-mu. Where users of the Fairlight CMI sample libraries were limited to a generic range of musical instruments, users of software like Apple's Logic Pro can imitate the sounds of specific keyboard instruments like a Fender Rhodes Mark II from a much larger library:

> within my laptop now I have, thanks to Logic, samples of hundreds and hundreds of instruments, particularly keyboard instruments that I like to use, drum kits and stuff, which are actually samples, not synthesized versions of them and so there's instrument sampling where you re-create one of the first uses of the sampler following on from the Mellotron. It's not the same as playing a Fender Rhodes Mark II Suitcase [Piano] or whatever but I can't afford [one] and I don't know anyone that's got one. It gives me the opportunity to sketch something out with a Fender Rhodes and often through a little bit of filtering and a couple of effects here and there it sounds great. Combine that with the rest of the piece of live instrumentation and as a sketching tool that's absolutely fantastic and that's sampling possibilities at a very low cost, opening up a massive range of musical instruments that you can use. I don't swear on it. I don't particularly like the final piece being played that way. I've got opinions against it but in terms of composition it's fantastic and so that's another area of contemporary technology that's really helped me (Perman 2008).

The development of digital synthesizers/sampling instruments that could replicate the sounds of acoustic instruments was met with mixed reviews from users in the 1980s. There are no issues about fidelity levels for Perman as a user of software samplers but rather than being at ease with the use of a laptop to imitate the sounds of acoustic instruments there is a sense that it is still better to use the 'real' thing for performance.

As well as using digital sampling technologies to imitate acoustic instruments, the members of Found sample sounds from acoustic or electric instruments, which are then used as the source for playing these sounds with other instruments. Perman explained

more about this while defining sampling as a process involving any digitally recorded

sound rather than being related to the re-appropriation of pre-existing sound recordings:

> From my point of view, the definition of sampling is the process of recording a sound, having it in what would be a sampler, a bit of technology, that can play back a sound on demand. It doesn't matter where that sound source comes from. You can then use that to manipulate. We always manipulate the sample no matter if it's come off a record or if it's a guitar strum. That, or the sort of ring after you play the guitar chord, becomes a really interesting keyboard sound once put into a sampler and played over the octaves. I think that's definitely sampling. Or you would take your voice and then pitch it and manipulate it. That's sampling (*ibid.*).

The process of manipulation is key to an ideology of creativity around sampling that

places emphasis on what happens *after* the act of digital recording: it is not just about

taking sounds but transforming them to create new sounds or new ways of using sounds.

As discussed in the first chapter, composers at the BBC Radiophonic Workshop used the

Fairlight CMI to create new musical instruments from a juxtaposition of digitally

recorded sounds: Clarjang was made from a clarinet sound and a metallic noise. Perman

uses his computer, software, and keyboard instrument to 'mix' sounds together: a snare

is sampled from a pre-existing recording and combines with the crackle of vinyl. The

sounds of a clarinet are mixed with the sounds of falling rain after recording outdoors:

> We were down at the Sculpture workshop and recorded sounds there. For me, one of the nicest moments [was] when we had this guy who was playing the clarinet in this little pavilion with the rain beating down on it and he held some really long clean notes and as soon as he'd gone I basically fed it into the computer and started playing chords with them and it just sounded so nice. There was something so woody and organic about it with the rain crackle in the background (*ibid.*).

Rather than being expelled by using digital editing tools, the sounds of the non-human

environment and 'the natural world' are incorporated into recordings. Acoustic

instruments like clarinets are recorded in makeshift studios and computing technologies

used to create sounds that are celebrated as 'organic' rather than digitally processed.

Found Sounds: Appropriation, Additive Approach, and Accidents

Having discussed the hardware and software sampling technologies used by Campbell and Perman and explained how their approach to their use has shifted away from the re-use of pre-existing recordings towards imitating the sounds of acoustic instruments and sampling the sounds of everyday life, I now want to look at three recordings to illustrate three different approaches to sampling: appropriation, an additive approach, and the inclusion of sounds derived from accidents or unplanned events in the recording studio. One of the few Found songs with a sample from a pre-existing recording can be heard on a track from *This Mess We Keep Reshaping* called 'Some Fracas of a Sissy'. A short sample of a trumpet from the song 'Night Life in Shanghai (Ye Shanghai)' by Chinese singer Zhou Xuan is used throughout the first half of the track. Campbell explained:

> It's a straight lift. I sorta liked it because it wasn't like we were just taking a groove from it and building a whole tune. I knew we'd taken horns and a little bit of the female vocal and then when I built the track I thought, 'fuck it. I'm just going to let people hear where I've taken this from' (Campbell 2008).

After the second verse, the short trumpet sample is followed by the vocals of Xuan from a longer sample of the pre-existing recording. According to Perman, this act of revealing is a common tactic among hip-hop producers who decide to disclose the sound source. In this case, the source was thought to be an obscure Chinese song. As a result of its use during the Beijing Olympics in 2008, the members of Found realised it was a well-known song in China.[11] Despite its popularity, the sample was not cleared and the song

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[11] For more on Zhou Xuan and Chinese popular music, see Stock 1995. Stock writes about how the recordings of singer-actress Xuan and the music of 1930s Shanghai was rehabilitated by the Chinese authorities in the 1980s and 1990s as a response to the circulation of US and European pop music on cassette tape. In 1985, a double cassette was reissued called *Jin Sangzi Zhou Xuan* (*The Golden Voice of Zhou Xuan*) followed by a four-cassette collection, *Zhou Xuan*, in 1993.

is credited to Campbell/Perman.[12] There have been no legal issues around copyright infringement, which is partly explained by Found's semi-professional status, the release of the recording on a small micro-label, and China's historically lax copyright laws.[13]

The appropriation of pre-existing recordings is now viewed as marginal to the sampling practices of Found - the reasons given for this are artistic rather than legal – and a more typical example of their use of digital sampling technologies can be heard on a track from their first album, *Found Can Move*, called 'Static 68'. The starting point for this recording was not a melody, lyrics, or musical ideas lifted from a pre-existing recording. The focus was on using sounds normally considered extraneous to the processes of listening to vinyl recordings and Perman wants to avoid this being taken too seriously:

> I don't want this to sound too pretentious but it starts with an atmosphere or a character rather than chord structures. There'll be a sample that has got a bit of dirt to it that's really interesting. 'Static 68' started out as a record static loop which I then built lots of stuff on top of but it was actually that little static from the run out groove which was the most interesting thing for me and the whole song grew round that (Perman 2008).

Melodies are also derived from sources such as the sounds of a truck reversing. These are developed into a song by adding guitar chords along with other forms of instrumentation. The original sampled sound becomes irrelevant and, even listening very

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[12] Perman told me his experience of clearing a sample for use on a record released on his own label left him determined to never go through the process again: 'If we sample something then we'll try and hide it or we'll just not worry about it because I know a lot about previous court cases and I think basically what would happen is we'd get a cease and desist letter and that'd be it but the likelihood is in this day and age people wouldn't even know or you get what happened to Danger Mouse, such a high profile case where it made his career and there was absolutely no downside to that project whatsoever so I was an idiot to try and clear stuff' (Perman 2008).

[13] For more on recent changes to Chinese copyright law and government policies relating to the impact of digitalisation on its creative industries, see Street, Zhang, Simuniak, & Wang 2015.

carefully, it is difficult to hear the sound of static in 'Static 68'. This approach to the use of digital sampling technologies maps directly on to Brian Eno's description of an additive approach to recording where sound production technologies can be used 'to chop and change, to paint a bit out, add a piece' (1983a, p. 57). Perman makes the comparison with 'an abstract painter in the way that they keep on working a canvas until they're content and sometimes the original under painting is completely lost' (Perman 2008). The digitally recorded sounds of static or trucks may even be removed at the end of the process despite being what Perman calls the 'initial seed' (*ibid*.) for musical ideas. In this case, the use of digital sampling technologies is continuous with ideas about the recording studio as a compositional tool and the earlier uses of analogue technologies.

As well as the sounds of 'the natural world' like rainfall being included in recordings, Found use digital sampling technologies to retain and experiment with 'urban' sounds recorded unintentionally rather than erase them. When trying to record in home studios, the noises of everyday life in tenement buildings cause problems with 'bleeding' sounds:

> Something I'm getting into just now through necessity because I've got a really noisy neighbour is just not waiting. I used to wait for quiet times to record, especially vocals because you have to have the mic quite high but now I'm just going to leave it all in. If there's someone cutting the grass I'm just going to leave it in there or a dog barking. It's the same aesthetic as the snare drum thing. It's a kind of sampling, unfettered sampling (Campbell 2008).

While digital editing tools can be used to remove unwanted noises or mistakes from recordings, the solution here is to record, sample, and experiment with them to add authenticity. An example of this in Found's music is contained in the song 'See Ferg's in London' on *This Mess We Keep Reshaping*. Campbell's recording of the final vocal take

was interrupted by a phone call that caused him to leave the room, but, rather than edit out unwanted noises in the attempt to capture a 'perfect' performance, we are left with the sound of a door opening. This is different to the short interlude in Kate Bush's 'All We Ever Look For' where the opening of a door leads the imagination of the listener to a fictional performance. For Found, it provides a piece of 'punctuation' and a short pause in the music that occurs just after the lyric 'when everything's gone quiet'. The interruption to the recording acts as a reminder to the listener: this is a *real* performance.

Sampling and the Home Studio: Dislocated Recording and Live Performance

Having discussed how Found use digital sampling technologies to shape their recordings, I want to end this case study by focusing on the role these technologies play in redefining the notion of a recording studio and their use as part of live performance. In his study *Any Sound You Can Imagine*, Paul Théberge describes the growth of home studios in the 1970s as a private space for performers to try out musical ideas before entering professional studios to record them. There is still a tendency to talk about 'going into the studio' and I imagined melodies, lyrics, and song structures being constructed as part of a two-stage process of writing and recording. However, for Campbell and Found, everything occurs in the one place: 'it's all done in the studio really. When we say in the studio we mean in our bedrooms but it's not like we prepare demos and then go and do it proper. It's all part of the same thing' (*ibid.*). Each musician defines the studio differently depending on the equipment they use. For Campbell, the home studio is a misconception as it encompasses a much smaller area of private space depending on his domestic arrangements. The way in which Found work might be

described as an example of *dislocated recording* where each member of the band works in isolation in domestic or temporary spaces before coming together at different points in the process when their physical presence is required.[14] The use of laptops equipped with recording software and software samplers enables collaborative practices to occur flexibly without having to go into a place designated as a professional recording studio.

The mobile nature of the laptop and its ability to function as a virtual recording studio and a digital sampler means that recording music in a studio is less about a single location or multiple pieces of expensive equipment.[15] As well as the bedroom being a location where Campbell's contributions are performed and recorded, Perman explains that he and other band members can be even more flexible in terms of the spaces they use to create music: 'Kev's studio is his sampler and so he'll just sit with his headphones plugged in so he can work anywhere. My studio's just built round my laptop with a few things plugged into it' (Perman 2008). It turns out there are no differences between the studio Perman uses as an artist and the one he uses as a musician because they are one and the same thing: 'I sit at my laptop and kill my eyes for music and art. I'll sit and draw at the very same desk where I'll write crap little melodies. I'll switch between having to do something in Photoshop to working in Ableton' (*ibid.*). The boundaries

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[14] Albin Zak refers to examples of 'location recording' (2001, p. 105) when rock bands like The Band or The Red Hot Chili Peppers left large state-of-the-art recording studios in favour of old mansions in Los Angeles with primitive mixing desks and outdoor swimming pools.

[15] In his article 'OK Computer: Mobility, Software and the Laptop Musician', Nick Prior explains that mobile music technologies have extended 'the possibilities of collaboration and iteration. For instance, band members no longer have to be physically co-present to collaborate with each other. Software files and audio files can be easily sent through electronic or regular mail to be added to, modified or mixed, then returned for further iteration' (2008a, pp. 919-920).

between the role of musician and artist are as fluid as the flick of a cursor or the prerequisites of funding applications. When asked if Found consider themselves musicians or artists or both, Campbell's answer is that 'it depends who's paying. It depends what we're applying for' (Campbell 2008). The definition of a recording studio is just as fluid, consisting solely of a single piece of hardware (a laptop) with software (Ableton Live) that enables sounds to be digitally recorded, stored, and manipulated.

When I interviewed Found in 2008, they were keen to move from the dislocated recording experience described above to one where they could capture the experience of their live performances by playing together in a professional recording studio.[16] Campbell thinks 'that something [special] happens when people play music live together' (Campbell 2008). The use of digital sampling technologies and other sound recording technologies involving individual acts of music making with non-human technologies is less valued than the 'shared oxygen' of humans making music together as part of live performance.[17] For Found, though, this does not exclude the use of laptops and digital sampling technologies are as important to their live performances as acoustic and electric instruments like drums, bass, guitar, and keyboard. The absence of a dedicated digital sampling device during live performance was noticeable when Kevin

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[16] This occurred with Found's third album, *factorycraft* (2011), which was recorded in Chem19 Recording Studios and released by Chemikal Underground, the label that owns the studio.
[17] On the relationship between musicians and non-human technologies when overdubbing in recording studios, Albin Zak writes: 'overdubbing requires the performer to summon up inspired performances in the absence of not only an audience but other musicians. What in a live situation is an interactive interchange among players – a kind of musical breathing together – becomes a one-way responsive relationship between the musician and a fixed, unchanging musical partner, the track' (2001, p. 54).

Sim, who programmes and plays the MPC2000 when the band perform on stage, did not appear for a gig because he had overslept. It limited their set list options and they managed to perform five songs without him before 'he appeared in the crowd and everyone cheered. It just made everything make total sense and have more impact' (Perman 2008). The MPC2000 had previously been used as a click track for the band to keep time but became an instrument of live improvisation when used with a delay pedal:

> The two of them together means he [Kev] can have so much variation in his sound that I think it's definitely a musical instrument. He'll trigger a sample then mess with the settings on the delay pedal and he can really change the pitch. It's a different live performance every time he uses it and that for me is an example of a really good live musician (*ibid.*).

Even though early digital synthesizer/sampling technologies like the Fairlight CMI were mobile enough to be transported by aeroplane or car and used as part of live performances by artists like Stevie Wonder, digital sampling technologies have often been thought of as a studio tools that are used (rather than played) by a single individual. The mobility of contemporary digital sampling technologies, like the MPC2000 or laptops with software samplers, means they are not just compositional tools used in recording studios. They are musical instruments used as part of live performance, collaboration, and real-time improvisation. Through both their design and use, they have also contributed to re-shaping the definition of what a recording studio is and can be.

Conclusion

One of the reasons Found form part of a useful case study about contemporary uses of digital sampling technologies is they continue an art school tradition of investing pop creativity with technological experimentalism. The case study also contributes to a

necessary literature on amateur and semi-professional musical practices because the importance of non-professional music making has often been ignored in the field of music studies.[18] Found's approach to using digital sampling/sequencing technologies like the MPC2000 and software samplers like Ableton Live's Simpler has shifted from re-using the sounds of pre-existing recordings towards the inclusion of found sounds in their recordings and the imitation of acoustic instruments. The sample libraries of software packages like Apple's Logic Pro make available sounds from a wide range of musical instruments and Found use it to replicate the sounds of Fender Rhodes Mark II Suitcase Pianos. In this case, the laptop might be described as a 'boundary object' (Star & Griesemer 1989) containing software for cultural production in the fields of art and music that moves between and enables users to work in different social worlds.[19] While this and other digital technologies are utilised with enthusiasm, what remains is an older discourse of authenticity around ideas of playing live and using *real* instruments.

The sounds of pre-existing recordings also continue to provide members of Found with the basis for new musical ideas. This case study centred on its core song-writing

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[18] According to Prior, 'in the domain of music, the idea of the 'amateur' has been given especially short shrift. Indeed, with the exception of Ruth Finnegan's now classic ethnography of music-making in a small English town, very few studies have tackled the amateur in any detail. Finnegan herself notes how musicological analysis has gravitated to the 'best' or 'highest' forms of music-making. In popular music studies this has meant skewed attention to the highly commodified and spectacular domains of the large-scale sub-field' (2010, p. 402).

[19] Like 'interpretative flexibility', the concept of a 'boundary object' is derived from the social study of science and can be usefully applied to the study of music technologies. Star and Griesemer describe them as 'objects which both inhabit several intersecting social worlds *and* [original emphasis] satisfy the informational requirements of each of them. Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity…' (1989, p. 393).

partnership but Kevin Sim is another key user in the group. His use of the MPC2000 as an instrument for improvisation has led to him being described as an 'MPC wizard' (Campbell 2008) by a fan keen to learn more about his sampling techniques and programming skills. One of the ways Sim uses the MPC is to sample untraceable excerpts from vinyl recordings by other artists and groups in a practice similar to the microsampling techniques outlined in the previous case study. Perman says: 'He samples off records a hell of a lot but you'd never know. He hears tones he likes and…just chop[s] a tiny little segment of it [to] create a palette of sounds, maybe just ten sounds that he can then write an entire piece with' (Perman 2008). Digital sampling technologies are musical instruments that have been used to expand what George Martin calls 'the infinite palette of musical colours' (1979, p. 76) and the last two case studies in this thesis continue to examine the wide range of socio-musical practices relating to digital sampling and the 'interpretative flexibility' of its instruments. While sampling in the genre of hip-hop has influenced the approach to using digital sampling technologies by members of Found and a loop-based approach to the re-appropriation of pre-existing recordings remains relevant to the next chapter, the musician around whom the next case study is based has little interest in hip-hop. The third case study in the thesis attempts to extend the range of genres and musical technologies associated with the practices of digital sampling by exploring the use of a foot pedal as a looping device in folk music.

6 - *Foot Pedals and Folk Music: King Creosote*[1]

Introduction

When academics have examined how digital sampling technologies have been used as part of music-making processes they have tended to focus on a single musical genre: for example, Joseph Schloss's (2004) ethnographic study of sample-based hip-hop or Timothy Warner's (2003) analysis of Trevor Horn's pop productions. In this case study, I want to explore how the use of a device not usually identified as a digital sampling technology has been used to re-shape the practices and sounds of a genre, folk, not usually associated with the use of digital sampling technologies. A genre like folk, where musicians and ideologues have placed importance on the authenticity of performances and traditionally been opposed to the use of new technologies, becomes an interesting site of study for understanding the diversity of contemporary approaches to the use of digital sampling technologies.[2] As folk music splintered into many sub-genres, the ideology of authenticity became less important though 'folk' musicians who decide to use digital technologies still have an ambivalent relationship with the genre.[3]

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[1] An initial draft of this chapter was presented at the International Association for the Study of Popular Music (IASPM) UK and Ireland conference at the University of Salford on 7 September 2012. I am grateful to Barbara Bradby, Norma Coates, Adam Scott, and Francisco Tapia-Robles for helpful comments and questions.

[2] According to Frith, folk was a celebration of 'pre-capitalist modes of music production' (1981, p. 159) at the end of the nineteenth century. This ideology became problematic during the twentieth century as a relationship developed between folk music and sound recording. For more on field recordings and the use of recording technologies within folk music, see Western 2015.

[3] Rob Young writes that, when used in reference to contemporary music, folk has become 'as much a signifier of texture and aesthetics as an indicator of ingrained authenticity – as in such descriptive terms as 'acid folk', 'free folk', even the ungainly 'folktronica'' (2010, p. 8).

This ambivalence towards the genre of folk and its anti-technology ideology can be found among the Fence Collective in Fife. Its leading members include Kenny Anderson (aka King Creosote) and their music has been labelled both 'new folk' and 'indie folk'.[4] Albums released by Anderson on its micro label, Fence Records, include musical borrowings such as found sounds, lyrics lifted from email messages, and voicemail recordings.[5] Choral voices and classical recordings can also be detected in the low-fidelity mix along with instruments more traditionally associated with folk music, like acoustic guitars and accordions. To investigate these incongruities, I met with Anderson and a semi-structured interview was guided by three basic research questions – What digital sampling technologies do you use? How do you use these digital sampling technologies? Why do you use digital sampling technologies? The answers to these questions provide the structure to this case study about the use of a digital foot pedal as a digital sampling device. As an example of another 'boundary object' that is used for different purposes in different socio-musical worlds, the foot pedal is used in this case to loop sampled sounds from pre-existing recordings but from a different range of sources and in different ways to the appropriation of pre-existing recordings in hip-hop. This is a

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[4] Described by one journalist as 'the Fife indie-folk mafia' (Maxwell 2009), the Fence Collective was started by Anderson in the 1990s and has helped shape the careers of KT Tunstall, Withered Hand, and The Pictish Trail. For more on the history of the Fence Collective and Fence Records, see Galloway 2013. For a history of 'new folk', see Encarnacao 2013.

[5] Anderson claims to have released more than forty albums as King Creosote. These include a series of DIY albums on Fence Records: *12 O'Clock on the Dot* (2000), *Disclaimer* (2001), *Psalm Clerk* (2003), *Vintage Quays* (2004), *Rocket D.I.Y.* (2005), and *They Flock Like Vulcans to See Old Jupiter Eyes on his Home Craters* (2008). Two albums were released on the major-owned label 679 (*KC Rules OK* (2006) and *Bombshell* (2007)). Albums released by Domino Records include *Kenny and Beth's Musakal Boat Rides* (2003), *Flick the Vs* (2009), and *Diamond Mine* (2011) with Jon Hopkins, which was nominated for the Mercury Music Prize.

case study of a user of digital sampling technologies who is ambivalent about folk music and is also ambivalent about the use of digital sampling technologies more generally.

Old Instruments, New Folk: Accordions and Foot Pedals

Anderson's close association with folk music is partly due to family connections - his father is the accordion player and Scottish Dance Band leader Billy Anderson who has presented a radio show called *Sounds Scottish* on Tay FM since the 1980s - and partly due to his membership of the folk/bluegrass band, the Skuobhie Dubh Orchestra in the late 1980s and early 1990s.[6] Instead of considering himself part of the Scottish folk scene, though, he views his life as a performing musician with the Skuobhie Dubh Orchestra and his development as a singer/songwriter (King Creosote) quite separately:

> As somebody that played folk music on an accordion when I started in bands it was almost like starting a different musical life entirely. The two things were no way connected. Even with the Skuobhie Dubhs starting up, that was a bluegrass, kind of folk band. I wasn't writing songs for them so the songwriting thing and me writing my own music and recording it was completely different to this other thing. It wasn't until later on in the Skuobhie Dubh history when I started writing songs for that band and that kind of took over really and then I realised that everything I had learned in music was just another tool (Anderson 2009).

Anderson is keen to contrast his musical identity as a 'folk' performer with his musical identity as a singer/songwriter, though these are more fluid than this account implies: the accordion is one of the instruments he uses when performing as King Creosote. In this role, he finds himself identified as a folk musician because he uses these kinds of instrumentation but the description of his music as folk sits uncomfortably with him:

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[6] The Skuobhie Dubh Orchestra is pronounced The Scooby Doo Orchestra after the cartoon character. The band, whose members included KT Tunstall and Anderson's brother Een, released three albums but broke up when their relationship with a record label based in Scotland 'started to go a bit sour' (quoted in Cloonan, Frith & Williamson 2003, p. 110).

It has rankled me a little bit when they hear the accordion and instantly classify it as folk when to my ears it's obvious that the songs I write are not folk songs. They're just not. They're just your normal pop songs I suppose but the fact that I've used [an] accordion or sing in a [Scottish] accent has somehow made them folk songs. I don't know any folk songs that are in any way as obscure. The folk songs I know are pretty good in that they tackle age-old themes and they do it well and they're relevant. A folk song written in the 1800s is relevant today because they tackle age-old worldly themes. I don't [think] my songs are going to be relevant in twenty years never mind in two hundred years (*ibid.*).

Despite wanting to be affiliated with pop music, Anderson has enjoyed little chart success and has been described by one journalist as an 'alt-folk darling to the (relative) masses' (Wilson 2009). He disassociates himself from folk music because of the themes of his songs and thoughts about their longevity; it is not related to the use of digital sampling technologies that may be contentious with the purists and ideologues of folk.

The device that enabled the practices of digital sampling to become part of Anderson's early songwriting experiments as King Creosote was a second-hand guitar pedal.[7] He bought it in the early 1990s when the members of the Skhuobie Dubh Orchestra visited the city of Dundee on a shopping expedition in search of new musical equipment:

Yonks ago when The Skuobhie Dubhs were still together it must have been [19]93 or something like that we'd up to that point just primarily been a bluegrass dry instruments kind of band. We never bought effects. We never bought amps. And then for some reason we decided we should get some of these musical toys. So we went over to Dundee and it was things like: 'maybe it would be good if the fiddle had an amp. Maybe it would be good if I used a couple of guitar pedals'. So I was just looking at guitar pedals and I bought an equaliser. All it does is give you a bit of EQ and [then] I saw this second-hand pedal. It was

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[7] Effects units have traditionally enabled musicians to alter the amplified sounds of various instruments. Foot pedals (also known as stompboxes) have been used to create a range of sonic effects for guitarists. Steve Waksman explains that pedals are 'small metal boxes containing transistor circuits that, when connected between the line that ran from guitar to amplifier, altered the electronic signal delivered to the amp, changing the sound. The most common such device was the distortion-inducing fuzzbox, a staple of [Jimi] Hendrix's sound' (1999, p. 183).

like a digital delay pedal and I'd never really thought of delay but it was second-hand and the guy in the shop did the salesman pitch and said 'look it's a really good quality pedal and that's pretty cheap. If you bought this new it would cost this and if you're thinking of [using] delay…'. So I bought this pedal and in that Skuobhie Dubh band, because we'd gotten so used to not taking any additional equipment, all this stuff just ended up sitting about (Anderson 2009).

One reason The Skhuobie Dubh Orchestra did not integrate these technological devices into live performance was a reluctance to do so by members of the band with stricter ethical ideas about the kinds of musical instruments that are appropriate for folk or bluegrass music. According to Anderson, there were also aesthetic challenges and problems posed by trying to combine more traditional acoustic instruments with sounds that could be recorded and performed using a digital delay device as a digital sampler:

> With The Skuobhie Dubh Orchestra the hardest thing was getting the other band members to let these things in. At the time the drummer was very forward thinking and he was up for using anything but at the other end of the scale I had my brother [Een] who would just be like 'how can I play a banjo over that?' or 'banjos are for this style and this style only'. He always has been a bit of a purist when it comes to the sounds that you make and the instruments that you use and the style that you play. I'm a musical tart really. I just put anything together. My main drive was to find things that sound new and combinations that sound new (*ibid.*).

Anderson's claim to be more musically adventurous than his peers highlights internal divisions within the folk world about what technologies are appropriate or acceptable for use. Rather than being part of folk music ideology, his ideas about mixing sounds are influenced by concepts with their origins in art music such as originality. He uses the digital delay pedal as a sampler to create music as part of a modern aesthetic, which is focused on the development of new sounds and not the preservation of traditional songs.

Anderson bought his delay pedal with the intention of using it to create effects for his guitar but, after some initial experiments, it was never used for this purpose. The pedal became a different kind of musical object: 'I didn't use it all. It was just something I bought as a digital delay pedal and then it was too much hassle to set it up, to set a delay time. I just never used it as a pedal. It just went in the box and in fact I've never used it as a guitar pedal. It's my sampler' (*ibid*). Rather than choosing to use the pedal in this way, Anderson stressed how his discovery that it could be used as a looping device was accidental. It was the result of 'mucking around' with things and asking questions:

> It's a dead simple pedal. It's got like two pots on it and you can push it at one end. There's like a time pot and then this one had different settings. It had like loop. It had repeat and then after that it looked like a kind of volume type thing or something. So that was it. I was like 'what does that loop thing do?' So I was just mucking around with it and realised that when I punched in or out the loop function this thing could act as a sampler so it would take a bite of up to say four seconds in length and it was quite a hit or miss but if I got it on loop it would just go endlessly and I was like 'wow!' (*ibid.*).

Anderson did not mention the name or model of the digital delay pedal during our interview and, in later email correspondence, he explained the reason for choosing the foot pedal related more to its colour than any design specifications. He did not choose to use a particular kind of digital sampler and made a comment about the pedal that can be interpreted as light-hearted rather than attributing agency to a non-human object: 'it chose me' (*ibid.*). Like the laptop, an object that crossed boundaries of art and music in the previous case study, the digital delay pedal acts as a digital sampling technology and

is used in ways that were unforeseen when purchasing the device. In this case, it is used

to loop sounds from pre-existing recordings rather than to create guitar effects.[8]

For a solo artist without much equipment or the skills of other musicians at his disposal,

Anderson's delay pedal proved useful as he searched for sounds to add to the keyboard,

guitar, and accordion sounds on the recordings he was working on in his home studio:

> When that band [The Skuobhie Dubh Orchestra] broke up and I started recording
> as King Creosote and had a digital eight track, I didn't have a lot of equipment. I
> didn't have keyboards. I had a Casio keyboard or something. I had a guitar,
> accordion, and some percussion bits and bobs. I was always looking for some
> other thing and I found this digital delay pedal and was like 'oh aye what's this?'
> So I was trying to use it and because it was second-hand it hadn't come with a
> manual or anything (*ibid.*).

As outlined in the first half of the thesis, manuals for digital synthesizers and sampling

instruments like the Fairlight CMI confused users such as Richard Burgess. Users like JJ

Jeczalik ignored them because they were too long and they preferred to learn about the

instrument through a process of trial and error.[9] Anderson did not have the option of

reading a manual because, as a second-hand pedal, it came without a box or instructions.

Even if the pedal had come with a manual, Anderson would have likely ignored it for

fear the process would be perceived as 'technical' and 'logical' rather than 'creative':

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[8] In the 1980s, pedals were designed that allowed sounds to be digitally recorded, stored, and
looped. For a useful history of guitar effects pedals and more on the introduction of digital delay
pedals, see Hunter 2013: 'the wonders of digital delay arrived on the pedalboard in the early
1980s with what seemed massive capabilities for long delays, clean signal reproductions and the
endless fun of one, two, or up to 16 seconds of looping delay' (p. 38).

[9] On tacit knowledge gained by recording engineers through practical experience, see Horning
2004. The concept of tacit knowledge was developed by Michael Polanyi and defined by Harry
Collins as 'knowledge or abilities that can be passed between scientists by personal contact but
cannot be, or have not been, set out or passed on in formulae, diagrams, or verbal instructions
and instructions for action' (2001a, p. 72). For more, see Polanyi 1958, Collins 1974, 2001b.

> I've got a real phobia of manuals and I've got a real phobia of having to sit down with a bit of kit for hours to work it out. Every time you use it you have to plan ahead. For me that, and recording and writing, they're different things. One is a technical exercise and I've always been like that. It's maybe just laziness but I really find that so boring and a lot of music done in that way like an extension of that is to go onto Pro-Tools and all that cutting and pasting and looping. To me that's more of a mathematical, computer-based exercise (*ibid.*).

This distinction shows how Anderson's ideas about the creative process are shaped by the ideology of folk music (anti-technology) as well as art music (originality). As a songwriter, he is keen the process remains an artistic rather than a technical one and the song is separate from its digital editing. This, of course, assumes the artistic expression of ideas can be disconnected or separated from the technologies used to express them when the development of musical ideas are always entangled with music technologies.[10]

Anderson's use of digital sampling technologies is of secondary importance to a commitment and fidelity to the notion of a song, which exists prior to the act of recording it. There is a desire to protect the craft of songwriting from the use of more 'rational' technological devices. Though it seemed unlikely Anderson would want to use a rack-based sampler as part of his music making and use of technologies, I asked if he had ever been interested in buying a device from Akai's range of digital samplers:

> Nah, it's just too much bother. Gavin in the band uses samplers and he's continually asking me to get the sources of samples I've used so that he can get them into his Akai. Even when we've done that, and we've done it on a few occasions, to my ear they don't sound right because they are right. He's made them right. He's given them a start point and an end point. He's almost gotten them bang on in time with the song. He's either time-stretched them or he's made them how they kind of should have been but to my ear that sounds wrong.

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[10] As Frith writes, 'the industrialisation of music cannot be understood as something which happens *to* music, since it describes a process in which music itself is made – a process, that is, which fuses (and confuses) capital, technical and musical arguments' (1992, p. 54).

What I like about the samples I've used and the fact I'd gotten used to them is the irregularities in them. All the wrongness that is in those samples has become the thing that I hear and when I hear it sanitised or just cleaned up or quantised it just doesn't sound right. It's like 'That's not it.' And to try and explain a feeling, you can't do it (*ibid.*).

Musicians are more likely to use the language of right and wrong rather than good and bad when considering musical decisions (Frith 1990) and this appears to be the case with Anderson. His interest in inserting digital samples of pre-existing recordings into his music is because they sound 'wrong' and results in recordings containing the kind of 'mistakes' and 'errors' that digital editing tools and technologies are able to remove. While other members of the Fence Collective like Found or The Pictish Trail have used Akai's MPC range of digital sampling sequencers, Anderson has never had the urge to play (with) or experiment with one:

Not really. I've watched other people working them and I'm just like 'I don't know how you can be bothered with that'. It's too clinical. It's too music by numbers. Oh, you've got to set this. You've got to set that. You've got to do a crossfade. You've got to take the start and the end and get rid of any clutter. No you don't (Anderson 2009).

Anderson has fixed ideas about music making as a creative act and wants to be involved in playing an instrument rather than programming one. Devices dedicated to digital sampling hold no appeal for him and he favours using music technologies to create 'imperfections' as part of the DIY ethic of 'new folk' music.

Sample Sources and the Non-Use/Use of Delay Pedals in Live Performance

Having discussed the digital delay pedal Anderson uses as a digital sampling technology rather than a guitar effects pedal, I want to briefly examine two King Creosote recordings where the pedal has been used to insert sounds from pre-existing recordings.

The accidental discovery that a digital delay pedal could be used as a digital sampler and looping device encouraged Anderson to begin searching for sample sources he could record and loop. This started as a trawl through an old collection of cassette tapes:

> I was like 'this is the kind of thing that acts as sampler'. So then I started going though old tapes that I had, looking for or listening for sections of music that were uncluttered enough because obviously this thing is taking everything in. It's just like a mono feed and a mono out so I didn't want chunks of music that were overly elaborate. I wanted things that were stripped back so I was going through classical-esque tapes and old random stuff that folk had given me. I'd known about sampling and the big story that The Verve got nabbed for whatever so I knew there was some illegality around it but at the same time I reckoned [it'd be okay] if I went for more obscure and certainly classical stuff that's outwith [copyright]. I know that record labels have copyright on a lot of classical stuff but the owner doesn't. The owner's long gone. It's almost in the public domain. So I was going through folky things. I was going through classical things, opera things… (*ibid.*).

There are similarities here between the sampling and looping of pre-existing recordings by Anderson and the technological practices of loop-based hip-hop. Yet it is a genre he has little interest in: 'It's something I admire but it's just a style I'm not into. I've never heard a hip-hop record and thought 'wow'. It's just something I've never listened to. I don't have any hip-hop records' (*ibid.*). While there is an unwritten rule among hip-hop producers about sampling only from original, rare, and, often expensive, vinyl recordings (Schloss 2004), Anderson does not adhere to any strict rules or set of sampling ethics. He samples sounds from a more random selection of sources: old classical tapes, gifts from friends, and free CDs given away with music magazines such as *Q*. The sources of Anderson's samples are whatever happens to be 'lying around'.

Though Anderson is not interested in searching for breakbeats on rare vinyl recordings, one of his first attempts to use the digital delay pedal as a digital sampler was to create a loop from a group who have been a staple of sampling in hip-hop since the mid-1980s:

> The first proper loop I got was a Funkadelic loop. At the time I didn't know what the song was. It was just on an old cassette. So I heard this Funkadelic intro and I thought that would make a good loop so I just set the thing at maximum and then caught it on the first beat of the bar and it just so happened that the four second maximum length[11] was exactly a bar and a half of this Funkadelic [song], like bang on. I was going through a song called 'So Forlorn' and I was like that sample works with every chord in this song. It was like a four chord trick but the sample was perfect behind it. So I just used it as the backbone of the whole song and then I started going back to that initial Funkadelic song and started nipping out little 'woo ooh' noises (Anderson 2009).

On the version of 'So Forlorn' from the album *Kenny and Beth's Musakal Boat Rides* (2003) a guitar riff and vocals by George Clinton have been looped from an uncredited Funkadelic recording and are multi-tracked with Anderson's acoustic guitar and accordion. The source of the sample is not as important as whether the sounds complement chords in the pre-existing song composed by Anderson. Without a manual for instructions on how to loop sounds using the pedal, he attributes contingency to the process of synchronising sounds from the pre-existing recording with the recorded sounds of acoustic instruments. Rather than possessing specific programming skills that have taken time to learn or read about in a manual, Anderson suggests it is about luck.

Aware of the possible legal implications of sampling sounds without the permission of the relevant owner/s, Anderson looks for sounds from recordings of songs and

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[11] 'The four second maximum length' refers to Anderson's belief he can loop four seconds of pre-recorded sound without needing permission from the copyright owner of the song and/or the recording. This relates to the principle in US law of *de minimis non curat lex* ('the law cares not for trifles') referred to in the microsampling case study. However, it is not part of UK law.

compositions that are in the public domain. This led him to using samples from out-of-copyright recordings of classical music as heard on another song from *Kenny and Beth's Musakal Boat Rides* called 'Turps'. The decision to sample a classical recording was not just because it was assumed to be out of copyright. There are other aesthetic reasons related to difficulties recording particular instruments in the confines of a home studio:

> I was using choral works instead of me doing my own backing vocals and then there were certain things I'd fall into that I'd be looking for like I'd never at home get a decent bass sound so I'd often go and look for low strings. I've used a lot of choir stuff. I've used a lot of world music sounds because they're unusual and anything that was stripped back. I wasn't looking for drum loops per se or guitar wig outs or anything like that. I was almost using that sampler as another instrument and then I got into sampling vocals I'd already done on a track and I used it in all sorts of ways to sample old recordings of my own band (*ibid.*).

While the sources of Anderson's samples tend to be from a random range of pre-existing recordings, he has also appropriated performances from studio and unreleased recordings by fellow members of the Fence collective. A series of drum sounds and solos recorded in a coal cellar in the early 1990s doubles as an ad-hoc sample library and a source of drum loops. On the sleeve notes of the King Creosote album *Red on Green* (2004), Rich Amino is thanked 'for any drum loops that fell off his recording on to mine'. Where there can be issues over copyright infringement when sampling from pre-existing recordings, here the ownership of songs and recordings is dealt with informally.

Anderson mainly uses his digital delay pedal while working on recordings in his home studio and tends not to use his foot pedal while performing live. This is partly for practical reasons and the difficulties of incorporating samples into songs while on stage:

> I have a couple of times tried to put a couple of samples onto [live songs]. As I say, I got this other thing off my brother. It's not a proper sampler but it is in a

way. It's a gadget about that size and it can hold up to 16 seconds [of sound] but you have got some control over starts and ends and looping times and all that. I've tried to use that live a couple of times and it's just never worked out. It's hard to play live with samples because the samples I've used are not clear. They're quite muddy sounding anyway. You can't really hear what's going on. I suppose when those looping pedals came along I did have the notion of getting one of those when they first arrived because it's a similar way of doing things. You've got to punch in and get out. It's very live but then I was thinking where would I get my samples from? Would an audience sit there and wait while I fast-forwarded and rewound a tape to get a bit, nip it out, pitch it, no that's not quite right, go back. I didn't see how that would work in a live [setting] (*ibid.*).

In Anderson's case, the absence of his foot pedal or other digital samplers is partly because he thinks listening to a recording and going to a live performance should be two different experiences.[12] The use of digital looping pedals like Anderson's have become common in the live performance of new folk and other genres of popular music by artists like Ed Sheeran and KT Tunstall. Tunstall famously used an Akai's E2 Head Rush pedal (Figure 22) when performing on the TV show *Later...with Jools Holland* in 2004 and she uses the foot pedal to create a groove during solo performances by tapping a rhythm on the side of her guitar and recording and looping the sound. 'Woo hoo' accents are added and allow her to perform the role of backing vocalist as well.[13] Anderson dismissed this approach to the foot pedal as a technological gimmick when I asked him about his own non-use of the digital delay pedal during live performances:

I find [it quite dull] when people use those pedals and over use those pedals. They all do the same sort of thing. They tap their guitar. They play a little lick on

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[12] He states: 'I'm not into replicating recordings at gigs anyway. I think, 'great, leave all those songs sample-ridden because that's how they were done' but the live version doesn't have to have the same thing' (Anderson 2009).

[13] John Richardson explains how the device enables the real-time simulation of multitrack recording studio techniques and writes that 'contrary to the received wisdom on looping and other repetitive practices, which portrays them as 'passive' and when, sampling is involved, 'parasitical', the evidence of this television footage points towards a heightening of agency through the performer's immersion in the act of composition' (2009, p. 91).

the guitar and when you do stuff like that you're limiting yourself to chords that'll work over those notes. Most of the people I've heard using those pedals the song ends up the same. You get this over saturated mush and they all do it and it's a shame but that put me off really. I don't know if I want to go down that same route because it sounds like that's the route you go down if you have one of these because if everyone's doing it the same kind of way they've now got this bit of cleverer stuff that have harmonised with that. They've added a bit of vocals. They come out and they all come in. Like well, I don't see the point of that really (*ibid.*).

Anderson's use of the delay pedal differs from that of someone like KT Tunstall because he does not record loops of his own musical gestures that are then repeated continuously during the performance of a song. He is keen to position himself as an artist who uses digital technologies in ways that unpredictable, unplanned, and not part of a social trend.

Figure 21 Akai E2 Headrush

Off-kilter Randomness, Colour, and Textures: Why King Creosote samples

In this case study I have described how Anderson samples (a second-hand delay pedal as a digital sampler) and what he samples (an arbitrary range of sounds on old tapes and free CDs - funk, classical, world music - as well as found sounds, field recordings, and recycled studio recordings). The final question that has shaped this case study is why:

> Why? It was just by accident. I don't think I would ever have gone out and bought a sampler and I never have. I was just going through my stuff, I realised this pedal had this unique, you know, whatever. I haven't seen that pedal owned by anybody else and I imagine they must have sold thousands of the things but I never come up against that pedal. I've never seen it again in a shop. It was just this freaky thing (*ibid.*).

Stressing how the introduction of digital sampling technologies into his music making practices was by accident rather than design, Anderson positions himself as following an aesthetic of difference that fits neatly with the 'indie folk' ethos of the Fence Collective and an ideology of not 'following the crowd'. The use of the foot pedal as a digital sampler also relates to working in relative isolation on small, self-financed projects:

> It was all about recording on my own because I don't play that many instruments and I didn't have that many different sounds at my disposal but what I did have was a library of CDs that I could get sounds out of even smaller samples where I've heard something amid the clutter and I've just tried to go in and get the tiniest amount and sometimes when you take the pitch of that all the way down you end up with this quite amazing drone whether it was a flute to start with or anything in that range. So it was all born out of me looking round the room and thinking I've used that three times this week. I can't have that again. That sound I'm tired of. It just came from that and then I realised the power of this thing. I'm amazed at how often I used that thing. I mean now I've got to stop myself using it cause I didn't realise I was using it quite so much. I listened back to certain albums and it's all over it like from start to end and there's not one song I didn't go in and use that thing and then that goes on over a period of years so now I use it more sparingly (*ibid.*).

The technical restraints (or affordances) of working alone in a home studio without other musicians using a limited number of musical instruments is eased by the possibilities

digital sampling offers in terms of finding sounds from pre-existing recordings and avoiding the overuse of particular instruments. However, the introduction of new sounds using the digital delay pedal leads to the overuse of particular digitally sampled sounds.

The insertion of digitally recorded samples in Anderson's music often comes at the point in the recording process where something extra is needed to provide texture or colour and this approach to multi-track recording chimes with the additive approach to recording discussed in the previous case study about the art/music collective, Found:

> [In] most cases I've done the guide guitar, I've done my percussion, put a bit [of] keyboard on. I've only got eight tracks so I'm getting to about track six or seven or eight now and thinking I just need something else: what is it? and that's the point where I listen to things and see if could nip out either a choral thing or a strings thing or anything. It really depends at what point I need to have that extra thing if I need it (*ibid.*).

The use of sampled sounds provides an easy way of adding more instruments or sounds to create something 'a little bit different'. The use of the foot pedal as a digital sampler is also about finding sounds from pre-existing recordings to add new colours to a recording of a song. In this sense, Anderson is part of the same art school tradition to which artist/musicians like Found belong, even though he did not study at an art college:

> For me, mainly it is adding colour. I'd say 90% of my sampling and taking samples has been to add just this other texture that I haven't been able to get from the few things that I have lying around. I don't know if I have the energy to get a string section together from somewhere, rehearse, dot the music, get them rehearsed, and bang when in fact it's a simple case of there's the three notes I want on repeat and there they are (*ibid.*).

Anderson uses the digital delay pedal to 'paint with sound' and add colour to recordings but with less sophisticated tools than artists like Found who use laptops and software samplers. Early digital sampling instruments like the Fairlight CMI were designed to

imitate the sounds of acoustic instruments amid fears they would replace orchestral musicians. For Anderson, the delay pedal is an energy saving device. It is used to sample and loop the sounds of acoustic instruments that he finds on pre-existing recordings rather than co-ordinating a process where 'real' musicians are recorded playing them.

As well as the use of digital samples by Anderson to add colour to recordings, the use of the foot pedal is important for him to introduce a randomness and off-kilter feel to his music. In contrast with the design aims of digital musical instrument designers at Fairlight Instruments or New England Digital, he does not want control over sound:

> With the delay pedal you've got no control over how long your sample is. You can't just cut in and cut out. You've got to try and guess how long you want your sampling window to be but it's dead easy to pitch it once you've got it. What's not easy is to get it to continually loop. I used to say that my samples were either in time or in tune but never really both. What that did with my music was it threw up a kind of random element. I quite liked the idea that these samples were all off-kilter with the song and your ear had to grow to kind of learn the patterns. It adds a little bit of playability to your songs (*ibid.*).

By inserting samples into music that are out of time or out of tune, Anderson wants to create a more difficult form of listening and challenge the perceptions of his audience about what sounds right or wrong in relation to harmony, melody, and rhythm. He chooses sounds that clash and also wants to introduce elements of surprise and chance:

> I want to be constantly surprised by what comes out the end of the recording using these random samples as one way of ensuring that really. I don't know where a song's going to end up because sometimes I put a sample on as the last thing and it's completely changed the nature [of it]. It's added something really melancholic and added this weight to the lyrics that wasn't initially there or it's just this random thing. It doesn't quite fit the song but it's made me think about the chords in a different way. The song becomes brand new again (*ibid.*).

Anderson adds samples to recordings in order to change the way he hears particular songs. The use of the delay pedal as a digital sampler to include random sounds from pre-existing recordings alters the feel and mood of songs that no longer remain fixed. A deliberate decision to leave things unpolished and create a tension between sounds considered 'right' and 'wrong' also extends to the volume of particular samples:

> Some samples just did not work if they were too loud. If I got them quiet enough they seemed to add a kind of weird[ness], even though they were probably in the wrong key. In fact I know a lot of them were in the wrong key but if you had it quiet enough certain notes would just disappear. I haven't yet heard anyone else use samples in quite the same way because there's something really uncontrived about it. It just sounded really naive but now when I listen back it just sounds like two musical styles coming together by chance and working in a random way, which for me when I listen back to older songs is the thing that my ear has gotten used to and I still hear new things and new combinations of notes when you've got this weird, off-kilter sampler running up against something metronomic and everything time it comes in it's completely different (*ibid.*).

Anderson's desire to create 'a unique bit of music' (*ibid.*) separates him from the folk ideologies of tradition and history about which he is ambivalent. However, by describing his use of the digital delay pedal as 'uncontrived', he highlights how the discourse of authenticity, which was based around the use of 'real' sounds and 'real' instruments in the first two case studies, continues to be important to a user of digital sampling technologies who is also ambivalent about the use of digital sampling technologies.

Conclusion

The foot pedal has become an established part of Anderson's musical toolkit and does not appear to be more or less significant than other instruments he uses to make music:

> I don't even think of it as a sampler anymore. Like I said, I just think of it as this thing that it is like having another instrument in the room and I don't use it all the time just like I don't use the accordion all the time. I don't use the guitar all the

time. I don't use my piano. It's just something that I like to use now and again and I've learned over the last twelve or so years or more I know what it can do. I know it inside out. I know what it effect it will have and the beauty in it is just finding new things to use that trick on so yeah I do listen to certain music in a different way and just think I could nip that bit out and I know exactly how it would fit (*ibid.*).

The way Anderson listens to music has changed and mirrors how hip-hop producers are always on the look out for short extracts of recordings that can be sampled and looped. Having used the instrument for more than a decade, there is a familiarity with the foot pedal and understanding of what it can do that confirms what Brian Eno has described as the 'rapport you can have with the instrument' (1995, p. 35). A close relationship develops between the user and the musical instrument. Anderson explains: 'it's almost like the sampler becomes like a co-writer in the room or an arranger. That always comes out of just being bored and not having a lot of money to go out and buy new gadgets every time, like 'I've used that keyboard to death. I need to get something else' (Anderson 2009). Anderson's language indicates the importance of the foot pedal in his compositional processes and the extent to which his use of digital sampling instruments have co-constructed and mutually shaped his technological practices as a music maker.

This case study has aimed to expand the range of musical genres associated with the use of digital sampling technologies and shift the focus of sampling studies towards an exploration of how folk music and other musics – rock, blues, country and western, and western art music - have been mediated by both analogue and digital technologies.[14] In

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[14] The use of digital sampling technologies also conflicts with the ideology of rock, for example. Speaking about his experiences in the studio during the making of Nirvana's *Nevermind*, producer Butch Vig explained: 'This is a band that specifically didn't want things to sound

the case of folk, this has occurred using a number of tools in the recording and production of music: the portable tape recorders of John and Alan Lomax, the multi-track recordings of folk rock artists in the 1960s and 70s, and the digital sampling devices used by Kenny Anderson and other members of new folk music scenes in the first decades of the twenty-first century. Anderson uses his digital delay pedal to sample and loop pre-existing recordings into his home studio recordings, although this is in a different way to the tradition in hip-hop of using recordings from genres like soul, funk, and jazz as a form of 'ancestor worship' (Tate 1988).[15] A folk musician like Martyn Bennett sampled the songs of travelling people from 1950s field recordings on his album *Grit* (2003) as a way of merging traditional cultures with new technologies. However, Anderson does not seek to place himself 'in the tradition' of Scottish folk music through his use of digital sampling because the sample sources are chosen randomly and are largely irrelevant because their recognition by audiences and listeners is not important.

This case study has shown how pre-existing recordings continue to play an important role in the use of digital sampling technologies and how hardware instruments continue to be favoured by some users over laptops, PCs, and software samplers. The aim was to expand the range of instruments associated with digital sampling technologies - digital synthesizers, sampling keyboards, sampling drum machines, rack-based samplers – to

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'digital'. I think it's a dirty word to them!' He goes on: 'The band is really into spontaneity and first takes, and they weren't very good at doing things over and over again. So every time they were warming up, I'd be recording. After I felt they had some good performances, I'd use an Akai sampler to take things and move them around' (quoted in Jackson 1992, p. 37).

[15] On the song 'Two Frocks at a Wedding' from the album *Flick the Vs* (2009), Anderson sampled the sounds of bagpipes and Gaelic vocals on one of his father's recordings, though it is unlikely he would describe this as an act of 'ancestor worship'.

include digital delay/looping pedals. It has highlighted how the foot pedal has been used by Anderson as an object that helps cross the boundaries of musical genres. The final case study in this thesis focuses on a user considered influential in the field of digital sampling who has a more tangled relationship with popular culture. This, and a manifesto that places restrictions on the sounds he can record with digital sampling technologies, makes his practice a significant contrast to those in the other case studies.

7 - The Sounds of Everyday Life (and Death): Matthew Herbert[1]

Introduction

One of the arguments developed in this thesis is that approaches to the study of digital sampling by scholars have focused too heavily on the borrowing of sounds from pre-existing recordings and the resulting issue of copyright infringement. Mark Katz writes:

> Digital sampling offers the possibility of what I would call performative quotation: quotation that recreates all the details and timbre and timing that evoke and identify a unique sound event, whether two seconds of Clyde Stubblefield's drumming or the slow, unsteady tapping rhythms produced as a I type this sentence. In other words, traditional musical quotations typically cite works; samples cite performances (2004, pp. 140-1).

Katz is correct to state sampling allows the re-use of musical and 'non-musical' performances[2] but stops short of recognising that a much wider range of human and non-human sounds can be sampled and used as part of (popular) music. The final case study in this thesis focuses on the music and ideas of Matthew Herbert and his practices are important to my arguments because he samples from everything *but* pre-existing sound recordings. A set of rules called the Personal Contract for the Composition of Music (P.C.C.O.M.) prevents him from doing so. These include using 'real' instruments rather than virtual instruments and avoiding pre-existing sounds on synthesizers and drum machines. Like early users of digital sampling instruments such as the Fairlight CMI, Herbert wants to use 'real sounds' (Herbert 2012). For this reason, digital sampling technologies are used by Herbert to produce field recordings and this case study focuses

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[1] An initial draft of this chapter was presented at a meeting of the Scottish Pop Academics Network (SPAN) at Glasgow Caledonian University on 25 January 2013. I am grateful to Bob Anderson, Matt Brennan, Martin Cloonan, Evangelos Chrysagis, and Nessa Johnston for useful questions and comments that forced me to think more critically about its content.
[2] As Frith writes, 'music becomes music by being heard as such by the listener' (1996, p. 100).

on the re-use of field recordings in the production of (popular) music. This chapter, thus, explores Herbert's use of found sounds in dance music - food being digested, knuckles being cracked, teeth being brushed - and the use of field recordings made in sewers, war zones, and crematoriums. Using data drawn from an interview with Herbert, it situates him in the field as a user of digital technologies who samples everything except pre-existing recordings as a way of developing a more 'authentic' approach to sampling.

House Music + Musique Concrète = House Musique Concrète?

The musical practices around field recordings remain associated with art and folk worlds rather than the worlds of popular music.[3] As a contemporary field recordist, Herbert has a complicated relationship with the musical and technological practices found in genres like pop and hip-hop, as well as in the dance scenes he was connected with in the early stages of his career. Though he speaks disparagingly of contemporary pop music and 'the sort of trancey r&b bullshit that's coming out of the charts at the moment' (*ibid.*), he has composed music for the Eurovision Song Contest – though this involved a subliminal protest about the treatment of Palestinians. While admitting to being influenced by hip-hop producers like DJ Premier and albums such as De La Soul's *Three Feet High and Rising*, Herbert was never interested in exploring the loop-based approach to sampling that has dominated the genre and denigrates the re-appropriation of pre-existing sounds as a form of musical consumption: 'I wouldn't have described it then in these terms but in retrospect I would say that it feels like consumerism. It feels

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[3] For a series of interviews about the practices and use of technologies by field recordists including Francisco Lopez, Hildegard Westerkamp, and Felicity Ford, see Lane & Carlyle 2013.

just like shopping, musical shopping. Putting things together like music by numbers and you just happen to choose the numbers. It didn't seem that interesting to me' (*ibid.*). Preferring instead to collaborate with London Sinfonietta and insert sounds associated with the genres of glitch and electronic dance music (EDM) into a recomposition/remix of Gustav Mahler's Tenth Symphony, Herbert positions himself in the field as an idiosyncratic user of digital sampling technologies and moves between the worlds of art, classical, avant-garde, *and* popular music without being central to any of them.[4]

Figure 22 Casio FZ-1 Digital Sampling Synthesizer

Herbert's interest in manipulating sounds began at an early age and, as with Tommy Perman of Found, it started with the use of analogue technology as a cut-and-paste tool. His family home contained tape-based musical technologies that were used to record sounds from the radio and a father with a professional interest and expertise in their use:

> I don't know whether I inherited it from my Dad who was a sound engineer at the BBC but there was a certain interest and love of technology in the house. I had tape recorders at home that I'd always record bits of the radio with, bits of

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[4] Herbert's art music credentials were underlined in May 2012 when the BBC Radiophonic Workshop was re-established as The New Radiophonic Workshop (NRW) by the BBC in partnership with The Arts Council of England and he was appointed its Creative Director.

the Top 40, and chop up little bits, take bits out that I didn't like and things like that. That's from a very early age. That's from the age of about nine or ten and so there was a general sense of that in the house. The music shop was a very exciting place to go as a twelve [or] thirteen year old with these new machines [digital samplers] being invented and the prices coming down as well. I don't think it was a surprise or a coincidence rather that I started to get more into it as soon as I was able to buy something (*ibid.*).

The first sampler Herbert bought was a Casio FZ-1 (Figure 22) in 1995 - 'it was one megabyte. It was the size of [a] table' (*ibid.*) - and cost him approximately £300.[5] He remembers having twenty eight seconds of sample time available but living in a rural location like Kent imposed limitations on the sources of sound he could sample from. Sampling from sound recordings was not an option because there were no record shops in which to buy them and there is no mention of raiding the record collection belonging to his parents. Instead, he made music from the sounds of more mundane objects:

I grew up in the countryside in a little village miles from anywhere. There was no record shop. There was just Radio 1 basically. There [were] no magazines that dealt with it [sampling] or if there were they weren't making it to my part of the town. [I was] pretty isolated so bridging that gap into thinking about making music that sounded like what I thought sounded like real music as opposed to my doodlings or what have you, that was a big jump so I'd be sampling the beginnings of these sample CDs like *Company Time* and *Space* [that cost] fifty quid. Coldcut did one at the end of the [19]80s where it was just a load of drum breaks and funny samples. It would open you up to access to sounds. I mean I'm totally against that now. I'm totally embarrassed about it but it was a sort of prod in that direction in a way. So that was one aspect to it: taking things that already existed. I wasn't really sampling records because I didn't really have any records or a record player and I didn't have a mixer particularly to do things but pretty quickly part of the stuff that I did was the sampling of objects. The first thing I sampled was an apple. Then it was a pepper pot. Then it was just things lying around the house so books, videocassettes, and radios. It was just things from the house and it was a very domestic version of music, quite literally. It was literally whatever was to hand. What I sample now is completely different [as is] the

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[5] When Casio released the FZ-1 Digital Sampling Synthesizer in 1987, one reviewer described it as 'the first realistically priced 16-bit professional sampler to hit the market' (Jenkins 1987). Costing £1899, the maximum sample time was 14.5 seconds at 36kHz, 29.1 seconds at 18kHz, and 58.2 seconds at 9kHz.

principle behind it and the way of working but at the beginning it was literally:
I'm not quite understanding the potential of this tool and sampling anything
(*ibid.*).

Like Kenny Anderson in the previous case study, Herbert claims to have started
sampling whatever was lying around and admits to using pre-existing sounds from
sample library CDs. For Herbert, though, sound libraries now represent a technological
quick fix he has disassociated himself from; he now prefers to sample the sounds of
everyday life, what he calls 'real sounds'.[6]

The move towards the use of field recordings in Herbert's musical practices can be
traced back to his use of found sounds in the production of dance music. In 1998, he
released *Around the House*, an album that indicated an interest in the sounds of domestic
spaces. It begins with the sounds of crockery being cleared up and an intercom buzzer
signals the prelude to a romantic night-in: 'Hey honey, come up'. The special guest is
co-writer, and now ex-wife, Dani Siciliano who sings gently in the background.[7] If there
is a connection between each song on the album and particular rooms in a house, it is not
clear from the floor plans or the titles, many of which refer to difficulties in the personal
relationship of the couple ('We Go Wrong', 'Never Give Up'). The track 'Bedroom
Jazz' does not contain the sounds of sex, sleeping, or snoring and there is only one song
on the album where the listener can hear the sounds and activities of a room referred to

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[6] In *Any Sound You Can Imagine,* Paul Théberge traces the growing importance of sound
libraries for users of synthesizers and digital samplers in the 1980s and quotes from a magazine
review of Yamaha's SY77 synthesizer in 1990. It states: 'producers and keyboardists will find
that sound libraries are a must because it takes so long to program 'real' sounds' (1997, p. 81).
[7] Kodwo Eshun described the album as 'a tour through a domestic landscape, each [vinyl] side's
label presenting a floor plan showing the movements of the duo, amplifying the emotional
contours of interior space' (2000b, p. 37).

in the title. The most significant scene of this domestic drama takes place 'In the Kitchen'.[8] A plaintive song called 'The Last Beat' suggests this is a tour through a relationship with insoluble problems and 'Going Round' soundtracks love as non-linear but there is little to indicate these emotional experiences are taking place in specific spaces. This is an album of house music on which Herbert is introducing concepts from *musique concrète* and using 'real' instruments such as guitar, bass, and piano rather than the more completely conceived concept albums he would go on to make, some of which are composed entirely from the digitally recorded/sampled sounds of 'everyday life'.

Herbert's fascination with found sounds and field recordings was developed further on the album, *Bodily Functions* (2001). This time around his palette was created by sampling the sounds of the human body including 'the blood of Martin Schmidt' (Herbert 2013a) on 'Foreign Bodies' and the sounds of laser eye surgery on 'You Saw it All'. Schmidt is one half of the electronic duo Matmos who are credited as engineers on these two tracks and released an album in the same year called *A Chance to Cut is a Chance to Cure*, a concept album about cosmetic surgery.[9] Herbert's project was less

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[8] In an interview, Herbert stated: 'At the beginning you hear me saying, 'Right, what ingredients have we got?' Beans, bacon, eggs'. From start to finish we make breakfast. What you hear is us laying out the plate. There's one point where you hear me cutting open the bacon, that's really loud. The toast is going *tiktikertikertiker*. We start frying things, that's when you hear *shsshhhhhurrur*. Then we get round to eating it and there's a loud noise, that's me spreading butter on toast. I picked that one sound, used that as one of the percussion sounds, picked out a couple of other nice sounds and layered them through. From start to finish the whole process is in real time. There's no edits. From walking into the kitchen to taking it out and eating it – that's how long it takes, which is not very long, about 11 minutes' (quoted in Eshun 2000b, p. 37).

[9] Jim Haynes describes how the album was made using 'a wealth of field recordings from nose jobs, cauterizing muscle tissue, laser eye surgery and liposuction. The album begins with the

macabre and along with the sounds of food being digested, knuckles being cracked, and teeth being brushed, there are samples from new-born babies, the slamming of doors, and the recycling of bottles. The latter two examples are similar to Peter Gabriel and Kate Bush's early experiments with the Fairlight CMI and journalist Rob Young writes that Herbert's album 'harked back to the very earliest postwar tape experiments of *musique concrète*: Pierre Henry's creaky tape cut-up *Variations For a Door and A Sigh* is the clear antecedent for much of his early music' (2003, p. 26). The comparisons with art music composers disguise the fact that much of Herbert's earliest music was designed for dance floors, though he has been keen to avoid being typecast as a dance music producer.[10] His denunciation of dance music, or dance music associated with mass culture, reads as an attempt to position himself as a musician whose practice has little relationship with popular culture. This can also be attributed to the manifesto he drew up in 2000, the Personal Contract for the Composition of Music [P.C.C.O.M.] (Incorporating the Manifesto of Mistakes), which shaped the making of *Bodily Functions* and has placed creative and technological restrictions on his use of digital sampling technologies and the music-making projects he has been involved in since.

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light shuffling House groove of 'Lipostudio (And So On…)', which introduces an odd textual duet between human fat gurgling through a tiny vacuum and a bleating clarinet' (2001, p. 28).

[10] A biography written for Herbert's website explains how he 'would later distance himself from this early work, in that he felt a little too deeply implicated in the hedonistic club scene of the time but primarily because he had sampled other people's music, for which he would later be repentant. 'I feel it is a betrayal of what I really believed to be the right thing to do at that time. I was seduced and shaped in part by people and assumptions around me'' (Stubbs 2012).

Contractual Obligations: 'The Sampling of Other People's Music is Strictly Forbidden'

Inspired by the Danish filmmaker Lars Von Trier and his Dogme collective, who launched a manifesto in 1995 that announced their decision to use only hand-held cameras and avoid props, special effects, or the addition of sound during the post-production process, Herbert created the P. C. C. O. M.[11] As with Dogme's manifesto, there are ten self-imposed commandments and an optional rule relating to the remixing of recordings by other artists. Herbert's contract for the composition of his own music prevents 'the use of sounds that exist already' (Herbert 2005a) including the use of drum machines or factory presets and pre-programmed patches.[12] It states that 'no replication of traditional acoustic instruments is allowed where the financial and physical possibility of using the real ones exists' (*ibid.*). The use of digital synthesizer/sampling instruments to replicate the sounds of acoustic instruments, which was the aim of the designers at Fairlight Instruments and E-mu Systems in the late 1970s and early 1980s, is not allowed. Above all, the sampling of other people's music is not permitted. Herbert explained that the introduction of a personal contract was a reaction to the way in which new digital technologies were being used at this time and a desire for the music making process to be more difficult:

> There was a strong movement in technology to encourage you to start writing music in a certain way, to always take the easy route, to take the short cut and actually the most exciting thing to happen in music was that music could now be documentary. You can make and take real sounds as opposed to something that

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[11] For more on Von Trier and the rules of Dogme '95, see Roman 2001, Simons 2003.

[12] See Goldmann 2015 for interviews with instrument designers Robert Henke and Mike Daliot, producer Michael Wagener, and artist Cory Arcangel on preset sounds. Stefan Goldmann is a Berlin-based producer whose album, *Industry* (2014), contains *only* preset sounds from three Japanese workstation synthesizers: Yamaha TG33, Technics WSA1R, and Korg Triton Rack.

already exists and for me [the personal contract] was a re-statement to remind myself to do that (Herbert 2012).

The ideology of authenticity that runs through this thesis, from the designers of digital sampling technologies to the users in the case studies, reappears in Herbert's rules. In his case, there is an enthusiasm for the creative possibilities available to musicians through the use of digital technologies and instruments to record and manipulate the sounds of everyday life, and at the same time preserve 'real' sounds and 'real' instruments in his music.

Like Dogme's approach to filmmaking, Herbert's personal contract was an attempt to challenge what he viewed as conventional music making practices that began to develop around digital technologies, particularly around the removal of mistakes. His contract states: 'the inclusion, development, propagation, existence, replication, acknowledgement, rights, patterns and beauty of what are commonly known as accidents is encouraged' (Herbert 2005a) and he explained why he was keen to avoid perfectionism:

> One of the important things about accidents is [they] undermine the more traditional elitist perspective of the auteur or the composer or genius or the maestro, all the male ideals of hierarchy. For me, there's a political aspect to it, which is handing control to something else or some other form. The second thing is it feels much more a human experience. It feels like you're part of the process rather than opposing the process. Another thing is that perfection has led us into some pretty dark places in the past from eugenics to neoclassicism. It's also led us to places like Kraftwerk (Herbert 2012).

His argument against auteurs disguises Herbert's desire to achieve virtuoso status in relation to digital sampling. When asked if he plays any instruments other than the digital sampler, Herbert replied:

I do but they all have limited interest for me because if I pick up the guitar I can't play it as good as Marc Ribot or Jimi Hendrix. If I play the piano I can't play it as good as Thelonius Monk or Bill Evans. But if I've recorded the sounds of London sewers I've made myself, no one else has got that. There's no one else to compete with (*ibid.*).

There is humour in the reply and Herbert does not always take himself seriously but his individualism is in contrast to the way an art/music collective like Found operates with a number of core members and different musical roles. He is credited as the composer and copyright owner of the sounds of 'the natural world' that have been digitally recorded. His are individual projects conceived by Matthew Herbert on which other people provide assistance, including other users of digital technologies who have helped him capture sounds in the field (or fields) that have been difficult for one person to record.[13]

Field recordings by Herbert are made with portable tools including Sennheiser MKH 418-S microphones and a Nagra V 24 bit Linear Location Recorder.[14] When recording and manipulating sounds *inside* the studio rather than out in the field, Herbert admits to buying and using almost every digital sampling technology that becomes available:

I'd buy one of everything and try and use them. The only ones I've never really owned are the [S]950s, the Akais, those ones. I've never really liked the sound of them actually. The one that I use a lot is the Akai [S]612, which is the first one that Akai ever made and just does one sound and that's what I use live. A huge amount of my sound manipulation live, my whole live career, has been built

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[13] Chris Pickhaver is credited with making additional field recordings on a project called *One Pig* (2011). On the front cover for the album *There's Me and There's You* (2008) Herbert lists musicians, engineers, photographers, journalists, and web designers who have been involved in the project. It takes the form of a petition in which the undersigned agree that 'music can still be a political force of note and not just the soundtrack to over-consumption'.

[14] The MKH 418-S is a shotgun microphone that enables sounds to be recorded in Mid-Side (MS) stereo. Its recommended retail price is £1440 (Sennheiser 2016). The Nagra V is a digital recorder with removable hard disk and can record one hour of 24-bit audio at a sample rate of 48kHz per GB of disk space. Released in 2002, it has since been discontinued (Nagra 2016).

around one of those because it's the only sampler that has a start and end point, mover or slider, so you can instantly cut a sample up manually and it's got filters and knobs. There's nothing internal so it's much more like an analogue synth and much more playable than some of the others we had to programme. So I've used virtually everything and ended up using the Casio FZ-1 for years and years and years. I used it for fifteen years and then in 1999 I got an E-Mu, the e64,[15] which was pretty great. I'd had an [E-mu] SP-1200 drum machine for a while, which was pretty great. I had an MPC, which I didn't get on with (*ibid.*).

As with the users in the previous two case studies, Herbert compares the playability of a musical instrument with a technology that has to be programmed. While Ziggy Campbell of Found spoke about how the MPC2000 was designed in a way that made it playable, Herbert explained why he *did not* develop a successful relationship with Akai's MPC range and expresses frustration with samplers designed for users who want to build up a library of sampled sounds rather than continually search for 'new' sounds:

They're very hard to manipulate. After about a couple of years I abandoned sampling other people's music and basically just used it to sample my own sounds and there's only very, very few samplers that were actually set up to do that. For example, they were never set really to fill them up every time you used them. They were always built thinking you'd use the same sounds again and again. You'd create a library and you'd use that. So Akai's [samplers have] always been bad apart from the [S]612. They've always been really bad at quick manipulation and quick input of a lot of samples so the MPCs and the [S]950s they took hours to truncate one sample. It would take you ten minutes to get one sample ready. If you're sampling fifty times a day every day for ten years or what have you, you just want it to be as quick as possible. One interesting thing was that because of the microphone input on the Casio [FZ-1] all my sampling was in mono until I got the E-Mu and then I could sample in stereo. Now most of my recording [or] sampling is done of sources outside of the studio and imported in to the computer. Now I just use soft samplers, which I don't really like but the capacity to store 100 gigabytes of recordings that I've made is really great (*ibid.*).

The move towards using software samplers does not conflict with any of Herbert's self-imposed rules so long as he does not use any presets or software synthesizers. In the case

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[15] The e64 was a rack-based sampler released in 1995 after E-mu's acquisition by Creative two years earlier. With 64-voice polyphony and 2Mb of RAM, which could be expanded to 64Mb, it cost £2650 (Wiffen 1995).

study about microsampling, Marc Leclair expressed enthusiasm for being able to digitally record hours and hours of everyday sounds and noises using software samplers. For Herbert, their benefits relate as much to the options they offer for the labelling, organisation, and archiving of sampled sounds in the memories of personal computers.

One of the advantages of using software samplers relates to the extremely large number of sounds that Herbert can store on hard drives. He can index these sounds using a keyboard, monitor, and mouse much more quickly than the time it takes to scroll through the alphabet to label a track or sound using a sampler with a small LCD[16] screen like an Akai S612:

> the good thing about software samplers is their ability to handle huge amounts of data and for it to be catalogued as well. It sounds like a really, really small point but things like being able to give [sounds] a name is really important. My library of sounds, not that I've added [it] up, is going to be over a million sounds now and being able to know what a particular sound was and those old screens where you had to choose the letter and scroll through the entire alphabet and the number system first in capitals then in lower case, numbers, just to be able to change the first letter. It slowed you down enormously. When you're trying to work quickly and try to get a musical idea going, it's not really happening. So that made a big impact. One of the reasons for [using] software samplers is that the indexing is so much quicker (*ibid.*).

Unlike Kenny Anderson, Herbert does have access to the manuals for the digital samplers he owns but he does not read them and employs others to execute specific technological tasks relating to software packages that he does not enjoy using:

> I've never had the patience to read manuals. I always think it's a failure of the technology if you have to use the manual a lot. I think, of course, if there's specific problems that you want to solve it should be there but really it should be self-evident. Another really important thing is I had time then. When I first

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[16] LCD stands for Liquid Crystal Display and is the type of electronic visual display used on most computer monitors and televisions having replaced Cathode Ray Tube (CRT) technologies.

started I was unemployed but now I don't have the time to learn new technology. I once started with Max/MSP[17] and I bought it and I spent a few hours on it, didn't get enough back from it and I've never used it since. Now I just pay someone to build the patches for me. There just isn't the time to learn new instruments and new technologies. It's exhausting (*ibid*.).

Herbert is both a user *and* non-user of music software technologies and is in the privileged position of outsourcing tasks perceived to be less artistic and important to his technical assistants or what Howard Becker calls 'support personnel'.[18] As with Trevor Horn, who owned a Fairlight CMI but employed JJ Jeczalik to learn how to use it, Herbert is an auteur of digital sampling technologies who wants to be recognised for his cultivated approach to their use but does not have time to learn how to use them himself. He created a personal contract to make the process of using digital technologies more difficult at a time when they could be used to do things quicker. Yet as a user/non-user of technologies he is not averse to designing solutions of his own to make and save time.

The Sampling of Politics: Moral Rights and Wrongs

Having outlined the hardware and software technologies Herbert uses and how he and others are using them, I want to look at *why* he is using these sampling technologies.

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[17] MAX/MSP is a visual programming language based on two earlier programs: Max (named after Max Mathews) and MSP (after Miller S. Puckette, a programmer of Max). Thom Holmes writes: 'Max/MSP can trigger audio-processing routines at the same time that it manages other aspects of a performance, such as the spatial distribution of sound to loudspeakers, the triggering of MIDI devices, and the multitrack recording of the outcome. The time needed to master an audio development environment such as Max/MSP can be daunting' (2016, p. 326).

[18] Becker writes: 'Participants in an art world regard some of the activities necessary to the production of that form of art as 'artistic,' requiring the special gift or sensibility of an artist. The remaining activities seem to them a matter of craft, business acumen or some other ability less rare, less characteristic of art, less necessary to the success of the work, and less worthy of respect. They define the people who perform these special activities as artists, and everyone else as (to borrow a military term) support personnel' (1974, p. 768).

Since introducing his personal contract, Herbert has used digitally recorded samples as the basis for every sound on most of his albums and live performances. All sampled sounds used on Herbert's albums are listed meticulously on his website. His Radio Boy project *The Mechanics of Destruction* (2001) incorporated the sounds of Big Mac meals and Gap boxer shorts being destroyed and re-composed as music. The projects with jazz big bands, *Goodbye Swingtime* (2003) and *There's Me and There's You* (2008), included samples from supermarket tills, a guillotine, and a passport. Some of these albums are based around a single concept such as the Wishmountain album *Tesco* (2012), which was made solely from the sounds of the UK's top 10-best selling brands of 2010. A preoccupation with politics, food, and consumption led to the making of *Plat du Jour* (2005), an album that contained compositions such as 'The Truncated Life of a Modern Industrialised Chicken' and 'Nigella, George, Tony and Me' in which the sound of a tank is reversed over the meal that Nigella Lawson served for George Bush and Tony Blair in Downing Street while discussing the invasion of Iraq (Herbert 2013a). A recent project, *One Pig* (2011), incurred the disapproval of PETA (People for the Ethical Treatment of Animals) for attempting to record the sounds of a pig's life from its birth through to its death in an abattoir Herbert was not allowed to enter for legal reasons. It is not clear *who* Herbert is digitally recording these sounds *for*: concept albums containing unpleasant and disturbing sounds are unlikely to be listened to from beginning to end.[19]

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[19] In the liner notes to *One Pig*, Herbert thanks 'anyone who has the time and inclination to sit down and listen to the whole record from start to finish, in order, in one go…' (Herbert 2011).

Herbert appears determined to expose his audience to sounds they might normally be prevented from hearing and, although unable to record the sounds of abattoir slaughter, he has gained access to a crematorium in order to record sounds not usually heard by mourners:

> In the crematorium where they burn the body, the body burns for about ninety minutes, something like that, possibly two hours, two and a half hours, but there's still bones left, bits of bone left. So they scrape the bones out. They put them in what's called a Cremulator which is like a washing machine with some graphite balls in it and some bones and they just go round in this drum and it's the most fucking hideous noise you'll ever hear in your life. It's just bones being ground down and then they put a cup at the bottom and that's what they collect the ashes in and that's what your ashes are. It's just a collection of bones. It's not the whole body. It's just a few of the bones in ash. So when I was there I recorded the sound. The guy's like 'record this. This is a great noise.' So I recorded it. I got it home and added it to this Mahler remix that I did of Mahler's 10th Symphony. Particularly knowing what it was and the fact it was this hideous sound made it really disturbing and it brought a huge emotional weight to the piece. It gave it a weight of authority and horror that wouldn't have come from almost many other things. But I thought if that was my mother's bones and somebody had recorded her bones being ground down and put them on a record without asking her permission, I'd feel pretty pissed off about it. I hadn't asked their permission. I didn't know anything about this person whose bones I had recorded so I took it out. The end result is not quite as good but morally it's much more appropriate than having the bones of an anonymous stranger ground down, even though it's the most extraordinary noise you'll ever hear (Herbert 2012).

Questions are raised here about whether certain sounds should *not* be sampled. Herbert has broached this subject by sampling the sounds of Palestinians being shot by Israeli soldiers on *There's Me and There's You*, and *The End of Silence* (2013) is 'made entirely from one 6 second recording of a Gaddafi war plane dropping a bomb during the battle of Ras Lasnuf [*sic*] on 11th March 2011 made by war photographer Sebastian Meyer' (Herbert 2013b). His music is politically motivated and he wants to present listeners with the mediated realities of war. However, the political contexts are

complicated and it may be worth speculating whether a code of conduct is needed for sampling musicians in the same way that journalists, photographers, and editors operating in theatres of war are obliged to follow guidelines about what and what may not be broadcast, printed, or published.[20]

Herbert admits to trying to change the world with his music but he is also trying to change the way in which people hear and perceive the world: 'I think that's true. I think I'm probably going to fail on both counts [Laughs] but yeah absolutely. I don't know why I would aim for anything less. I don't particularly want to write a piece of music that's going to make people feel like drinking a bit more beer in the bar tonight' (Herbert 2012). Slogans about reclaiming the streets were used by anti-capitalist and environmental protesters in the 1990s but Herbert has a much wider aim. In his words:

> It's about reclaiming the world. It's about saying these things can also be musical instruments. You can turn shit into music. You can turn waste into something permanent. One of the proudest things about the pig record [*One Pig*], which is not what I set out to do, is that this pig would just be poo literally and in landfill. It would've just been shit out and dissolving into component parts in the ground but actually here we are three years later and somebody in Scotland and somebody in Russia and somebody in Australia, and somebody in America knows about and has listened to the life of that pig and so it's a way of remembering. It's a way of creating little monuments to these events instead of letting them just go past unforgotten (*ibid.*).

Herbert values the meaning of every single sample and uses the digital sampler as the basis for political statements about capitalism, globalisation, and consumerism. At times,

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[20] The Society for Ethnomusicology has a Position Statement on Ethical Considerations (1998), which contains guidelines about carrying out fieldwork in a responsible way. On the use of recordings, it states: 'Ethnomusicologists acknowledge that field research may create or contribute to the basic conditions for future unanticipated, possibly exploitative, uses of recordings and other documentation. They recognize responsibility for their part in these processes and seek ways to prevent and/or address misuse of such materials when appropriate'.

these are didactic and moralistic - for example, the liner notes to *Plat Du Jour* instruct listeners to avoid using supermarkets (Herbert 2005b).

The discourse around the ethics of digital sampling since it became a popular practice in the 1980s has been focused on issues of theft and intellectual property (Porcello 1991). Herbert's practices raise a different set of questions about the moral rights of technology users as well as the moral rights of humans and other sentient beings whose bodies produce sounds that have been digitally recorded during their life or after their death: Who owns the digital recordings of these sounds? Who should be credited as the owner of these sounds? What permissions are required to use them? Herbert decided against using the sounds recorded in the crematorium because he was unable to ask permission from the family of the deceased. However, this was a matter of conscience rather than of copyright, which is not an issue he has to contend with at the moment:

> Not yet. It will be in a hundred years time. McDonalds will have copyrighted the sound of their burgers. Mazda will have copyrighted the sounds of their MX5. Edinburgh University will have copyrighted the sounds of their campus. That will all come. We've got a window now. That's why I'm trying to dash through it as fast as possible and collect up the scraps (Herbert 2012).

Though copyright is not yet an issue for Herbert, there are problems involved in taking some of the more unusual or controversial sounds he has sampled out of their original contexts. It is important to him to make it clear where these sounds are from, as their careful categorisation online and in liner notes suggest; these sounds, however, may go unnoticed, appear random, or be unidentified unless listeners read about the sources. I asked Herbert if there was a danger some political meanings might be lost or the ability to make a statement about the situation in Palestine lessened if the sound of a gunshot is

divorced from the location of its recording. He directed me towards his attempt to

challenge the way a particular country was represented while its pop stars performed to a

global audience:

> There's an opportunity to smuggle those sounds into a Eurovision song contest. I
> did the sounds in between the films when Russia hosted it so I had to come up
> with one for Israel and they had all these happy skateboarders in Israel. I was like
> I can't just pretend that Israel is one happy skateboarding family so I had the
> sounds of these gunshots and Palestinian homes being bulldozed. You can still
> hear it. I can't believe I got away with it. You can hear it all. It's pretty great to
> be subversive on that sort of scale but I think the important thing is it's music
> first. It should draw people in (*ibid.*).

If this political act is judged by Herbert to have been a success it is precisely because the

sounds that were sampled were *not* recognisable or identifiable by the intended audience

and the question here becomes who the performance is for and whether the political

message the music is trying to communicate is understood or ignored by its listeners.

Some sounds in Herbert's music will be recognisable; other sounds will cause confusion.

Conclusion

Like Todd Edwards and Marc Leclair in my first case study, Matthew Herbert is not

interested in the sampling of pre-existing recordings. As with these two producers, the

digital sampler – in the form of both hardware and software – is his main musical

instrument:

> The sampler is absolutely completely and utterly fundamental to what I do and
> there's certain things now, for example, there's a function in Logic now where
> you can click on a file and it says turn this file into a sampler and it loads into a
> sampler and lays it across the keyboard. You can ask it to chop it up into
> transients as well. The thing that I spent the last twenty years painstakingly doing
> it will do it in ten seconds, laid out so I can just play it as it is. That means that
> that aspect of the creative process is no longer interesting or particularly relevant

because it's just instant. The computer's making some of those decisions for you (*ibid.*).

There is ambivalence here about the 'democratisation' of digital sampling technologies and frustration with the way digital technologies are making musical processes easier. Despite his anti-elitism, Herbert wants sampling to remain a specialised activity so he can remain ahead of the game. Like Kenny Anderson in the previous case study, Herbert is keen to incorporate mistakes and accidents into his music and yet for Herbert it is part of a more considered manifesto that has more in common with the traditions of art music and high culture rather than with the indie DIY aesthetic. Compared to someone who accidentally discovered that a guitar pedal could be used as a looping device, Herbert is an auteur of digital sampling technologies who has been interested in the manipulation of sound from a young age and attempts to use every single sampling device available to him. In the 1980s and 1990s, a sample was a short digital recording lasting seconds because of restrictions relating to memory. Now, the use of software samplers with more memory and portable recording devices with removable hard drives has blurred the discursive terrain about how we distinguish between a sample and a digital recording.

In *Any Sound You Can Imagine*, Paul Théberge recognises that the use of digital technologies have helped to change our definitions of what music can be.[21] The use of digital samplers has also changed our definitions of what a musical instrument is and can do: they can be used to record, store, manipulate, and reproduce a greater range of

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[21] He writes: 'Recent innovations in musical technology thus pose two kinds of problems for musicians: On the one hand, they alter the structure of musical practice and concepts of what music is and can be; and, on the other, they place musicians and musical practice in a new relationship with consumer practices and with consumer society as a whole' (1997, p. 3).

human and non-humans sounds in an increasing number of ways. Herbert's practices also raise questions about the role of the musician and ways that it continues to change with the use of digital music technologies and tools. For Herbert, digitally recording sounds enables him to assume the role of a documentarian rather than that of a musician:

> I definitely think sampling has a historical quality to it and a historical purpose to it. This is what the world sounds like and in a 100 years time if people are still listening to music or listening to it in this way they'll be able to hear what the sewers in London sounded like in musical form or what have you at that time. So I absolutely think it's a living diary in that respect. It's about bearing witness (*ibid.*).

To say that Herbert is recording the sounds of the world, however, ignores the high-tech manipulation of those sounds: it is not the sounds of sewers we are hearing but the sounds of sewers, samplers, microphones, and manipulation. As digital technologies become increasingly entangled in the social practices of musicians, the ideology of transparency and realism that has existed since the early history of sound recording technology continues to be part of the discourse of contemporary users of music technologies. Herbert's discourse demonstrates that there is now an even greater desire to capture 'real sounds' and the sounds of the non-human world in unmediated ways.

Conclusions

The starting point for this research was the premise that the study of digital sampling had been dominated by institutional processes such as the legal framework of copyright. A focus on the re-use of pre-existing recordings in genres such as hip-hop had been at the expense of examining the ways that samples have been employed in other genres of popular music. This thesis has looked at a range of practices relating to digital sampling and the use of digital sampling technologies in a range of musical genres. It demonstrates that sampling and its uses have often been defined too narrowly. Samplers have often been viewed as social weapons and were used by 'cultural terrorists' like Negativland and The KLF to attack concepts like copyright and authenticity. This thesis has used empirical evidence to explore how digital sampling technologies have *also* been used as musical instruments, editing tools, compositional tools, and social mediators. As well as being used to produce and reproduce its sounds, music technologies are ways of mediating the world. The case study of Matthew Herbert's work shows how digital sampling technologies are used to mediate and reproduce the sounds of the 'real' world. Primary and secondary data gathered from interviews with users about their musical and technological practices are valuable if we are to avoid drawing conclusions about the uses of musical instruments that are not supported by evidence. As well as this emphasis on the contemporary users of digital sampling technologies and their practices, the first half of the thesis focused on writing a history of digital sampling technologies in order to understand how discourses, technologies, and musical practices relating to digital sampling have changed since the late 1970s.

In rethinking the history of digital sampling with a focus on its instruments and the musical and technological practices of their users, this thesis highlights the contingencies in the design and making of musical instruments: the histories of companies like Fairlight Instruments and E-mu Systems were shaped by shifting technological developments and commercial priorities. Neither of these companies set out to design a digital sampling instrument: the Fairlight CMI was designed as a digital synthesizer but used for digitally sampling external sounds. Michael Kelly, who was joint Managing Director at Syco Systems, recalled how Peter Vogel at Fairlight told him: 'God, don't sell it for its sampling. We only put the 'mic in' on the back as a last minute afterthought!' (Kelly 2015). The contingencies in the process of designing digital sampling instruments are mirrored in the ways these technologies were adopted by users. While Dave Rossum, Scott Wedge, and Marco Alpert at E-mu encouraged users to re-design the Drumulator by sampling sounds of their own, Vogel did not expect the Fairlight CMI to be used to sample pre-existing recordings because only one second of sample time was initially available. A compressed version of the argument in the first three chapters might read: Fairlight Instruments developed a digital synthesizer to imitate acoustic instruments; users of the Fairlight CMI began to sample the sounds of everyday life. E-mu Systems developed a digital sampling keyboard and encouraged users to sample the sounds of everyday life; users like Marley Marl began to sample drum breaks from pre-existing recordings. I set out to understand how technologies have been used historically to shape both the sounds of music and the practices of music making. I took Pinch and Bijsterveld's advice to 'follow the instruments' and also examined the relationship between the designers and the users of musical instruments.

To understand technical objects, Madeleine Akrich recommends studying the relationship between designers and users as well the relationship between 'projected' users and 'real' users. This was the aim of my research and my findings show how digital sampling technologies have been employed by 'real' or actual users in ways unimagined by their designers. I would have liked to look more closely at how 'real' or actual users shaped the re-design of digital synthesizer/sampling instruments as part of a feedback loop. For example, Vogel told me that users of the Fairlight CMI contributed sounds to its sample library. There also existed a User's Club and Fairlight Instruments published a newsletter for its users, though I did not manage to gather any primary data or find specific information about these two ways in which designers were communicating with users. Further research on the amateur and semi-professional users of instruments like the Fairlight CMI would be useful for understanding how their practices correspond with the professional users who are the actors in the history I have written in the first half of the thesis. It was the *users* of music technologies I turned to in my case studies and highlighted the multiplicity of digital sampling technologies being used in the processes of contemporary music making - digital synthesizer/sampling keyboards, sampling drum machines, rack-based samplers, foot pedals, and software samplers on PCs and laptops. I have shown how the 'interpretative flexibility' of digital sampling instruments was assumed to have closed in the mid-to-late 1980s and 1990s: a consensus was reached about their use as they became associated with the re-appropriation of pre-existing sound recordings. As has been demonstrated by the case studies in the second half of the thesis, however, there has been no stabilisation or

closure mechanism; there is still 'interpretative flexibility' as digital sampling technologies continue to be used for different purposes in a range of musical worlds.

The case studies in this thesis have focused on how users within different social groups have been using digital sampling technologies over the last decade. My intention was not to make generalisations about the use of digital technologies but, instead, emphasise the diversity of musical and technological practices as exemplified by a small sample of semi-professional and professional users. The first case study focused on two producers of electronic dance music, Marc Leclair and Todd Edwards, who both explained the advantages of using software samplers and the amount of memory available for storing sounds. In the case of Edwards, it is the *human voice* that is central to the sounds he samples and re-composes to create virtual choirs and spiritual messages. In the case of Leclair, microsamples from radio broadcasts are recycled and immortalised as part of recordings he thinks of as *collages*. The second case study focused on Found, a group of semi-professional users of digital sampling technologies who favour an approach they refer to as *unfettered sampling*. This involves an interest in extraneous sounds that have been captured accidentally during the recording process, which they decide to reshape or leave intact rather than edit out.[1] For members of Found, an Akai MPC2000 acts as a digital sampler, a sequencer, and a studio. Like the laptop, it is a meta-device.[2] Theirs is

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[1] For more on the sounds of skipping CDs, malfunctioning electronics, and the use of accidental noises in the genre of glitch, see Cascone 2000, Young 2002, Bates 2004, Sangild 2004.
[2] Nick Prior writes that the laptop is 'an all-in-one production unit that meshes composition with dissemination and consumption. This is what differentiates the laptop from other mobile music devices such as the four-track portastudio, Walkman or miniature keyboard. In effect, it is a

a case study about using digital sampling technologies in bedrooms and other types of home studios. It is also about the use of *mobile* digital sampling technologies and the way they enable a *dislocated recording* process that occurs in multiple 'studio' spaces rather than in a single location.

In contrast to the case study about Found, which was based around how a group of users negotiated the use of hardware devices and software samplers to make music, the third case study returned to an individual user – Kenny Anderson (aka King Creosote) - who has worked as part of a loose community of musicians in a semi-rural environment. Anderson has an ambivalent relationship with folk music and he also has an ambivalent attitude to the use of digital technologies. His discovery that a second-hand digital delay pedal could be used to loop sounds from a random selection of pre-existing recordings was an accidental one and its importance to his compositional processes is contrasted with his lack of interest in using dedicated digital sampling devices. This is a case study about the *low-fidelity (or lo-fi)* use of digital sampling technologies that continues a theme in earlier chapters of the thesis: the use of the Fairlight CMI Series I to create a 'grungy' sound and the lowering of sample rates by hip-hop producers like RZA to create a 'ghetto' sound.[3] The final case study is about a user who moves between the boundaries of different socio-musical worlds; the sampler is the instrument that allows him to do so. Matthew Herbert wants people to listen more carefully and pay closer

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meta-instrument, potentially containing all sounds (a feature it shares with the sampler) and production processes (a feature that transcends the sampler's capabilities)' (2008a, p. 914).

[3] Adam Harper defines lo-fi aesthetics as 'a positive appreciation of what are perceived and/or considered normatively interpreted as imperfections in a recording, with particular emphasis on imperfections in the recording technology itself' (2014, p. 6).

attention to the sounds of the environment or what R. Murray Schafer referred to as 'the soundscape of the world' (1977, p. 3).[4] He uses high-tech digital instruments but his work is part of a longer historical narrative along with composers such as John Cage (everything as music) and within the modernist tradition of futurism (noise as music). With a manifesto that supports his technological practices, this is sampling as *high art*.

Two themes that were evident in the first half of the thesis also emerged during the writing up of its case studies: these are the themes of (i) accidents and (ii) authenticity. During the design of the Fairlight CMI, Peter Vogel accidentally discovered that sampling a sound was a more 'faithful' way of imitating acoustic instruments than using digital synthesis. As an example of serendipity in the recording studio, Marley Marl used an E-mu Emulator to sample drum sounds instead of a voice on a pre-existing recording. While accidents and mistakes did not feature in my first case study, they are part of Found's *unfettered sampling*: the sounds of falling rain or noises from next-door neighbours remain part of digital recordings and are manipulated rather than removed. As part of his lo-fi approach to music making, Kenny Anderson stressed that the use of a foot pedal to insert sampled sounds in his music was not the result of a conscious decision but something that he discovered by accident. Matthew Herbert made a deliberate choice to include mistakes and accidents in his music and this is part of his manifesto. Nick Prior writes that 'the history of technology and music are histories of misappropriation, accident and contingency precisely because of the way objects are

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[4] For more on soundscapes and the perceived problems of noise pollution in the late twentieth century, see Truax 1977. For discussions of the soundscape and its relevance to the fields of sound studies and anthropology, see Kelman 2010; Samuels, Meintjes, Ochoa, & Porcello 2010.

used and misused in practice' (2009, p. 86). Much of the material in this thesis supports this argument. It also demonstrates how the users of digital sampling technologies construct narratives about their musical identities and approaches to creativity around accidental discoveries and actions with unintended consequences. This thesis shows why academics should be sensitive to ways in which musicians attempt to write *themselves* into histories of misappropriation, accident, and contingency. Users develop their own myths of misuse and mistakes around the unconventional uses of digital technologies.

In the first half of the thesis I used the term *digital imperfections* to describe the challenges and fidelity issues faced by users of early digital synthesizer/sampling instruments like the Fairlight CMI. The use of accidents and mistakes mentioned in the previous paragraph might also be referred to as examples of digital imperfections, which are added to sound recordings as a way of making them more authentic. This is the other theme that runs through the whole thesis: the importance of realism and authenticity to both the designers and users of digital sampling technologies. Claims about the high fidelity levels of sampled sounds were central to the marketing campaigns of instrument designers at Fairlight Instruments, E-mu Systems, and New England Digital. Users of the Fairlight CMI such as Kate Bush were excited about recording the 'real sounds' of everyday life; composers at the BBC's Radiophonic Workshop welcomed being able to re-create the sounds of acoustic instruments using 'real sounds' rather than synthesized ones. This same discourse of authenticity is employed by the contemporary users of digital sampling technologies in each of my case studies. Marc Leclair was critical of virtual instruments like software synthesizers that were unable to faithfully reproduce

the sounds of hardware synthesizers: the Roland TB-303 was 'the real thing'. Members of Found use software samplers to imitate the sounds of acoustic instruments but prefer to use the 'real' instrument where possible as part of a more authentic live performance. Kenny Anderson strives to use his sampler in ways that are 'uncontrived' and Matthew Herbert prefers to use 'real sounds' rather than pre-existing sounds. Todd Edwards was the only user who did not appear concerned with making music in an authentic way. He made no distinction between samplers and 'real' instruments, though he did express nostalgia for the analogue imperfections of pre-digitally recorded music – crackles, hisses, muffled sounds – sounds that can now be digitally reproduced. This thesis has been about new ways of doing things with digital technologies. It is also about older ways of *thinking* and *talking* about doing things in new ways with digital technologies.

One of the research questions that shaped this thesis was about how sampling, and more specifically the use of digital sampling technologies, has shaped and reshaped the practices and sounds of popular music since the late 1970s. Each chapter has focused on musical and technological practices, and sound recordings have also been used to illustrate arguments about the use of digital sampling instruments to record, store, reproduce, and manipulate sounds: the breaking glass as a form of *digital concrète* on Kate Bush's 'Babooshka'; the use of the Fairlight CMI by composers at the BBC Radiophonic Workshop to create the sounds of new instruments; the looping and sequencing of 'natural' sounds like a car starting by JJ Jeczalik and Art of Noise; the samples of James Brown's shriek before hip-hop producers could loop and repeat the sounds of a whole breakbeat; the quantised rhythms and repetition of short vocal phrases

in Akufen's music; the use of microsamples by Todd Edwards to create melodies that do not make literal sense; the sound of static from old vinyl and the noise of trucks reversing as sampled by Found; randomly chosen choral and funk loops in 'folk' recordings by King Creosote; the sounds of pig noises taken from field recordings and the digitally reproduced sounds of sewers in the music of Matthew Herbert. As well as there being continuities with pre-digital ways of making music, this small selection of sounds and practices that have been discussed in the thesis suggests how the sounds of popular music have changed in recent decades. It also highlights how perceptions have changed about what sounds can be considered part of popular music since the introduction and use of digital sampling technologies in the late 1970s and early 1980s.

One of the aims of this thesis has been to develop a conceptual framework for understanding the historical and contemporary uses of digital sampling instruments in a variety of socio-cultural contexts: in home studios, professional recording studios, on concert stages, and more mobile sites of musical production and performance. The instruments of contemporary music making are often missing from the study of musical instruments and the technologies of digital sampling are often missing from the study of popular music - digital synthesizer/sampling instruments like the Fairlight CMI and digital samplers like the Emulator are examples of the 'missing masses' of (popular) music studies. This thesis has tried to make them more visible. As the fields of organology and museology continue to change, those studying music technologies and the instruments of music making - acoustic, electric, analogue, *and* digital instruments – are working in interdisciplinary ways across a number of academic fields to shift the

institutional boundaries that separate them.[5] I hope to have made a contribution to the study of music technologies by developing a conceptual framework about the design and use of digital sampling technologies that can be used and applied to the study of other musical instruments and technologies. By following the instruments, designers, users, and sellers of music technologies like digital synthesizer/sampling instruments, we can make more sense of the socio-technological processes of making music in the twentieth and early twenty first century. By focusing on the *use* of these instruments – how musicians learn to use them, the failure to follow the instructions in manuals, the making of mistakes, the deliberate use of accidents, receiving reboot error messages, and the contingencies of musical practices - scholars in the fields of popular music studies, the sociology of music, ethnomusicology, sound studies, the study of record production, and the study of musical instruments can begin to develop a more nuanced understanding about the entangled relationship between human beings and music making technologies.

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[5] See Pinch & Bijsterveld 2004 for their introduction to a special issue of *Social Studies of Science* on music technologies and the study of musical instruments as technological artifacts by scholars in ethnomusicology, history, anthropology, cultural studies, and sociology. For more on the new interdisciplinary field of sound studies, see Sterne 2012a, Pinch & Bijsterveld 2012.

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