RaY

Research at the University of York St John

For more information please contact RaY at
ray@yorksj.ac.uk

Mark Marrington, From DJ to djent-step: Technology and the re-coding of metal music since the 1980s

Mark Marrington trained in composition and musicology at the University of Leeds (M.Mus., Ph.D.) and is currently a Senior Lecturer in Music Production at York St John University. He has previously held teaching positions at Leeds College of Music and the University of Leeds (School of Electronic and Electrical Engineering). Mark has published chapters with Cambridge University Press, Bloomsbury Academic, Routledge and Future Technology Press and contributed articles to *British Music*, *Soundboard*, the *Musical Times* and the *Journal on the Art of Record Production*. His research is currently focused on digital technologies in music creation and production – principally digital audio workstations – and their role in shaping contemporary popular music practice. Other interests include music production practice and songwriting, music technology pedagogy, the contemporary classical guitar and British classical music in the twentieth century.

Contact: York St John University, Lord Mayor's Walk, York YO31 7EX, United Kingdom. E-mail: m.marrington@yorksj.ac.uk

ABSTRACT

This article considers the ways in which metal has interacted with the aesthetics of electronic music since the 1980s, from its earliest exchanges with hip hop through to recent developments in the djent subgenre. It highlights the persistence of metal's practitioners in adopting new technologies (including samplers, drum machines and Digital Audio Workstations) and the challenges that this has brought to established ideas of conventional metal music practice. Underlying the discussion is the notion of the 'code', a familiar term in metal music studies, which has been employed to articulate ideas of metal's core musical attributes. In these terms, electronic music's creative practices can be seen to have facilitated both the deconstruction and re-contextualization of metal's code, enabling the genre to be re-imagined and ultimately enriched.

Introduction

This article has two purposes: first, to trace metal's evolution in relation to the aesthetic practices of electronic music and its associated technological tools and, second, to consider the extent to which these have contributed to a re-conceptualization of metal music's 'code'. I use the term 'code' here in reference to Weinstein (1991: 22), for whom it refers to a specific set of criteria that 'came to define metal' and 'could be used to generate new works exemplifying the genre and to identify works that fell within it', thereby, demarcating 'a core of music that could be called, indisputably, heavy metal'. Similarly, Berger (1999: 75) has used the expression 'rhetoric of typification' to denote within metal 'patterns of practice that are highly stable over time and highly shared among their practitioners'. The default position as regards metal's 'code' or its 'patterns

of practice' is neatly summarized by Keith Kahn-Harris in his essay 'Breaking Metal's Boundaries' (2014), in which he uses the term 'core' to suggest the genre's consistent elements:

> Whatever metal is it almost always utilises distorted guitars that draw on a quite limited selection of riffs – this is metal's inner 'core'. To be sure, lite metal at one end, and grindcore at the other, differ substantially in song structure, instrumentation, timbre, vocals, tempo, lyrics and other aspects. Yet the repetition of distorted guitar riffs mobilising augmented fourths, and a limited set of other intervals, is common to both.
>
> (Kahn-Harris 2014)

In the same essay, Kahn-Harris also considers the nature of innovation within metal, which he characterizes in terms of introducing musical elements 'outside this riff-based format' and as a process of 'questioning and transforming the core itself'. These ideas provide a useful starting point from which to explore the ways in which creative strategies deriving from electronic music have influenced the metal genre. By this I refer to the uses of particular technologies that came to prominence during the 1970s and 1980s, including samplers, sequencers, synthesizers and drum machines. Central to my discussion is the question of how the practices associated with these technologies have informed the structure and character of metal music and whether metal's core, as specified here by Kahn-Harris, has been modified – or re-coded[ ] – as a result. It is important to point out that none of these technologies has been widely considered part of common practice within metal, despite their ubiquity and acceptance in many other popular music genres. The reasons for this are largely bound up with particular conceptions about the role of technology within metal aesthetics. To take one instance, the pre-programming of musical elements using sequencers or drum machines is

essentially antithetical to notions of human agency that are necessary to the perception of authenticity within metal performance. Machine technologies do not, for example, enable metal artists to demonstrate the 'great manual dexterity' and 'technical proficiency' (Weinstein 1991: 23–25), required in heavy metal guitar performance, or the virtuosity on which Walser (1993) has written extensively. Human musicianship remains central to contemporary metal music's production aesthetics, which as Mynett has observed, 'index sound producers in the form of performing musicians, rather than computer, or synthetic based sound production' (2013: 52).

These concerns over technologies and their capacity to mediate the authentic artistic expression of popular musicians have formed part of the wider discourse of popular music studies (see Frith 1986; Goodwin 1988). Also of relevance to this discussion are theories of technological determinism (see Théberge 1997, 1999; Taylor 2001; Katz 2004), which are concerned with the unique properties of individual technologies and their capacity to re-shape musical content, often in ways that are not necessarily intended by their users. From this perspective, metal artists' resistance to samplers, for example, might be understood in terms of the threat they pose to the integrity of the substance of metal music itself, given that they have the potential to fragment, transplant and transform audio recordings in ways that render them unrecognizable. Such notions also inform the debates over which elements ought to be admitted to or excluded from metal's timbral palette (the conventions governing acceptable instrumentation and sound sources), which stem from a desire to preserve metal's essential sonic identity. This includes the arguments over the legitimacy of keyboards within the standard metal line-up, the authenticity of digital amp modelling

and the acceptability of triggered drum samples. As Théberge has commented, 'the specific uses or the explicit rejection of various technologies are often instrumental in defining both the aesthetics and politics of particular musical genres' (1999: 210).

To explore these ideas, this article will focus upon three significant areas of interaction between metal and electronic music practice since the 1980s. In the first part, I consider the ways in which sampling effectively catalyzed the deconstruction and re-contextualization of metal's code during the 1980s and 1990s, ultimately giving birth to a sampling aesthetic within metal itself. This is followed by a discussion of industrial music's role in encouraging the importation of machine aesthetics, electronic experimentation and remixing into metal's domain. The survey is then brought up to date with a consideration of the digital audio workstation's influence on the development of recent forms of metal, specifically djent, a subgenre with numerous electronic spin-offs that are unique to that environment. The concluding part of the article suggests ways in which the nature of metal's domain might be re-thought in the light of the influences discussed.

Metal's code deconstructed and re-contextualized: Sampling practice during the 1980s and 1990s

Sampling has played a particularly important role in re-contextualizing metal in relation to electronic musical aesthetics. The early practice of sampling metal by non-metal artists enabled the re-situation of key elements of metal's code – typically guitar riffs and drum patterns – within contexts that were quite different from its own performance traditions.

At the same time, sampling from outside metal by its own practitioners allowed new influences to infiltrate the genre. Théberge (1999: 2019) defines sampling as:

> The use of pre-recorded sound and music – drum and other instrument sounds culled from decades-old rock albums, percussion breaks, James Brown's vocal pyrotechnics, bits of film and television sound tracks – in the creation of rhythm tracks for use in hip-hop and rap, in dance remixes, and in so-called 'mastermixes' with the origins of the sounds being more or less recognizable depending on the intentions of the artists and the knowledge base of their audience.

These pre-recorded materials were initially sourced via the turntable and tape machine, with hardware-based devices and later computers adding increasing levels of convenience to the process of assembling and editing sounds in digital form.[2] Hip hop artists were the first to import metal and related heavy rock material into their work during the 1980s, re-purposing its musical substance for new creative ends. The Beastie Boys arguably set a precedent with their use of AC/DC's 'Back in black' riff on the track 'Rock Hard' (1985) and on their subsequent debut album, *Licensed to Ill* (1986), which sampled Black Sabbath's 'Sweet Leaf' ('Rhymin and Stealin') and Led Zeppelin's 'The Ocean' ('She's Crafty'). Metal samples also sat well with the more aggressive and politically focused hip hop of the late 1980s. Public Enemy's 'She Watch Channel Zero?!' (1988), for example, loops a short segment of Slayer's 'Angel of Death' riff, adding considerable impact to Chuck D's rapping. Ice T, a self-confessed metalhead and frontman of the thrash metal band, Body Count (Ice T and Century 2011), quotes 'War Pigs' in the song 'Rhyme Pays' (1987) and in the gangster rap epic 'Midnight' (1991), combines the 'evil'-sounding guitar riff from the song 'Black Sabbath' with a drum fragment from 'When the levee breaks'.

Electronic artists working within the hardcore techno genre during this period also sampled metal among many other sources. On the album, *Delete Yourself* (1995), for example, the Berlin-based electronic music collective, Atari Teenage Riot, used material from Powermad's 'Slaughterhouse' (on the track 'Speed') and Thanatos's 'Bodily dismemberment' (on 'Into the death').[3] Here, as with hip hop, metal riffs are employed to provide a hard-edged sonic underpinning to the group's often aggressively delivered social and political messages. Atari Teenage Riot also went on to collaborate with Slayer on 'No remorse I wanna die' (*Spawn* soundtrack, 1997), which fused the latter's metal riffs with the then ubiquitous 'Amen Break' loop, constituting an early attempt to connect metal with the drum 'n' bass genre.[4] Ian Christe, in discussing the Digital Hardcore Recordings scene that produced Atari Teenage Riot and similar German bands such as Bomb 20 and EC8OR during the 1990s, has suggested that this music effectively constituted a 'digital equivalent of metal' in its own right, which stood 'outside the headbanger lineage' (2004: 334).

Metal musicians' responses to sampling initially demonstrated a certain ambivalence and even negativity towards the practice. According to Mike D, the problems encountered by the Beastie Boys in attempting to clear AC/DC's 'Back in Black' riff for use in their track 'Rock Hard' stemmed from the fact that 'AC/DC could not get with the sample context. They were just like, "Nothing against you guys, but we just don't endorse sampling"' (*NME* 1999). Adrock's quip, 'So we told them that we don't endorse people playing guitars', although tongue-in-cheek, is illustrative perhaps of a perception on both sides of the incompatibility of the performance conventions of the respective genres. The most well-known collaborations between metal and hip hop artists

during this period – Run DMC and Aerosmith's re-working of 'Walk this Way' and the

Beastie Boys' collaboration with Slayer guitarist Kerry King on 'No sleep till

Brooklyn'/'Fight for your right to party' (both 1986) – were the product of Def Jam

producer Rick Rubin's pioneering approach to record production. Indeed, the Beastie

Boys' work with King might not have occurred at all had it not been for the coincidence

of Rubin producing Slayer's *Reign in Blood* album around the same time as his work on

Licensed to Ill. Regarding King's view of the collaboration, Rubin has commented that:

> I think he just thought it was bizarre. He's a real, serious metalhead. He really loves
>
> metal, and I don't think he listens to much music outside of metal. At least then he didn't.
>
> I don't think it spoke to his aesthetic. And honestly, in retrospect, I don't think he really
>
> spoke to the Beasties' aesthetic.

(Grow 2016)

By contrast, the 1991 Anthrax/Public Enemy re-working of the latter's 'Bring the Noise'

(another Def Jam experiment) is considered to be one of the more equally matched

collaborations of this period because a younger generation of metal artists weaned on hip

hop were becoming more sympathetic to the genre. Indeed 'Bring the Noise' has often

been credited with laying the foundations of the nu metal movement (see Yates 2014),

which had important consequences for metal's code.[5] Nu metal has typically been

discussed in terms of metal artists' adoption of elements of hip hop music – namely rap

styles and funk grooves – into their riff-based metal idiom (Udo 2002; Pieslak 2008).

Less attention, however, has been given to nu metal artists' interests in the technological

aspects of hip hop practice themselves. Particularly notable in this regard is the

emergence of a sampling aesthetic within nu metal, which drew from turntablist practice,

as well as the use of hardware/computer-based sampling technologies. One of the most

significant bands here is Slipknot, who from their earliest work made sampling an integral part of their death metal-derived aesthetic. This was reflected in the band's final line-up, which included two individuals who rather than contributing to the instrumental line-up instead brought specific technology-focused expertise to the proceedings. Sid Wilson (also known as DJ Starscream) was originally recruited for his scratching skills (a typical turntablist technique), which added percussive layering to the already dense musical textures. His extensive knowledge of vinyl culture also had a bearing on the choice of sampled 'breaks' that began to appear on the band's recordings. Craig Jones, known as '133 MHz' (in reference to the speed of his computer), became the band's programmer with responsibility for procuring additional samples and sound effects, including material taken from film and video game soundtracks (McIver 2002, 2012). The work of Wilson and Jones can be readily observed on the group's 1999 debut album, *Slipknot*. Speech elements contribute to the claustrophobic atmosphere, such as the disturbing speed-manipulated, 'The whole thing I think is sick' (excerpted from the 1973 documentary, *Manson*), which opens the album, the sampled scream which permeates the introduction to 'Prosthetics' and the quotation of 'Here comes the pain' from the film *Carlito's Way* in '(Sic)'. On other tracks, sampling from contemporary urban forms such as Jungle introduces classic electronic music memes into the band's style. 'Eyeless', for example, contains an instance of the sped up 'Amen break', which is alternated with the live drum part, while 'Spit it Out' employs a short section from a DJ Stretch Jungle remix of 'Papa Lover' by General Degree.[6]

Slipknot's use of sampling does not feel contrived, or grafted on, rather it functions to expand the sound palette of the band in the service of their disturbing vision,

as well as signify in sonic terms their diverse musical roots.[7] Another prominent nu metal band, the Deftones, similarly recruited an established DJ, Frank Delgado, to contribute samples and sound effects to the band's sound. Like Wilson, Delgado was also an adept turntablist, although his approach in the Deftones' work is often more akin to sound design than classic turntable/sampling techniques (Fortner 2010). This is illustrated in the synthetic atmospheres that provide a backdrop to tracks such as 'Digital Bath', 'Teenager' (which also uses a drum loop) and 'Knife Party' on *White Pony* (2000). As Delgado has commented, 'There was no preconceived way on how to add me into the mix. It's not like we were going to have a metal hip hop thing with scratch breakdowns. I just interweave myself into the songs' (Udo 2002: 121).[8]

Integrating electronic music with metal: Machine aesthetics and industrial music

Although the nu metal idiom was undoubtedly enriched by the inclusion of sampling techniques and turntablism within its musical armoury, most nu metal acts, nonetheless, tended to retain the traditional distorted electric guitar and vocal-led performance aesthetics of the live metal band – in other words, metal's core remained dominant. A more committed approach to the integration of electronic musical aesthetics within the metal genre, in which machine processes are felt to inform the character of the music itself, can be discerned in the isolated experiments that occurred in metal's development during the late 1980s. These resulted from the needs of particular metal musicians to branch out into new projects as a means of developing their artistry beyond the metal

idiom, as occurred with Justin Broadrick, for example, a former guitarist in Napalm Death, who left the band after the release of the debut album, *Scum*, in 1988. Broadrick's work in the band Godflesh (formed with bassist G. C. Green in 1988) was notable for the use of drum machines, which imparted a highly metronomic quality to the music while still retaining the essential elements of metal. Broadrick's comments imply that the inclusion of the drum machine served the band's need to economize on human members, as well as facilitate a certain musical vision: 'We knew we didn't need anyone. We knew what kinds of rhythms we wanted. I knew what I wanted to hear, but it had to be better than what I could do, so we got a machine' (Pettigrew 1992). Metal's code is not lost in this process, rather it is re-thought – the band's debut EP, *Godflesh* (1988), contains material that often moves at a slow tempo (in stark contrast to Napalm Death), foregrounding the drum machine's presence, but is underpinned by an unbroken wall of distorted guitar, functioning more as background texture than front line riff. Two other members of Napalm Death, Mick Harris and Nic Bullen, also moved towards a re-imagining of metal in their work as Scorn (formed 1991), described by the Earache records website as 'an amalgam of technology and searing rhythms, processed through a dub perspective' (Earache n.d.). The marriage of these influences can be heard on the track 'On Ice' (*Vae Solis* 1992), which combines heavy riffing with speech samples and programmed synthesizer elements.[9]

The experiments of Godflesh and Scorn found a particular affinity at the time with industrial music, a genre notable for its eclecticism, having been informed by influences as varied as krautrock, experimental electronic music (such as musique concrète), avant-garde popular music and even disco (Vale 1992; Thompson 1994).

Industrial artists' emphasis on electronic experimentation (Throbbing Gristle), drum machines and cheap synthesizers (Cabaret Voltaire), as well the use of 'found sounds' (Einstürzende Neubaten), foregrounded an open-minded technology-driven aesthetic, which eschewed traditional instrumental timbres and performance values (Hegarty 2007). Significantly, metal was a popular stylistic resource for industrial musicians, whether in the form of samples or live distorted guitars. Notable instances of metal sampling are found in the work of the Young Gods on 'Envoyé' (1986), for example, and KMFDM, who made use of the 'Angel of Death' riff on their track 'Godlike' (1990). According to KMFDM's frontman, Sascha Konietzko, the reason for sampling metal was because it was 'interesting to use it as a kind of white noise for reinforcement of our music' and to free it 'from all those tempo changes and boring attitudes it had' (Di Perna 1995: 69). Given that 'the best riffs came only once and were never repeated [...] the fascination, actually, was to sample a great riff, loop it, and play it over and over again' (Di Perna 1995: 69). The desire to fetishize the riff in this manner has a certain kinship with the practice of isolating and repeating the 'break' associated with hip hop artists previously discussed. However, Konietzko's notion of 'white noise reinforcement' is also of interest, here highlighting the industrial artist's concern with harnessing metal's sonic properties to bolster texture. Another prominent German industrial group with metal leanings, Die Krupps, went a step further, issuing an EP devoted to metal cover versions (*A Tribute to Metallica*) in 1991. This was particularly daring interpretation of the band's work that substituted guitars for synthesizers and included heavily processed vocals and dance beats, as well as additional remixes. The North American industrial scene of the late 1980s, especially the bands Ministry and Skinny Puppy, also played an important role in

re-contextualizing metal music relative to industrial influences. Ministry, for example, on albums such as *Land of Rape and Honey* (1988), combined a heavy thrash guitar-oriented style with synthesizers, samplers and drum machines (Reed 2013). Skinny Puppy's approach to sampling, which drew from various media, including horror film (see *VIVIsectVI* 1988), can be seen as providing a model for bands such as Slipknot (McIver 2012).

Where the integration of electronic music aesthetics with metal is concerned, there appears to have been a particularly productive interchange between metal artists and the industrial scene. A key factor here was industrial music's purpose in employing technology, which was ostensibly to reflect an attitude of negativity towards technology itself and its impact upon society (Hegarty 2007; Reed 2013). Metal artists who shared such views naturally had an affinity with the genre, such as Fear Factory, who drew upon industrial music's technological resources to express a dystopian vision that, ironically, questioned the value of technological progress to the human condition.[10] The earliest fruits of the band's interest in electronic music are illustrated by the EP *Fear is the Mindkiller* (1993) and the important album which followed it, *Demanufacture* (1995). The former is notable for being a selection of remixes of songs from the band's debut album, *Soul of a New Machine* (1992), which were undertaken by the Canadian industrial band Front Line Assembly (Rhys Fulber and Bill Leeb). This group was regarded by Fear Factory as possessing a technological aesthetic that they desired but which they had been unable to achieve themselves due to lack of know-how and access to equipment. As guitarist Dino Cazares has remarked in a recent *Metal Hammer* interview discussing *Demanufacture*:

> *Fear Is The Mindkiller* is what we wanted to be. […] We just didn't have the technology
> to do that at first. We didn't have the keyboard samples or the old-school computers that
> guys like Rhys were using. So we'd try to emulate the machine with guitars, bass, drums
> and vocals. If you listen to old industrial bands like KMFDM or Ministry, they'd sample
> a metal riff and then loop it so it was the same riff over and over. Well, we were trying to
> copy *that*.

(Lawson 2015)

Fulber and Leeb's approach on *Fear Is the Mindkiller* was essentially to create driving loop-based re-workings of the original multi-track mixes, often involving considerable fragmentation and reiteration of significant musical elements, including vocal phrases and guitar riffs (e.g. compare the 'Vein Tap' mix of 'Self Immolation' with the original version). In effect, the remixes drew out and emphasized the precise and repetitive quality identified by Cazares that was already becoming evident in the band's performance approach. It was this experiment that then enabled the band to further develop their vision on *Demanufacture* in 1995, which was also mixed by Fulber (following the jettisoning of the band's original producer Colin Richardson), and *Obsolete* (1999). Both albums also reflected the computer-based approach to editing that was becoming increasingly common in the studio with digital recording software such as Pro-Tools (Dean 2013).

Fear Factory's work represents a particularly successful example of an industrial re-imagining of metal, which came to be integral to the band's identity, as well as pivotal to the formation of the so-called industrial metal subgenre. However, the adoption of such aesthetics in a metal context proved to be problematic in certain metal circles. For example, in 1993, as the industrial metal subgenre was beginning to be recognized, *Kerrang!* magazine (Arnopp and Alexander 1993: 42) debated the question, 'Is industrial

music killing metal?'. This elicited typically reserved views of industrial music's

technological stance relative to metal's traditional performance values. Blaze Bayley (of

Wolfsbane) commented that 'Industrial music won't kill Metal, because you cannot erase

the power of a live performance […] I just don't think that technology could ever take the

place of simplistic passion'. Similarly, Mitch Harris (of Meathook Seed) remarked that

'At the end of the day, a live band is more interesting to watch', while acknowledging

that 'the drum machine type feel *is* crossing over'. It is significant that more than twenty

years later, and in the light of considerable technological change within popular musical

practice, a 2016 *Metal Hammer* article discussing the rejuvenation of industrial metal

acknowledges the persistence of these attitudes: 'The term "industrial metal" is

polarising, and the basic characteristics of the genre, blending electronics with aggressive

metallic guitar and drums, is an abomination to heavy metal purists' (Stingley 2016).

In spite of such views, it is clear that the advent of the industrial metal subgenre

contributed to a general loosening of metal's boundaries in relation to electronic music

aesthetics. This can be seen, for example, in the adoption of drum machines and drum

sample looping on early nu metal recordings, such as Korn's 'Helmet in the Bush' (*Korn*

1994), a practice that later became central to the sound of bands such as Pitchshifter (see

the album *www.pitchshifter.com* 1998) and Static-X (on the album *Machine* 2001).[11] The

industrial aesthetic also created the conditions for the metal remix fad of the early-mid

1990s, which led to re-workings of tracks by major metal artists, including Megadeth,

Pantera, Morbid Angel, Motorhead and Anthrax.[12] These were undertaken in many cases

by industrial artists and, while quite varied in their imaginative scope, served to

acclimatize the metal genre to the possibilities of electronic music. Morbid Angel, for

example, collaborated with the influential Slovenian industrial band, Laibach, on an EP containing remixes of two tracks from the album *Covenant* (1993), 'Sworn to the Black' and 'God of Emptiness'. Laibach's re-workings were somewhat more conservative than the Fulber/Leeb approach and did not attempt to disturb the structural integrity of the original songs. Instead, the group was content with subtle modifications to the sonic environment using electronic processing. It is significant that the group's restraint in their treatment of the material has met with the disapproval of metal fans, with a recent review on the *Encyclopaedia Metallum* website (autothrall 2011), for example, remarking that there is 'too little meat on its mechanical skeleton'. Other remixing projects during this period functioned to demonstrate that newer incarnations of the metal idiom that were emerging at this time had in certain respects begun to move closer to the electronic music aesthetic. For example, the 'Cervical Edit' and 'Cervical Dub Extended' remixes of Pantera's 'Walk', by J.G. Thirlwell (aka Foetus, another artist associated with industrial music), employ staple electronic music techniques, including fragmentation and looping of the original mix material, sonic manipulation of the vocal line and speed manipulated audio. By the time these remixes were released (1993), the so-called groove metal style was well established, and 'Walk', a particularly characteristic example of the genre, possesses musical attributes, which already lend themselves well to the remix situation. The track contains a short repeated guitar riff, akin to a loop (particularly apparent in the outro), and is supported by very tight drumming throughout. Its sparse and clean arrangement also affords plenty of opportunities for the insertion of additional sounds and ambiences. Pantera's drummer, Vinnie Paul, has aptly commented that:

To us, heavy metal had to sound like a machine. The guitar had to have a buzzsaw sound to it, the drums had to have an edge to it, and Dime and Terry [Date] spent many hours getting the guitars 'ass-tight'.

(Wiederhorn and Turman 2013: 340)

Metal 'in the box': The impact of the software-based studio

During the 1990s, metal music evolved in the context of a general shift towards the use of computer-based production platforms. For example, Pro Tools, one of the first Digital Audio Workstations[13] (DAW) to be adopted in a professional studio setting, began to be employed from the mid-1990s as a means of capturing and editing digital audio (*Future Music* 2011). Even when used in its most functional manner, such software imparted particular 'electronic' ways of thinking, which began to inform metal's production values. These included cut and paste style editing of audio material, which encouraged copying and looping of identical recorded elements and the use of click tracks, upon which certain more rhythmically complex forms of progressive metal eventually became dependent (Mynett 2009). It is, therefore, unsurprising that bands such as Fear Factory, whose aesthetic was sympathetic to such ways of working, naturally progressed with the evolution of computer-based production tools. The generation of younger metal bands that constituted the nu metal movement – including Slipknot, Korn, A Perfect Circle and Powerman 5000 – also embraced the DAW, welcoming the facility and precision that it brought to recording and editing tasks (Kitts and Tolinski 2002; Christe 2004). Since this period, DAW have moved beyond their earlier role as an adjunct to the studio process to be accepted as fully fledged music production platforms in their own right, equipped with suites of computer-modelled studio gear (EQ, compressors and effects) and digital

emulations of samplers and synthesizers, which frequently surpass the power of their hardware equivalents. Today's DAW offer the facility to programme highly realistic sounding musical parts using MIDI, samples and loops, granting the user considerable creative autonomy in achieving their own fully realized musical performances. In addition, the versatility that such platforms offer for recording, incorporating, combining and manipulating audio from any source has had particular consequences for stylistic evolution of DAW-based musical genres. Broadly speaking, the electronic music practices previously discussed – sampling, the programming of musical parts, synthesis and the electronic modification of sound – can be seen to reside naturally within this software context and are part of the aesthetic of DAW-based music production.[14]

Recent discussions of metal music production (Williams 2015; Thomas 2015) have begun to recognize the importance of the DAW, particularly in terms of its influence on engineering approaches, as well as metal's sound, although little attention has so far been given to specific metal subgenres that have evolved in this context. A notable example in this regard is djent, which emerged in the late 2000s. Djent[15] is unique in its having flourished on Internet forums such as Soundclick and, later, *got-djent.com*, which remain important vehicles for the exchange of ideas about the music.[16] Indeed, it is this mode of potentially global exchange that has catalyzed the variety of fusions that have occurred within the subgenre during the last few years. Djent's musical roots are typically traced to the Swedish band Meshuggah, and the word 'djent' itself is an onomatopoeic reference to a hard-picked muted power chord riff associated with the band's style (Laing 2011).[17] It is the recurrence of this riff that enables the djent subgenre to be specified, while at the same time foregrounding a key signifier of metal's code that

enables it to maintain its links with its metal heritage. Djent's progressive metal roots are also apparent in its seven-string guitar virtuosity and complex rhythms and textures, as well as its characteristic guitar timbre or 'tone', which is achieved via digital modelling (Laing 2011; Shelvock 2013). The DAW has played a particularly important role in defining the djent sound. In the early period, for example, Propellerhead's Reason (a MIDI-driven sequencer with onboard samplers) or Native Instruments' Battery (a dedicated software-based drum sampler) was used to programme drum parts, which triggered sounds from the Toontracks 'Drumkit from Hell' sample library (Laing 2011). The DAW's influence on djent's character was also felt in another way, in that its click track facilitated the development of the precision technique associated with its guitarists. In the words of Periphery's Misha Mansoor,

> When you're playing that way you start to focus on parts of your technique that make all
> the difference in the world […] Things you'd never have noticed if you weren't sitting in
> front of a computer and hearing your playing back. It taught me how to play guitar.
>
> (Laing 2011: 52)

In this regard, as well as in its use of programmed and triggered samples, djent can be seen as reflecting the machine aesthetics of electronic music production. Ultimately, however, the djent artist's priority was to employ these technological resources in the service of a performance-oriented aesthetic designed to highlight virtuosic guitar-oriented musicianship. This desire to (in Mynett's words) 'index sound producers in the form of performing musicians' (2015: 52) is apparent in the production approach of many of djent's most influential live acts, including Periphery, Tesseract and Animals as Leaders.[18]

What has been more significant in the context of this article has been djent's evolution beyond this band-oriented context into further subgenres informed by electronic music styles. The pivoting point for djent's electronic re-contextualization has been the djent riff itself, which has effectively taken on the property of a meme. As subsequent fusions increasingly blur the boundaries of the original subgenre, the recurrence of this meme has effectively acted as a referent not simply to djent itself but also to 'metal' per se. One example is the work of the British musician, Paul Ortiz (known as Chimp Spanner), who has been associated with djent since the mid-2000s. Ortiz, who describes his music as 'prog-djent/prog-metal', cites a wide range of influences, including both Meshuggah and dubstep artist Burial (Propellerheads 2015). He began as a bedroom producer on Cubase (Heavy Blog 2012) and true to the djent format is an accomplished (seven-string) guitarist who performs his own characteristically djent-style riffs underpinned by programmed sample-led instrumentation (see *All Roads Lead Here* EP 2012). What places the music in more ambiguous genre territory, however, are the minimalist textures and evolving ambient soundscapes which often interject between or accompany the riffed guitar sections, reflecting Ortiz's interest in digital synthesizers (Propellerheads 2015). Ortiz is clearly conscious of where his music sits in relation to metal, commenting that 'it's metal in timbre and feel but it's also just music as well; it's got other things that people can just appreciate if they're coming from a different background and they're not into heavy, aggressive music' (MetalasFuck 2012).

Ortiz is signed to Basick Records, a progressive metal label that has been associated with the djent scene since the late 2000s, which, through its openness to a

range of artists claiming metal allegiance, has effectively acted to push metal's code into new territory. The work of the French musician Rémi Gallego, another Basick Records artist who is known as The Algorithm, is more extreme in its fusions. Gallego's work has been described by the artist himself as 'a crossover between IDM and metal', and 'heavy computer music', and has also been referred to as djent-step – essentially a fusion of djent with dubstep (Clarity 2011; DemiGodRaven 2012; NewFuryMedia 2016). Gallego performs using an on-stage set-up based on Ableton Live, a DAW which facilitates improvised sampling, combined with live drumming and/or guitar playing. In practice, his music, which like Chimp Spanner is instrumental rather than vocal led, comprises an eclectic sample-based mash-up of many different influences, including djent's characteristic signature riffs, dubstep basslines, synthesizer figures and samples drawn from sources as diverse as video game music and Daft Punk.[19] Gallego's description of his 'visual' approach to conceiving music suggests an entirely new paradigm for musical composition in the context of the DAW, within which, metal memes, along with the gestures of many other popular music forms, have become increasingly entwined:

> I compose songs directly on the DAW (Digital Audio Workstation), like an electronic
> artist, and it allows me to visualize directly what I'm writing. It's like a horizontal 2D
> retro game. Just imagine a character running through different universes and ambiances.
> In fact, this way I can actually 'see' a song, it's not just random sounds. I think I'm trying
> to record each song just as if it were a story full of twists. That's why I love brutal
> changes, and abnormal progressions. I want each part to be unpredictable. Just like a
> great scenario!

>   (Clarity 2011)

Metal's ongoing impermeability: Re-thinking the domain

Like industrial metal, djent has raised eyebrows in certain quarters, particularly where the musical eclecticism of some of its practitioners is concerned, which calls into question their legitimacy as 'metal' artists. In an article on the *Metal Sucks* website, for example, entitled 'The latest metal micro-genre bastardisation', Vince Neilstein writes:

> So it's basically drum n' bass with djent riffs over top. We need this […] why? It's not bad by any means but it just strikes me as unnecessary and forced, like trying to invent a new kind of sandwich; I liked the old sandwiches just fine, thanks.

> (Neilstein 2011)

At the heart of these and other similar comments lies a resistance on the part of metal's gatekeepers to the dilution of the genre by outside influences. This, as was suggested earlier, is to a certain extent bound up with entrenched ideas relating to metal's performance conventions and musical style, which new technologies such as the DAW threaten to undermine. It is important to point out, however, that metal artists' gravitation towards the electronic music practices discussed is consistent with a narrative of technological innovation that has been present within the genre since its inception. This has been acknowledged in both the scholarly literature (Weinstein 1991; Walser 1993; Berger 1999), as well as in the journalistic writing on metal (Gill 2002; Christe 2004). Weinstein (1991: 23), for example, in her consideration of metal's 'sonic dimension', notes the guitar's situation in 'increasingly elaborate electronic technology that distorts and amplifies' and its use of 'a wide range of electronic gadgetry'. Walser (1993: 45) observes that 'heavy metal relies heavily on technology for its effects', including the technology of the studio which defines metal's sound: 'reverb and echo units, as well as sophisticated overdubbing techniques have also become important to metal performance

and recording'.[20] Distortion, on which Walser and others have written extensively, is an electronically achieved effect that has become normalized within metal, but which at one point was an experimental and challenging leap into new sonic territory. Indeed, distortion in some quarters is viewed as a facet of experimental electronic music (for example, within the 'noise' genre), which may explain metal's appeal as a sonic resource to industrial artists. The recent exhaustive studies of metal production by a new generation of scholars such as Mynett (2015) and Thomas (2015) also make fully explicit the importance of technology in the evolution of metal's essential sound. Even where metal's traditional instruments are themselves concerned, innovative metal artists have attempted to push these particular 'technologies' beyond their conventional limits. This can be seen, for example, in Tom Morello's re-thinking of both the technical and timbral aspects of the guitar in his work with Rage Against The Machine or the development of seven- or eight-string modifications of the guitar that have occurred within progressive metal through to djent. The use of digital amp modelling for guitar tones, or triggered samples for drum parts, also constitute engagement with technological developments, which draw less critical comment because they relate to metal's typical instrumental format. However, now that metal's creation and production have been further de-centralized by digital technologies such as the DAW, there is likely to be more individual innovation than ever before where technology is concerned.

Finally, it is also worth re-visiting Ian Christe's point, in reference to the relationship of metal with the 1990s hardcore scene, that the latter could be regarded as a 'digital equivalent of metal […] outside the headbanger lineage' (2004: 334). By way of example, Christe cites Gabber, one of most aggressive electronic music forms of this

period, as 'every bit the techno equivalent of extreme metal' and the 'first point of crossover between death metal and techno, as bedroom producers matched suffocating guitar riffs and squawking techno-tronic punch' (2004: 335). What such a perspective encourages is a re-imagination of metal's code in a way that avoids being trapped in notions associated with particular kinds of riffs, drumbeats and vocal styles specific to metal's foundation, rather it can instead defer to a comparable musical ethos. What this ethos comprises, of course, requires more specification – Christe, for example, implies that it is the equivalent, in some other genre context, of metal's riffs. However, it is significant that Korn's lead singer Jonathan Davis should have recently evoked a similar idea in reference to *The Path of Totality* (2011), which was notable in the band's output for its production by dubstep artist Skrillex and other contemporary electronic musicians, including Noisia and Downlink. Davis comments that, 'North American dubstep is the new electronic heavy metal. It's the filthier, the better in that world, and with heavy metal, it's the heavier the better, so it's kind of the same thing' (Goodwyn 2012). Elsewhere, in reference to the same album, Davis has also provocatively stated that, 'There's a lot of closed-minded metal purists that would hate something because it's not true to metal or whatever, but Korn has never been a metal band, dude. We're not a metal band' (Giles 2012). Such comments are clearly hyberbole in response to criticism, but they serve to reinforce the point that dogged adherence to entrenched criteria can potentially stifle innovation. While Korn's recent work suggests that *The Path of Totality* may only have been a passing experiment, rather than a wholesale move into new territory; it is ultimately the willingness of such established acts to find common ground

between metal and 'foreign' influences that will enable metal practitioners to think more flexibly about the nature of their domain in the future.

Conclusion

The preceding discussion has illustrated that there has been a long-standing tradition of experimentation with a range of technological tools, either within or at the boundaries of metal practice. Perhaps, the best way to understand the impact of the various creative approaches discussed here – sampling, programming, looping, remixing, mash-up and so on – is that they have offered a kind of 'proof of concept' for the possibilities of re-situating metal's code in relation to electronic music aesthetics. This has enabled aspects of metal's code to be interrogated in terms of, for example, the challenge of machine aesthetics to metal's 'human' performance values, the possibilities of incorporating synthetic timbres into metal's timbral palette or the exploration of eclectic metal-electronica genre conflations. It is worth adding that the three subgenres of metal discussed in reference to these practices – nu metal, industrial metal and djent – have all been contested in regard to their legitimacy as 'metal'.[21] The resistance here undoubtedly relates in part to the fact that the particular technologies adopted by the artists working within these subgenres have encouraged ways of performing and creating music that are at odds with traditional metal aesthetics. However, as has been illustrated, metal's riff-based core has in each case remained largely intact, even when subject to considerable manipulation using sample-based techniques or sonic modification. Indeed, it is the retention of this particular element, however, peripherally, that has enabled these subgenres, at least from a musical point of view, to be situated convincingly within

metal's lineage. Given the stability of this defining aspect of metal's code, drum machines, samplers and DAWs, rather than compromising the genre, have instead provided a technological means of increasing the range of artistic expression of metal artists, while offering important indicators of what metal practice might encompass in the future.

REFERENCES

Arnopp, J. and Alexander, P. (1993), 'Killing technology? Is industrial music killing metal?', *Kerrang!*, 25 September, p. 42.

autothrall (2011), 'Laibach remixes – Review by autothrall', Encyclopaedia Metallum: The Metal Archives, http://www.metal-archives.com/reviews/Morbid_Angel/Laibach_Remixes/5136/autothrall/192699. Accessed 25 November 2016.

Barlindhaug, G. (2007), 'Analog sound in the age of digital tools: The story of the failure of digital technology', in R. Skare, N. Windfeld Lund, and A. Vårheim (eds), *A Document (Re)turn. Contributions from a Research Field in Transition*, Frankfurt am Main: Peter Lang Publishing Group, pp. 73–93.

Bell, A., Hein, E. and Ratcliffe, J. (2015), 'Beyond skeuomorphism: The evolution of music production software user interface metaphors', *Journal on the Art of Record Production*, 9, http://arpjournal.com/beyond-skeuomorphism-the-evolution-of-music-production-software-user-interface-metaphors-2/. Accessed 17 July 2015.

Berger, H. M. (1999), *Metal, Rock, and Jazz: Perception and the Phenomenology of Musical Experience*, Hanover, NH: Wesleyan University Press.

Christe, I. (2004), *Sound of the Beast: The Complete Headbanging History of Heavy Metal*, London: Allison and Busby.

Clarity (2011), 'Exclusive: Interview with The Algorithm', got-djent.com, http://got-djent.com/article/exclusive-interview-algorithm. Accessed 15 October 2016.

Davies, Greg (2015), 'The emergence of djent', Heavy Metal Historian, http://heavymetal666.com/2015/03/25/the-emergence-of-djent/. Accessed 5 December 2016.

Dean, J. (2013), 'Fear factory: The making of "Demanufacture"', Faster Louder, http://fasterlouder.junkee.com/fear-factory-the-making-of-demanufacture/847981. Accessed 29 October 2016.

DemiGodRaven (2012), 'No clean singing – The Algorithm', No Clean Singing, http://www.nocleansinging.com/tag/the-algorithm/. Accessed 28 November 2016.

Di Perna, A. (1995), 'Jackhammer of the Gods', Guitar World, 15: 6, pp. 54–71.

Earache (n.d.), 'Scorn', www.earache.com, http://www.earache.com/index2.html. Accessed 11 November 2016.

Fortner, S. (2010), 'Deftones Frank Delgado on why openness is so metal', Keyboard Magazine, 1 November, http://www.keyboardmag.com/artists/1236/deftones-frank-delgado-on-why-openness-is-so-metal/27994. Accessed 4 December 2016.

Frith, S. (1986), 'Art versus technology: The strange case of popular music', *Media, Culture & Society*, 8:3, pp. 263–79.

Future Music (2011), 'A brief history of Pro Tools', Future Music, 30 May,

http://www.musicradar.com/tuition/tech/a-brief-history-of-pro-tools-452963.

Accessed 25 November 2016.

Giles, J. (2012), 'Korn's Jonathan Davis: "We're not a metal band"', Loudwire, 17

February, http://loudwire.com/korn-jonathan-davis-were-not-a-metal-band/.

Accessed 21 October 2016.

Gill, C. (2002), 'Amped!', in B. Tolinski and J. Kitts (eds), *Guitar World Presents Nu-*

Metal, Milwaukee, WI: Hal Leonard Corporation, pp. 145–49.

Goodwin, A. (1988), 'Sample and hold: Pop music in the digital age of reproduction',

Critical Quarterly, 30:3, pp. 34–49.

Goodwyn, T. (2012), 'Korn's Jonathan Davis: "Dubstep is the new electronic heavy

metal"', NME, 8 August, http://www.nme.com/news/music/korn-17-1258109.

Accessed 21 October 2016.

Grow, K. (2016), 'Rick Rubin: My life in 21 songs', Rolling Stone, 11 February,

http://www.rollingstone.com/music/lists/rick-rubin-my-life-in-21-songs-

20160211/beastie-boys-no-sleep-till-brooklyn-1986-20160209. Accessed 25

November 2016.

Heavy Blog (2012), 'Paul Ortiz of Chimp Spanner – The HBIH interview', Heavy Blog

Is Heavy, http://www.heavyblogisheavy.com/2012/08/09/paul-ortiz-of-chimp-

spanner-the-hbih-interview-ii-this-time-its-bananas/. Accessed 15 October 2016.

Hegarty, P. (2007), *Noise Music: A History*, New York: Continuum Books.

Ice-T and Century, D. (2012), *Ice: A Memoir of Gangster Life and Redemption-From*

South Central to Hollywood, New York: Random House Publishing Group.

Kahn-Harris, K. (2007), *Extreme Metal: Music and Culture on the Edge*, Oxford: Berg.

——— (2014), 'Breaking metal's boundaries', Souciant,

http://souciant.com/2014/01/breaking-metals-boundaries/. Accessed 16

November 2016.

Katz, M. (2004), *Capturing Sound: How Technology Has Changed Music*, Berkeley:

University of California Press.

Kitts, J. and Tolinski, B. (2002), *Guitar World Presents Nu-Metal*, Milwaukee, WI: Hal

Leonard Corporation.

Laing, R. (2011), 'What is djent?', Total Guitar, May, pp. 49–54.

Lawson, D. (2015), 'Rise of the machine: The untold story of Fear Factory's

Demanufacture', Metal Hammer, 10 November,

http://teamrock.com/feature/2015-11-10/rise-of-the-machine-the-untold-story-of-

fear-factory-s-demanufacture. Accessed 29 October 2016.

Levine, M. (2015), 'Tracking and mixing with Nolly', Audiofanzine,

http://en.audiofanzine.com/sound-technique/editorial/articles/tracking-and-

mixing-with-nolly.html. Accessed 15 October 2016.

Marrington, M. (2011), 'Experiencing musical composition in the DAW: The software

interface as mediator of the musical idea', *Journal on the Art of Record

Production*, 5, http://arpjournal.com/experiencing-musical-composition-in-the-

daw-the-software-interface-as-mediator-of-the-musical-idea-2/. Accessed 17 July

2015.

———— (2016), 'Paradigms of music software interface design and musical

creativity', in R. Hepworth-Sawyer, J. Paterson, J. Hodgson and R. Toulson (eds),

Innovation in Music II, Shoreham-by-Sea: Future Technology Press, pp. 52–63.

———— (2017), 'Composing with the digital audio workstation', in K.Williams and

J.Williams (eds), *The Singer-Songwriter Handbook*, New York: Bloomsbury

Academic.

McIver, J. (2002), *Nu-Metal: The Next Generation*, London: Omnibus Press.

———— (2012), *Slipknot: All Hope Is Gone*, London: Music Sales Group.

Metal Hammer (2011), 'The league of Djentlemen', Metal Hammer, April, pp. 66–67.

MetalasFuck (2012), '"Basically this is my first band" – Paul Ortiz of Chimp Spanner

talks to Metal as Fuck', MetalasFuck,

http://metalasfuck.net/zine/articles/2012/basically-my-first-band-paul-ortiz-

chimp-spanner-talks-metal-fuck. Accessed 15 October 2016.

Mynett, M. (2009), 'Extreme metal: The SOS guide to recording & producing modern

metal', Sound on Sound Magazine, November, pp. 120–33.

———— (2013), 'Contemporary metal music production', Ph.D. thesis, Huddersfield:

University of Huddersfield.

Neilstein, V. (2011), 'The latest metal micro-genre bastardization: dubstep + djent =

djentstep', MetalSucks, http://www.metalsucks.net/2011/02/16/the-latest-metal-

micro-genre-bastardization-dubstep-djent-djentstep/. Accessed 14 October 2016.

NewFuryMedia (2016), 'Featured interview: The Algorithm (Remi Gallego)', The New

Fury, http://thenewfury.com/wordpress/featured-interview-algorithm/. Accessed

15 October 2016.

NME (1999), 'The New Scientists', NME, 11 November,

http://www.nme.com/news/music/beastie-boys-105-1392669. Accessed 3

November 2016.

Pettigrew, J. (1992), 'Godflesh – Louder than life', Alternative Press, June,

http://www.godflesh.com/articles/article2.html. Accessed 25 November 2016.

Pieslak, J. (2008), 'Sound, text and identity in Korn's "Hey Daddy"', *Popular Music*,

27:1, pp. 35–52.

Propellerhead (2015), 'Artist drop: Chimp Spanner', Propellerhead,

https://www.propellerheads.se/blog/artist-drop-chimp-spanner. Accessed 15

October 2016.

Reed, S. A. (2013), *Assimilate: A Critical History of Industrial Music*, Oxford: Oxford

University Press.

Shelvock, M. (2013), 'The progressive heavy metal guitarist's signal chain', in R.

Hepworth-Sawyer, J. Paterson, J. Hodgson and R. Toulson (eds), *Innovation in

Music*, Shoreham-by-Sea: Future Technology Press, pp. 126–38.

Stingley, M. (2016), 'We are witnessing the return of industrial metal', Metal Hammer,

15 June, http://teamrock.com/feature/2016-06-15/we-are-witnessing-the-return-

of-industrial-metal. Accessed 15 November 2016.

Strachan, R. (2017), *Sonic Technologies: Popular Music, Digital Culture and the

Creative Process*, New York: Bloomsbury.

Tankel, J. D. (1990), 'The practice of recording music: Remixing as recoding', *Journal of

Communication*, 40:3, pp. 34–46.

Taylor, T. D. (2001), *Strange Sounds: Music, Technology and Culture*, New York: Routledge.

Théberge, P. (1997), *Any Sound You Can Imagine: Making Music/Consuming Technology*, Middletown, CT: Wesleyan University Press.

——— (1999), 'Technology', in T. Swiss and B. Horner (eds), *Key Terms in Popular Music and Culture*, Oxford: Blackwell, pp. 209–24.

Thomas, N. (2015), 'The development of technology and its influence on recorded heavy metal music 1969–2015', Ph.D. thesis, Hull: University of Hull.

Thompson, D. (1994), *The Industrial Revolution*, Los Angeles, CA: Cleopatra.

Thomson, J. (2011), 'Djent, the metal geek's microgenre', 3 March, https://www.theguardian.com/music/2011/mar/03/djent-metal-geeks. Accessed 30 November 2016.

Udo, T. (2002), *Brave Nu World*, London: Sanctuary.

Vale, V. (1992), *Industrial Culture Handbook*, San Francisco, CA: Re/Search Publications.

Walser, R. (1993), *Running with the Devil: Power, Gender, and Madness in Heavy Metal Music*, Middletown, CT: Wesleyan University Press.

Weinstein, D. (1991), *Heavy Metal: A Cultural Sociology*, New York: Lexington Books.

Wiederhorn, J. and Turman, K. (2013), *Louder Than Hell: The Definitive Oral History of Metal*, New York: Harper Collins.

Williams, D. (2015), 'Tracking timbral changes in metal productions from 1990 to 2013', *Metal Music Studies*, 1:1, pp. 39–68.

Wilson, S. (2008), *Great Satan's Rage: American Negativity and Rap/Metal in the Age of Supercapitalism*, Manchester: Manchester University Press.

Xavier, T. (2015), 'Tesseract – Exclusive interview with Acle Kahney on the making of *Polaris*', Gear Gods, http://geargods.net/interviews/tesseract-exclusive-interview-with-acle-kahney-on-the-making-of-polaris/. Accessed 15 November 2016.

Yates, H. (2014), 'The story behind the song: "Bring the Noise" by Anthrax and Public Enemy', Classic Rock, 23 April, http://teamrock.com/feature/2014-04-23/the-story-behind-the-song-bring-the-noise-by-anthrax-and-public-enemy. Accessed 19 November 2016.

Discography

Algorithm (2012), *Polymorphic Code*, UK: Basick Records.

Animals as Leaders (2009), *Animals as Leaders*, USA: Prosthetic.

Atari Teenage Riot (1995), *Delete Yourself*, London: Digital Hardcore Recordings.

Beastie Boys (1986), *Licensed To Ill*, UK and USA: Def Jam.

Chimp Spanner (2012), *All Roads Lead Here*, UK: Basick Records.

Deftones (2000), *White Pony*, USA: Warner.

Die Krupps (1993), *Tribute to Metallica*, UK and USA: Hollywood Records.

Fear Factory (1993), *Fear Is The Mindkiller*, USA: Roadrunner.

——— (1995), *Demanufacture*, USA: Roadrunner.

Godflesh (1988), *Godflesh EP*, UK: Swordfish.

Ice T. (1991), *O.G. Original Gangster*, USA: Warner.

KMFDM (1990), *Naive*, USA: Wax Trax!

Korn (1994), *Korn*, USA: Epic.

——— (2011), *The Path Of Totality*, USA: Roadrunner.

Meshuggah (1995), *Destroy Erase Improve*, Germany: Nuclear Blast.

Ministry (1988), *The Land of Rape and Honey*, USA: Sire.

Morbid Angel (1994), *Laibach Remixes*, UK: Earache.

Pantera (1993), *Walk EP*, USA: WEA.

Periphery (2010), *Periphery*, USA: Roadrunner.

——— (2011), *Icarus*, USA: Roadrunner.

Pitchshifter (1998), *www.pitchshifter.com*, USA: Geffen.

Public Enemy (1988), *It Takes a Nation of Millions to Hold Us Back*, USA: Def Jam.

Scorn (1992), *Vae Solis*, UK: Earache.

Skinny Puppy (1988), *VIVIsectVI*, Canada and USA: Nettwerk.

Slipknot (1999), *Slipknot*, USA: Roadrunner.

Static-X (2001), *Machine*, USA: Warner.

Tesseract (2011), *One*, UK: Century Media.

Various (2011), *Metal Hammer Presents Djent*, UK: Future Publishing.

——— (2012), *Basick 2012 Free Sampler* (online), Basick Records,

http://music.basickrecords.com/album/basick-2012-free-sampler. Accessed 19 October

2016.

1.   In addition to Weinstein, my use of this term in relation to music and technology

is informed by discussions of remixing practice in Tankel (1990).

2.   See Goodwin (1988) for a historical perspective on the evolution of sampling

technologies.

3.	Powermad are an often overlooked speed metal band hailing from Minneapolis. The sampled material in question was taken from their only full-length album, *Absolute Power* (1989). Thanatos are a Dutch thrash/death metal band (founded 1984), and the sampled track appears on their album *Emerging from the Netherworlds* (1990).

4.	The *Spawn* soundtrack is notable for including a number of unique collaborations between metal musicians and electronic artists, including 'Satan' (Kirk Hammett with Orbital) and 'Kick the P.A.' (Korn and the Dust Brothers). The album also includes a remix of Metallica's 'For Whom the Bell Tolls' by DJ Spooky.

5.	Also of importance in bringing about this shift of attitude was the *Judgment Night* soundtrack (1993), which contained a number of collaborations between rock/metal and rap artists, including 'Disorder' (Slayer with Ice T) and 'Real Thing' (Pearl Jam with Cypress Hill).

6.	The 'Amen Break' is used again on a later Slipknot track, 'Pulse of the Maggots' on *Volume 3: The Subliminal Verses* (2004). The WhoSampled website provides some useful pointers for tracing the origins of particular samples and their uses in Slipknot's work.

7.	Scott Wilson (2008) has provided a thought-provoking analysis of Slipknot's production aesthetic, including the band's use of samples, relative to the US social and political context of the 1990s.

8.	Other notable nu metal bands who employed turntable and sampling techniques during this period include Limp Bizkit and Linkin Park.

9.	Harris also developed a Brian Eno-influenced ambient style during the same period in a side project called Lull, which effectively marked a total departure from the metal idiom.

10.	As illustrated by lyrics such as 'The machine is now alive/To wreak havoc in your lives/There's no use to hold me back/I am ready to attack' in the song 'H-K (Hunter Killer)' on *Demanufacture* (1995). The arresting cover artwork for the latter album draws a parallel between the human ribcage and the appearance of a product bar code.

11.	It is important to note that Pitchshifter's early work already shows a strong affinity with the 'industrial' idiom and is reminiscent of Godflesh in the use of drum machines. See the album, *Industrial* (1991).

12.	Specifically, Megadeth 'Symphony of Destruction' (Trent Reznor); Pantera 'Fucking Hostile', 'By Demons be Driven' (Justin Broadrick) and 'Walk' (J. G. Thirlwell); Morbid Angel 'Sworn to the Death' and 'God of Emptiness' (Laibach); Motorhead 'Ace of Spades' (CCN); Anthrax 'Potter's Field' (Al and Paul).

13.	DAWs are essentially computer-based music production suites possessing, in software form, all the facilities of the traditional hardware studio.

14.	For detailed discussion of the DAW's nature as a structure that informs musical creativity in a number of areas of music practice, see Barlindhaug 2007; Bell et al. 2015; Marrington 2011, 2016, 2017; Strachan 2017.

15.	On pronunciation, the 'd' is silent, thus, pronounced 'gent', as in the shortened version of 'gentleman'.

16. Occasional reviews and features in the *Guardian* (Thomson 2011), *Metal Hammer* (2011) and *Total Guitar* (Laing 2011) have also functioned to solidify the subgenre's wider recognition.

17. Djent artists have cited the opening of Meshuggah's song, 'Soul Burn' (*Destroy Erase Improve* 1995), as a defining example of the djent sound.

18. Certain members of these bands, such as Acle Kahney of Tesseract and Adam Nolly-Getgood of Periphery, are also recognized as accomplished metal producers in their own right (Levine 2015; Xavier 2015).

19. For a useful introduction to Gallego's sound, see *Polymorphic Code* (2012).

20. Walser has also noted ironically that 'the common perception of technological mediation as artifice' has informed narratives of metal's authenticity to the extent that it plays down the fact that within metal, there are 'effects that can be created only with help of very sophisticated technology' (1993: 16).

21. For discussions of these subgenres in terms of their outsider status relative to metal, see respectively, Kahn-Harris (2007), Stingley (2016) and Davies (2015).

Mark Marrington has asserted his right under the Copyright, Designs and Patents Act, 1988, to be identified as the author of this work in the format that was submitted to Intellect Ltd.