The Role of Harmony in the Construction of a Machinic Aesthetic

in Electronic Dance Music

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Abstract

This thesis represents the first extended study of harmonic practices and their significance in electronic dance music. Focusing on analysis of recordings from the 1970s–1990s, it identifies three distinctive harmonic practices which help to define what is labelled as a 'machinic' aesthetic in dance music and articulates a meaningful harmonic distinction between styles such as electro, techno and UK hardcore and Jazz/R&B-derived styles such as disco, deep house and garage. Given the extensive discursive links between dance music, tropes of futurism, and science fiction, the harmonic practices identified in this thesis are analysed alongside those of other genres. In particular, attention is paid to the similarities between science fiction film soundtracks and machinic dance musics, arguing that this similarity plays an important role in how those harmonies are interpreted by listeners. The analysis of dance music's harmonic connotations is further developed through a discussion of the results of a listening test carried out for this project, which lend weight to the semiotic potential of harmony alongside other musical parameters. This research is aimed at the music academic community and builds on previous work by Walter Everett and Richard Middleton on rock harmony, semiotic analyses of dance and industrial music by Philip Tagg and Karen Collins, and more recent scholarship on groove and timbre by Mark Butler, Hans Zeiner-Henriksen and Maria Perevedentseva. As such, it contributes to a new wave of musicological dance music research and will be valuable to future scholarship investigating the musical aspects of dance styles.

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Note on Conventions

Throughout the text of this thesis, rather than including full transcriptions of the many melodic sequences and riffs that are discussed as examples, the melodic shape of each sequence has been indicated, in the form of a series of scale degrees relative to a given foundation note (e.g., 8-♭9-♭7-8-4-♭6-5-1 (in C)). This abbreviated form of notation has been used in this thesis as it allows the scales of melodic sequences to be easily compared and also allows melodic sequences to be easily translated into pitch collections (e.g., the above riff produces the following pitch collection: 1,♭2,4,5,♭6,♭7).

This notation does not include rhythmic information and does not specify the duration of notes. Additionally, duplications of pitches are sometimes omitted (so a riff with the notes 1-1-1-1-♭3-4 may appear in the text in an abbreviated form, as 1-♭3-4). In many cases the overall length of the melody or riff is given (e.g., a 'one-bar' or 'two-bar' loop) and the instrument that plays the part is identified.

Heptatonic scale degrees are used throughout the text for readability, and to allow comparisons of melodic sequences, regardless of whether the scalar material being described suggests a heptatonic scale. For example, in a C Octatonic scale, the note of b♭ is notated as a ♭7 scale degree, even though this note is the eighth note of that scale.

The scale degree of '1' indicates the foundation note of the scale being described, with the scale continuing upwards into as many octaves is required to describe a melodic sequence. In the example, 8-♭9-♭7-8-4-♭6-5-1 (in C), the scale degrees '1' and '8' both describe a pitch of c, an octave apart.

In the text, chord names are presented in uppercase (e.g., EM, or Cm) while individual notes are presented in lowercase (e.g., b or d♯).

Introduction

Many writers have argued that some styles of electronic dance music possess a 'machine aesthetic', heard as evocative of the workings of machines and technology. Critic Simon Reynolds uses the term 'machine music' (2007, p. 313) to describe the aesthetics of styles of dance music such as acid house, techno, electro, UK hardcore and drum and bass. Kodwo Eshun uses the same term throughout *More Brilliant Than The Sun* (1998) to describe these same styles of dance music. Machinic dance music styles have also been described as inherently futuristic and evocative of future technologies. Reynolds has claimed that 'electronic music is driven by a quest to find the most radical or futuristic-sounding potential in brand new technology' (2007, p. 313), Matt Anniss's recent book about UK 'bleep' techno is entitled (after a 1991 track by Tuff Little Unit) *Join The Future* (2019) and Jeremy Gilbert and Ewan Pearson have described techno as 'more futuristic' than house music (1999, p. 74). These explicitly futuristic and technological 'machinic' dance music styles are also often associated with the themes of science fiction literature and cinema. For example, Robert Fink links the style of electro hip-hop with 'science fiction, computers, video games, and nuclear annihilation' (2005, p. 351), and Nettrice R. Gaskins argues that 'Detroit techno artists used science fiction imagery to envision a transformed society; the sound generated by the meeting of funk and futurism' (2016, p. 73).

The specific role that harmony might play in constructing this machine aesthetic, has, to date, been neglected in dance music writing. The central claim of this thesis is that harmonic organisation does play an important role in the construction of a machine aesthetic in dance music and may be heard as expressive of the noisy, mechanical and sometimes brutal movements and sounds of machines. This research is the first to argue that some harmonic practices in dance music are likely to be heard as expressive of machines and technology and may be important aspects of machine aesthetics in dance music. This research contributes to a growing body of academic work focusing on analysis of the musical aspects of dance styles. Studies focusing on the common structural, rhythmic and timbral features of dance music styles, and how these features may be meaningful to audiences, have already been produced by, for example, Mark Butler (2001) and Luis-Manuel Garcia (2005) (both focusing on the rhythmic and structural aspects of dance styles) and Maria Perevedentseva (2022), (focusing

on the expressive potential of timbre in dance music). This thesis represents the first extended study of harmony in dance music and its meaning for dance music audiences.

The neglect of harmonic analysis of dance music can be understood to result from an assumption, developed by dance music critics, such as Reynolds and Eshun, and adopted by academics such as Gilbert, Pearson, Butler, and others, that, within the context of repetitive and static harmony in dance music tracks, variations or differences in harmonic organisation have little or no significance for dance music audiences. Reynolds, for example, has argued that, in dance music, timbral and rhythmic qualities are of far more importance to producers and audiences, suggesting that 'processing is more important than playing; the vivid, ear-catching textures matter more than the actual notes played' (2007, pp. 314, 327). Furthermore, Reynolds suggests that the melodic and harmonic aspects of dance music tracks are systematically simplified to allow greater focus on rhythmic aspects of the music, arguing that 'complicated melodies would distract from the sheer lustrous materiality of the sound-in-itself; the pigment is more important than the line' (2007, pp. 314-315).

Moreover, Reynolds and Eshun argue that the supposedly simplistic harmonic organisation of dance music tracks can be contrasted with a more conventional 'trained' 'musicianship' that is found in non-dance styles such as rock and jazz, and in the R&B and soul influenced dance styles of house and garage. Reynolds claims that 'for conventionally trained musicians, the chord progressions and harmonic intervals used in electronic music can seem obvious and trite' (2007, p. 314). As a result, dance music 'tracks' are often described as reducible to, or synonymous with, their beat or rhythm (the distinction between dance music 'tracks' and 'songs' is discussed later in this introduction). Butler, for example, suggests that 'In many ways the beat is the music. Fans often describe the music simply as 'beats'' (2001, p. 2). Elsewhere he suggests that 'EDM is percussion music' (2001, p. 109) and has argued that 'at a fundamental level, electronic dance music emphasizes rhythm, meter, texture and timbre over melody and harmony' (2001, p. 334). Gilbert and Pearson similarly argue that 'in house and techno, the beat has become all important' (1999, p. 38). To the extent that the assumption, that harmony within dance music is unimportant, has been accepted in academic scholarship, it has had the effect of inhibiting analysis of the harmonic variety that is present in dance music 'tracks' and what harmonic distinctions might mean to listeners.

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These writers' assertions that harmony in dance music is unimportant to audiences can also be related to second assumption, that only longer-term 'discursive' harmonic structures, which are typically absent in dance music tracks, can produce meaning. According to authors such as Gilbert and Pearson, the short-term repetition of melodic and chordal patterns in acid house and techno tracks creates an ongoing perceptual 'present' which does not allow any longer-term 'narrative' or discursive meaning to be constructed. However, the assumption that only longer-term discursive harmonic structures can be meaningful precludes any understanding of how harmony may be meaningful even within the context of highly repetitive, rhythmically focused track form. By contrast, this thesis argues that, within the context of repetitive dance music track form, distinctions between the use of chordal harmony and 'static' harmony, and between consonant and dissonant forms of static harmony, are likely to be highly meaningful to audiences.

Through analysis of the harmony of dance music tracks, several distinctive harmonic practices can be identified that appear to play an important role in the construction of a 'machine aesthetic' in dance music. Importantly, these harmonic practices can be identified in many of the tracks that authors such as Reynolds and Eshun have highlighted as paradigmatic examples of machinic dance music. The analysis presented in this thesis suggests that many of these tracks often incorporate harmonic features or practices that are not commonly found in house and garage styles or in disco, jazz or pop/rock, and which may be heard as evocative of the workings of machines and technology, specifically, the use of 'dissonant' melodic riffs, the doubling of riffs with parallel chords, and the use of disjunctive and jarring harmonic shifts. For example, the Detroit techno track 'No UFO's' (1985) by Model 500 (an alias of Detroit techno producer Juan Atkins), features all of these harmonic practices: dissonant static riffs, riffs doubled with parallel minor triads, and disjunctive harmonic shifts. These harmonic practices can be identified in many dance tracks in electro, acid house and techno styles, whilst simultaneously being less common in house and garage styles of dance music. The use of these harmonic practices may, then, play an important role in distinguishing explicitly 'machinic' dance styles from other styles that typically employ harmonic practices derived from disco, soul, jazz and R&B.

Further evidence of the importance of harmony to dance music producers can be identified in the many tutorials and textbooks that have been produced that discuss the harmonic aspects of dance music production. The textbook *Music Theory for Computer Musicians* (Hewitt, 2008), for example, provides an introduction to harmonic theory specifically targeted at 'DJs ' and 'electronic music producers' and suggests that the Locrian mode, which has 'a really dark feeling' is 'used to a great effect in techno, drum and bass, and some of the harder styles of trance' (Hewitt, 2008, p. 221). Similarly, a YouTube video entitled *Music Theory for Techno* suggests that techno producers should 'embrace dissonance' in order to fully capture the techno sound, and also suggests that the Phrygian scale has an 'evil feeling' (Verlinden, 2021). Other music theory guides suggest how specific harmonic techniques might be used to evoke particular styles of dance music, suggesting that seventh chords can be used to create a 'disco' feel , the use of minor ninth chords may be appropriate in the deep house style, and that a 'signature sound' of Detroit techno is the use of fixed-interval minor triads (Clews, 2021, pp. 74,75,77). The existence of this pedagogical material indicates that harmony in dance music is important to both producers and audiences and that harmonic differences play an important role in establishing stylistic distinctions. For example, the use of dissonance in techno can be regarded as a highly intentional aspect of the style that producers may employ so that the music sounds sufficiently 'techno' and different from other styles of dance music such as house. Describing the difference between techno and house styles, Techno producer Jeff Mills has suggested, that 'the melodic sequences' and 'the basslines were very different' (Brewster & Broughton, 2006, p. 354). Mills' comments imply that harmonic differences, located in melodic sequences and basslines, are significant, both to producers and audiences.

1. **Prior research on harmony in 'song form' and 'track form' in dance music**

A distinction between 'songs' and 'tracks' has often been noted in dance music criticism. Simon Reynolds has, for example, suggested that 'each represented a different side of house: songs versus tracks, a R & B derived tradition of soul-full expression versus depersonalised functionalism' (1998, p. 19). This distinction has subsequently appeared in academic scholarship, as Mark Butler has also described this distinction between the house song, which wears 'its disco ancestry on its sleeve' (Butler, 2001, p. 17), and the house track, which emphasises drum machine rhythms and often eschews 'not only sung melodies but also

instrumental ones' . Butler also suggests that 'this distinction between "songs" and "tracks" dates back to mid-1980s' although 'house musicians and fans still use these categories today' (Butler, 2001, p. 17). Jeremy Gilbert and Ewan Pearson have also argued that house 'songs' combine house rhythms with traditional 'Philly soul and gospel derived song structures' (1999, p. 74). Richard Pope makes a similar distinction between trance and techno, suggesting that, 'unlike techno the typical trance track develops more of a song structure with its escalating melodies and highs and lows, the effect of which is to produce a sense of—utopian, harmonious, transcendent—elation' (2011, p. 38).

Conventional song structures, popular in dance styles such as house and garage, can be understood to segment a musical work into various sections (such as AABA or verse-chorus forms). These sections are often marked by harmonic change or closure. Dance music 'songs' are therefore defined in this thesis as any dance music recordings that feature segmented 'song form' structures. Common song structures in twentieth century popular music include 32 bar AABA forms, 12 bar blues forms, or verse/pre-chorus/chorus forms (von Appen & Frei-Hauenschild, 2015), although verse/pre-chorus/chorus forms are the most common of these types in disco and house and garage styles. Song forms often feature a harmonically contrasting B section or verse/chorus contrast that provides a sense of harmonic 'departure' or 'take-off' from the established tonal centre of the A section or initial section (von Appen & Frei-Hauenschild, 2015, p. 26). However, Butler argues that while the conclusion of sections or 'phrases' in conventional chordal harmony are commonly marked by harmonic closure or finality, that this is not the case in the harmonically static dance track, 'which is not harmonically driven' (2001, p. 233) . Butler also emphasises that dance music tracks typically do not feature sections which present a harmonic contrast to the original harmony or tonal centre.

Garcia has argued that, unlike dance 'songs', dance music tracks typically feature an unsegmented form, which, using terminology developed by Mark Spicer, he terms 'cumulative form' (2005, p. 7). Cumulative form describes a structure in which 'grooves' are built up over time through the gradual layering of riffs or loops and according to Garcia, 'is one of the most widely used prototypical forms in EDM' (2005, p. 7). Describing this form, Garcia notes that, 'effectively, loops are riffs of modular length that one strongly expects to

repeat, and looping is the practice of layering, adding and subtracting loops, allowing for the seemingly paradoxical effect of an ever-changing same' (2005, p. 7). Passages of dance music using cumulative form can therefore be regarded as structurally continuous and unsegmented, in contrast to segmented song forms. von Appen and Frei-Hauenschild, also note that continuous structures are common in dance music tracks, and suggest that such structures can be termed 'track form' (2015, p. 79). For von Appen and Hauenschild, like Garcia, in the context of track form 'concepts like verse and chorus often have no meaningful application. In the track form, the only variations over time that mark the form occur in the vocals or through the addition or removal of individual 'tracks' and other textural changes.' (2015, p. 79) Philip Tagg has similarly suggested that 'techno-rave tracks are horizontally (not vertically) monothematic. Other variation comes from the way in which tracks enter and exit and sound together with (or separate from) other tracks' (1994, p. 10).

As alluded to above, another key differentiating feature of dance 'tracks' from 'songs', according to Butler, Gilbert and Pearson, is that dance tracks typically lack longer-term discursive structures, instead being primarily based on short melodic patterns or 'riffs' based on the pitches of a single, static chord or pentatonic collection. The term 'riff' here is taken from the study of rock harmony where it is used to describe repeated melodic phrases that are typically limited to the notes of a single chord. Richard Middleton, for example, suggests that riff-based tracks are based on a single static chord which creates a static 'drone' quality (2002, p. 29). Similarly, Walter Everett's Type 5 and Type 6 tonal systems in rock are defined by their use of static minor-pentatonic riffs (2004, p. 5). Mark Butler has observed that, in the context of a typical techno track, 'pitches in the bassline may seem to belong to one chord rather than several' instead of being 'especially concerned with creating a sense of harmonic progression or tonal motion' (2001, pp. 233-234). Moreover, as the harmony is essentially static, 'tonality is not structured hierarchically within the record as a whole' (2001, p. 234), and as Butler has also noted in techno styles, 'in general, pitch patterns tend to be more riff-like than melodic' (2001, p. 233). Gilbert and Pearson similarly argue that track harmony is based on static riffs and lacks chordal harmonic motion: 'rather than constructing its melodic lines according to conventional methods of extended development and triadic harmony, house tends to use short bursts of melody, using pentatonic melodic techniques which, significantly, locate it firmly outside the dominant musical discourses of the West' (1999, pp.

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73-74). This lack of harmonic motion is noted as a key aspect of acid house and techno styles which are described as 'making no concession to classical demands for narrative meaning or harmonic substance' (Gilbert & Pearson, 1999, p. 73).

While the use of static melodic riffs is common in many rock and pop styles, riffs have, in many historical styles of popular music, typically been combined with conventional discursive chordal harmony in different ways (Middleton, 2002, p. 280). Butler therefore suggests that the key distinguishing feature of track form, from song forms, is that discursive chordal harmony is often entirely absent, and the resulting tracks are entirely riff based. Butler therefore implies that a distinctive feature of dance music tracks is that they often lack a chordal or harmonic layer that is typically present in dance songs. Allan Moore has argued that the overall texture of most popular songs typically consists of four textural layers, the 'explicit beat layer', the 'functional bass layer', the 'melodic layer' and the 'harmonic filler layer' (2012, pp. 20-21). Moore notes that the field of popular music 'exhibits a strong tendency to display four textural layers' (2012, p. 20) and that the presence of these four layers crates a musical texture that is 'the principal norm of popular music' (2012, p. 20). However, Moore also suggests that 'it is arguably the constitution of this layer [the harmonic filler layer], and the way it is actualized, that has the greatest impact on the attribution of a particular style by any naive listener' (2012, p. 20). So, while the harmonic filler layer in pop/rock and dance 'songs' may typically be 'filled' with chordal harmony, in dance 'tracks' this textural layer is often empty, or filled with additional static melodic riffs, and the absence of chordal harmony is a distinctive stylistic feature of many dance tracks.

Moore also notes that the harmonic filler layer in popular music is often used as the compositional basis of the work itself, with bass and melodic parts following a chordal harmonic progression. Moore argues that, for pop and rock musicians, the harmonic layer 'often represents the starting-point both conceptually and performatively, often preceding (in both these senses) both lyrics and melody' (2012, p. 21). That chord progressions are often understood as the compositional basis of pop and rock songs is evident in the titles of guides for rock and pop songwriters, such as *Chord Progressions for Songwriters* (R. J. Scott, 2003) and the assumption, expressed in *How To Write Songs On Keyboard* (Rooksby, 2005), that ''each section of a song – the verse, the chorus and the bridge – will have a chord sequence'

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(Rooksby, 2005, p. 8). Dance tracks can often be defined by their absence of harmonic change or chord progressions, and this lack of chordal harmony is evident in two tracks that Butler uses as examples of the 'track' form: Reese and Santonio's 'How to Play Our Music' (1987) and Jeff Mills' 'Jerical' (1993). Both tracks lack conventional chord progressions, and for long periods lack any harmonic filler layer of any kind. 'How To Play Our Music' features only drums and percussion, a repeated two-bar bass pattern, a two-bar vocal chant and, briefly, a second synth riff (labelled Bass line and sample 1, and riff 1a & 1b) (2001, p. 405). 'Jerical', meanwhile, features only drums and percussion and two melodic patterns (labelled Riff 1a & b and bass line (2001, p. 384)). Such texturally minimal tracks are therefore likely to be heard as distinctly different to dance 'songs' in two ways. Firstly, they lack any kind of chordal harmony, and secondly, they are texturally sparse, often lacking for extended periods textural layers such as melodic layer and the harmonic filler layer, being instead primarily organised around the drum and bass layers. As such, this textural distinction between tracks and songs is clear, and perhaps explains the motivation behind the popular description of dance music as simply 'drums' or 'percussion music' that was noted above.

Butler and Gilbert and Pearson also argue that the minimal texture of dance music tracks is a key point of distinction, more generally, between tracks and songs. The texture of dance tracks, in which the harmonic and melodic layers are often absent, and which are often entirely instrumental and represented by a 'bare minimum of bass and drums' (Gilbert & Pearson, 1999, p. 73), is contrasted with the lush, full production' and 'grand melodic gestures' of styles such as 'euro-house' (Gilbert & Pearson, 1999, p. 77). Gilbert and Pearson therefore suggest that, as well as the absence of chordal harmony, the common absence of a clearly defined 'lead' melodic layer in many dance tracks is a key aspect of differentiation between tracks and songs and may also be taken as evidence of a lack of commercial motivation in the producers of dance tracks (1999, pp. 70-71). They go on to suggest that tracks can be differentiated from euro-house songs, writing that, ''In their use of triadic harmony, emphasis on melody and linear narrative structures, we might see very little here which does not conform to the dictates of the classical tradition' (1999, p. 77).

Another distinctive characteristic of machinic dance music tracks is the centrality of short-term repetition and the frequent absence of any longer-term 'discursive' harmonic structures.

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Butler notes that in techno tracks, looped patterns tend to be short in length, for example in the track 'Jerical', in which 'none of the loops are longer than a measure' (2001, p. 232). Mark Butler contrasts the use of these short, riff-like patterns with the use of longer phrases in styles such as trance:

> In EDM genres other than techno – especially trance – patterns lasting as long as sixteen and even thirty-two measures are not uncommon: for instance, a trance track might have a sixteen-measure bassline in which each four-bar subdivision implies a single harmony. Patterns of this length are less common in techno (2001, p. 231).

The distinction between short, repeating patterns of one or two bars, and longer phrases, has been described by Richard Middleton as a distinction between short-term 'musematic' and longer-term 'discursive' repetition. When Butler suggests that 'techno does not exhibit phrase structure in the conventional music-theoretical sense' (2001, p. 234) he indicates that techno tracks are typically musematically structured, based entirely on the repetition of short melodic patterns, and lack the longer discursive elements that are typical of dance music songs.

Middleton notes that musematically repetitive riffs, unlike discursive phrases, are 'not too long to be apprehended in the present' (2002, p. 238). Tagg, similarly contrasts 'intensional' aspects of musical structuration, covering 'relatively short term or immediate presentation of musical detail', with 'extensional' aspects, which create 'long-term narrative in music'. Intensional aspects of musical interest, such as the repetition of riff-like patterns, are likely to be heard as operating within an 'extended present' and as producing a form of harmonic stasis, or harmonic 'being' contrasted with harmonic 'travelling' (2018, pp. 356-357). For Middleton, then, the effect of the use of riffs, 'to a greater or lesser extent, is always to level out the temporal flow, to challenge any 'narrative' functionality attaching to chord patterns and verse sequences, and to 'open up' the syntactic field for rhythmic elements to dominate' (2002, p. 281). This view, that all aspects of dance music, including harmony, operate entirely in the 'extended present' and have no 'narrative' meaning, has been accepted Gilbert and Pearson (1999), Garcia (2005), Butler (2001) and Hawkins (2003), who have all emphasised engagement with musematic repetition as central pleasure of listening to dance music.

It is important to note, however, that short, repetitive chord progressions can also be regarded as musematically repetitive, in addition to static melodic riffs, and dance tracks may

feature conventional chordal harmony instead of, or in combination with static riffs. As Middleton notes, 'just as melodic musematic repetition stems from Afro-American musical practice, so the harmonic equivalent - short chord sequences, usually two or three chords, treated as ostinatos - clearly has its origins in black music' (2002, p. 258). Such progressions are a key stylistic feature in R&B, disco and house and garage styles (for example, the one-bar i-iv-v chord progression heard throughout much of Marshall Jefferson's 'Move Your Body' (1986)), and are also characteristic of 1970s gospel influenced soul, funk and disco, for example, the two-bar I-IV (in C) progression of The Staple Singers' 'I'll Take You There' (1972). Musematic repetition is therefore a central aspect of many styles of popular music and all styles of dance music, not just explicitly 'machinic' styles, although within the context of an explicitly machinic style, short-term repetition may acquire machinic connotations. This possible reading of musematic repetition as evocative of the workings of machines and technology is discussed in more detail in Chapter Two.

2. A new model of harmonic variety in dance music

The above survey of the literature on dance music 'track form' has noted that dance tracks often lack chordal harmony and harmonic development, and that within this context, harmonic organisation has frequently been considered less meaningful to listeners than rhythm and timbre. Such an understanding of dance music track harmony, however, fails to consider how small differences within the context of the musematically repetitive 'extended present' may have significant meanings for dance music audiences. This research project is the first to focus on harmonic distinctions within the context of musematically repetitive passages of dance music tracks, and the first to suggest how those harmonic distinctions may be meaningful to dance audiences.

Most fundamentally, the use of short, musematically repetitive chord progressions (described throughout this thesis as 'chordal harmony'), can be distinguished from sections of 'static harmony' that lack any movement between chord roots and are based only on the notes of a single chordal harmony. Further meaningful harmonic distinctions can be identified within the category 'static harmony'. If, for example, static harmonies are typically based on the notes of a single chord, changing the quality of that chordal harmony (from major to minor, or minor to diminished, for example), or introducing dissonances or chromaticism, may alter

the expressive quality and meanings of that static harmony. Therefore, even though musematically repetitive harmony may have no 'narrative' quality, and often lacks any traditional harmonic function, harmonic distinctions in this context may still be meaningful to listeners.

As was noted above, the neglect of analysis of repetitive harmony in dance music may result from assumptions that harmony is unimportant to dance music audiences. Reynolds has claimed that 'in electronic dance, every element works as both texture and rhythm […] and rhythm usurps the place of melody' (2007, p. 313). Eshun, writing about Model 500's influential early techno track 'No UFO's' (1985), similarly argues that any melodic or harmonic properties of the track are secondary to those of timbre and rhythm when he claims that 'melody is replaced by bass synths that stab' (1998, p. 110).

The assumption that harmonic organisation in dance music tracks is unimportant to audiences has often been implicitly accepted in academic scholarship. Butler, for example, has suggested that when techno producers put static 'lines together, they tend to choose combinations that are relatively consonant' (2001, p. 234), but appears to take for granted that the distinction between consonance and dissonance is unimportant. For example, while analysing the rhythmic properties of the opening riff of 808 State's 'Cubik (King's County Perspective)' Butler does not question how the harmonic properties of this riff might be interpreted (2001, p. 136). The descending b–b♭–g–e riff of this track can be described as 8–7–♭6–4 (in B), suggesting a dissonant augmented second interval between the '♭6' and '7' scale degrees. Unlike purely pentatonic riffs, this riff contains and emphasises dissonant intervals such as the augmented second, and the tritone interval between b♭ and e, and may be heard as distinctively dissonant in character, unlike the pentatonic bassline of 'How To Play Our Music', for example.

Elsewhere, dissonant riffs have been discussed in academic writing on dance music, but the potential significance of their dissonant harmony has not been considered. For example, Hillegonda Rietveld, when describing the chromatic and harmonically unusual Roland TB-303 'acid' pattern of Phuture's 'Acid Tracks' (discussed in more detail in Chapter Three), adopts a Reynolds-like position when she argues that the harmonic properties of the riff are relatively

insignificant to listeners when compared to the riff's timbral qualities. Rietveld suggests that 'the actual tonal melody, generated by the programming, is superseded by extreme manipulation of its cut off frequency, resonance and decay functions' and 'the machine grain of the 303' (2014, p. 160).

Similarly, Garcia has noted that 'a common criticism of EDM as a genre is that it is 'just beats', prioritizing elements that would conventionally be considered functional at the expense of musical 'content' such as melody and harmony' (2016, p. 61). However, Garcia does not challenge the assumption that melody and harmony is essentially unimportant in dance music audiences, arguing instead that a relative lack of melodic and harmonic 'content' in dance music allows an improved engagement with rhythm. As a result, Garcia essentially agrees with Reynolds that tonal organisation is less important than rhythm and timbre in dance music, and so does not require specific consideration. For example, Garcia notes that DJ W!LD vs The Gathering's 'In My System (Jef K SystemMix)' (2010) features 'a string-synthesizer playing a four-bar chord progression' (2016, p. 61). But the internal harmonic properties of this chord progression, which might be regarded as the repeated 'A' section of the track, are not described in detail. The reader is left to speculate on the whether the chord progression is an example of a functional, non-functional or chromatic chord progression, or whether it is a chord progression produced by 'doubling' a static melodic riff with fixed chord shapes. It is implied that the answer to this question is not important to dance music audiences. In fact, the i^9-ii^9-$\flat vii^9$ (in F) progression is produced by transposition of a fixed chord voicing, a type of harmonic organisation that may be heard as mechanical, or even fantastical, suggesting that these harmonic distinctions are meaningful to dance audiences (the meanings of this type of progression are discussed in Chapter Five).

In turn, the assumption that harmonic organisation is unimportant in dance music can ultimately lead to descriptions of harmony in dance tracks that are misleading. Describing Model 500's 'No UFO's' (1985), Butler suggests that 'with the exception of the bassline, it contains little in the way of melody or pitch at all' (2001, p. 20). Although he has noted that the bassline has a melody, the assertion that the track contains 'little in the way of melody' is used to justify the absence of further analysis of the track's harmonic organisation. 'No UFO's', in fact, uses three of the tonal techniques that this thesis argues may be associated

with the evocation of machines and technology in dance music; dissonant static harmony, disjunctive harmonic shifts and doubling of riffs with fixed chords. For example, the bassline in 'No UFO's' is highly dissonant, beginning with an interval of a tritone between the first and second notes of the bass pattern, a harmonic property of the riff that may be highly meaningful to listeners. Butler's assumption that 'No UFO's' contains no meaningful melody or pitched elements, represents a barrier to a full analysis of the harmonic organisation of the track and results in potentially significant aspects of the music remaining unanalysed.

Elsewhere, and perhaps contradictorily, Simon Reynolds has argued that 'dissonance' does play a role in producing meaning in dance music tracks, although Reynolds uses the term to suggest an absence of harmonic organisation, rather than as a term which describes the dissonant relationship of tones within a melody or harmony. Reynolds implies that the style of darkcore drum and bass rejected all conventional forms of harmonic organisation, in contrast to the conservative and 'traditional' harmony of 'intelligent drum 'n' bass':

> What's invigorating about darkcore is its bracing anti-musicality. With its incorporation of atonal, unpitched timbres, non-musical sounds and horror movie soundtrack dissonance, darkcore is simply far more avant-garde than intelligent drum 'n' bass. The latter, in an abiding confusion about what constitutes progression for electronic music, is too deferential to traditional ideas about melody, arrangement, 'nice' textures, the importance of proper songs and hands on, real-time instrumentation. Paradoxically, it's the shit that's most uncompromisingly anti-melodic, that has the highest quotient of rhythmic dissonance, which really gets the punters going (Reynolds, 1996).

For Reynolds, then, the 'dissonance' of darkcore is taken as evidence of its rejection of harmonic conventions, its lack of harmonic organisation, and ultimately its aesthetic value as an 'avant-garde' style. However, Reynolds claim that darkcore is 'anti-musical' can be shown to result from a misunderstanding of dissonance as a quality which always arises from a lack of harmonic organisation. Reynolds' conflation of 'dissonance' with 'anti-musicality' and an absence of harmonic organisation, is evident in his description of darkcore as constituted from 'atonal, unpitched timbres' and 'non-musical sounds', and implies that dissonance arises primarily from an absence of conventional harmonic structures and conventionally pitched sounds. In fact, darkcore often features passages of dissonant harmony that are produced using conventionally pitched melodic and harmonic elements. For example, the track 'Darkrider' (1992) by Rufige Cru, begins with a dissonant riff doubled with minor triad chord stabs (an example discussed in more detail in Chapter Five). This dissonant harmony is not

produced by 'atonal, unpitched timbres' and 'non-musical sounds', it is instead produced through the manipulation of conventional harmonic structures, such as the minor triad.

The use of dissonant harmony may also be heard to refer to established styles of popular and film music, rather than suggesting a wholesale rejection of all harmonic conventions. As Reynolds notes, darkcore drum and bass may feature 'horror movie soundtrack dissonance', suggesting that the use of dissonant harmonies in darkcore may be heard to refer to the harmonic conventions of horror film music. The dissonant harmony of 'Darkrider' for example, may be heard to specifically refer to John Williams' theme for the 'Emperor' from the score to *Star Wars: Episode VI – Return of the Jedi* (1983) (this allusion to John Williams' music is also suggested by the inclusion of dialogue samples from the film). Dissonant harmony in darkcore, then, may suggest engagement with the harmonic and melodic conventions of established styles, just as much as the 'traditional' harmonies of 'intelligent' drum and bass, only it can be understood to engage with a different set of harmonic conventions. Reynolds' characterisation of styles such as darkcore as 'anti-musical' is ultimately misleading, as it implies that dissonance arises from the simplification, diminishment, or absence of harmonic organisation, rather than from the employment of conventional harmonic and melodic structures.

The harmonic analysis of dance music presented in this thesis contradicts the assumption that harmony in dance music tracks is essentially basic and lacks differentiation. Instead, this thesis argues that passages of dance music typically employ one of five common harmonic systems. Three of these can be described as systems of 'chordal harmony' (functional, non-functional, chromatic) while the remaining two are systems of 'static harmony' without chordal harmonic movement, and based on a single, static chord ('consonant static harmony' and 'dissonant static harmony'). This thesis also argues that, out of these five harmony systems, only the system of 'dissonant static harmony' can be strongly associated with a 'machine aesthetic' in dance music, while the other harmonic systems are commonly used in styles of popular music with no strong traditions of evoking machines or technology. While the majority of dance 'tracks' are structurally similar, lacking both harmonic contrast and structural segmentation, these tracks may be differentiated by listeners based on the different harmonic systems used within that track structure. The harmonic system describes the harmonic organisation within

the repeated 'A' sections of dance music tracks, allowing harmonic distinctions to be made between dance music tracks that utilise track form.

'Consonant static harmony', for example, describes the use of largely pentatonic static riffs, the typical harmonic organisation of blues riffs, funk and disco basslines, and many passages of popular and folk music. Such harmony is also common in house and garage songs and the many dance tracks that sample, or otherwise refer to, 1970s R&B and disco songs. This harmonic system is also commonly employed in machinic dance styles such electro, techno, and hardcore, but is not exclusively associated with those styles. Consonant static harmony, can be contrasted with the harmonic system of 'dissonant static harmony', describing passages of dance music which are likely to be heard as dissonant, with dissonant intervals typically produced through the addition of dissonant non-chord tones to a conventional pentatonic static framework. This thesis argues, in Chapter Three, using a theory of 'macroharmony' developed from Tymoczko (2011, pp. 155-191) and de Clerq and Temperley (2011), that dissonant static harmony in dance music is likely to be heard as distinctively different to consonant static harmony. This thesis also discusses the related practices of introducing disjunctive and unusual harmonic shifts between sections of otherwise static harmony (in Chapter Four) and the 'doubling' static melodic riffs with sampled or otherwise 'fixed' chords (in Chapter Five). Crucially, these practices are distinctive aspects of harmony in machinic styles, and, a will be argued in this thesis, may themselves be heard as evocative of machines and technology.

That the harmonic organisation of 'machinic' dance music styles such as techno and UK hardcore may be regarded as distinctive, has been briefly noted by Philip Tagg, who suggested a distinction between the 'tonal language' of 'European and North American techno-rave' and the harmonic languages of 'R&B dance' and 'dance rap' (1994, p. 9). Tagg both relates 'R&B dance' to earlier styles of Afro-Diasporic popular music, describing it as 'a sort of synthesized up-tempo soul-gospel-disco' and suggests that this style primarily employs a chordal harmonic system, featuring 'disco's major and minor seventh sonorities'. While, for Tagg, 'dance rap' is described as largely 'percussive', and thus without a recognisable harmonic system, Tagg notes that:

European and North American techno-rave seems to go in a big way for the Aeolian and Phrygian modes, not as harmonic padding for blues pentatonicism, but as straight sets of minor mode triads or bare fifths without much trace of a seventh, let alone ninth, eleventh or thirteenth (Tagg, 1994, p. 9).

It is unclear whether Tagg's description of 'techno-rave' harmony here is meant to describe chordal harmony or the 'doubling' of static riffs with fixed chord shapes. However, it is significant that Tagg is arguing that the harmony of 'techno-rave' may be heard as distinct from the more familiar chordal harmony of 'R&B dance', due to its use of potentially 'dissonant' macroharmonies that would be considered unusual in the context of R&B (e.g., use of the Phrygian mode). As will be discussed in Chapter Three, Tagg links this harmony primarily with evocation of non-Western musical cultures, rather than to the evocation of machines and technology, however he does identify a distinction between 'R&B dance' harmony and 'techno-rave' harmony that is potentially meaningful to dance music audiences.

3. Methodology

In order to better understand harmonic practice in dance music, this thesis identifies and describes a number of distinctive harmonic practices that have been employed in machinic dance music styles. It also hypothesises what these practices might mean to dance music audiences, and how their meanings might differ from harmonic practices more common in rock, R&B and jazz styles, as well as house and garage. The central chapters of thesis, chapters Three, Four and Five, argue that distinctive harmonic practices in machinic dance music are likely to function as musical signs, and suggests that they may primarily be interpreted as referring to the 'noise' of machines and technology, emotional states of anxiety and tension, or to the uncanny or fantastic. This analysis of the meaning of harmony in machinic dance music is augmented by discussion of the result of a listening test, which captured listener responses to recordings of dance music, in Chapter Six.

The distinctive harmonic structures discussed in this thesis were often realised through the use of particular music technologies, such as synthesisers, samplers and sequencers, that came to define the genre of electronic dance music in the 1970s, 1980s and 1990s. Some of these technologies and their interfaces and capabilities are named and described in chapters two, three, four and five, and linked to the use of particular harmonic practices in dance music. For example, the facility of the Roland TB-303 bass synthesiser to randomly generate

melodic patterns is discussed in chapter three; the ability of early pattern sequencers to produce disjunctive transpositions is described in chapter four; and the use of samplers and chord memory interfaces to produce chromatic chord progressions is explained in chapter five.

The use of music technology in this period afforded musicians and producers the capability to create musical structures (including, but not limited to harmonic structures) that were likely to be interpreted as possessing machinic qualities. For example, the use of sequencers and drum machines allowed producers to easily produce metrically precise rhythmic patterns that could be repeated indefinitely, or to produce repeating melodic patterns that could be easily transposed to different notes of the chromatic scale. Musical structural elements realised using these technologies may have not always be interpreted as possessing machinic qualities, but the noted machine aesthetics of electro and techno may be linked to the widespread use of these music technologies by dance music producers.

A complete account of musical communication in dance music, then, would describe the process by which a work is composed, performed, produced and recorded, in addition to how a recorded work is subsequently interpreted by listeners. Philip Tagg has suggested that descriptions of the compositional phase, or how music is constructed, can be described as focusing on its 'poietic' dimensions, while accounts of the process of interpretation by listeners can be understood to focus on its 'aesthesic' dimension (2012, p. 116). Nicholas Cook has similarly described as the 'esthesic' (1998, p. 33) as 'the plane of reception' (1998, p. 33) contrasted with the poietic, or the plane of production.

For reasons of space, then, this research focuses primarily on how features of dance music recordings might typically be interpreted by listeners, rather than including detailed discussion of how such features were produced. The absence of detailed discussion of the poietic process can be justified as the aesthesic interpretation of recorded dance music does not necessarily require knowledge of how recordings were realised, only competency regarding how features of such recordings should be interpreted. Most dance music listeners, in fact, are unlikely to possess detailed knowledge of the production process of any given recording, and aesthesic interpretations are primarily the result of acousmatic perception of audible features of recordings. The presence, within a recording, of musical signs that are

likely to be interpreted as possessing machinic or mechanical qualities, then, may typically be the direct result of the use of music technologies such as drum machines, sequencers and synthesisers, but conversely, the presence of machinic musical signs in a recording does not guarantee that music technologies were definitely used to realise them. Properties of dance music that may commonly be interpreted as expressive of machines and technology, such as metrically precise rhythms, or 'excessive' repetition, have typically been realised through the use of music technologies, but it can sometimes also be possible for human performers to imitate these same 'machinic' musical qualities in their performances. As Rebecca Eaton has noted, American minimalist music has historically been interpreted in terms of its machinic aesthetic, despite the fact that it is typically realised by human performers unassisted by music technologies. Eaton notes that without the 'pleasure of knowing' that human performers are playing such music, it may mistakenly be assumed to be performed by machines:

> New York Times critic Donal Henahan said of a 1970 Reich concert, "granted the pleasure of knowing humans are doing the job one wonders nonetheless if they really need bother, when machines can do it so much better" (Eaton, 2014, p. 5).

Musical signs that may be interpreted as possessing machinic qualities, then, can in some cases be produced without the use of music technologies. For example, the sequences of parallel chords that are the focus of chapter five, were typically realised through the use of samplers and chord memory interfaces, but in some cases, it is conceivable that they could have been manually 'played in' by a keyboardist. The aesthesic interpretation that a particular musical structural element possesses mechanical qualities is therefore likely to be based only on the perceived qualities of a musical structure at the point of audition. This research, then, is concerned primarily with the aesthesic question of how such musical structural elements are likely to be interpreted, independently of how they may have been produced.

Relatedly, this thesis' focus on discussion of aesthesic reception and meaning, and inclusion of a listening test, meant that it was not possible to include interviews with artists or producers. Investigation of how artists and producers regard the harmonic practices discussed in this thesis, and whether their understanding of the possible meanings of harmony corresponds with the interpretations of listeners, could be the focus of future research.

The harmonic practices discussed in this thesis are referred to as 'distinctive' because they are not commonly employed in house and garage styles of dance music, or in rock-and-pop music, and also because they have not previously been discussed in detail by popular musicology, which has, to date, focused on the analysis of harmony in rock and jazz. As a result, these distinctive harmonic practices represent the focus of this study, and the use of harmonic practices that are already well understood by musicology in dance music, such as functional and non-functional systems of chordal harmony, are not discussed in the same detail. Similarly, the use of consonant riffs in dance music, can be regarded as similar to the use of riffs in rock and R&B music, which has previously discussed in work by Richard J Ripani (2006, p. 45) and Richard Middleton (2002, p. 29).

However, a focus on the distinctive aspects of machinic dance music harmony should not be taken to suggest that chordal harmony and consonant riffs are uncommon in machinic dance music. In fact, many machinic dance music tracks use conventional chordal harmony or consonant static harmony. For example, the bassline of Reese and Santonio's 'How To Play Our Music', discussed above, uses only the notes of the B minor pentatonic scale, and such consonant riffs are common in machinic dance music. Similarly, Underworld's 'Cups' (1999), another track that Mark Butler has discussed in terms of its rhythmic features (Butler, 2001, p. 105), features a non-functional i7-iv7 (in G) chord progression, a form of I-IV progression, familiar from rock, R&B, and jazz harmony. For reasons of space, discussion of the many machinic dance tracks that use these harmonic systems, that have already been discussed by musicologists, is largely absent in this thesis.

The recordings that are discussed in this thesis reflect a focus on the development of distinctive harmonic practices in electronic dance music styles in the 1970s, 1980s and 1990s. Electronic dance music as a genre, established many of its most enduring styles, such as house and techno in the 1980s, and the harmonic practices employed in this period of dance music have been highly influential on subsequent artists working in the genre. This thesis, therefore, discusses the harmonic organisation of many recordings that were important in the development of these historically significant dance music styles. Chapter Three discusses the dissonant harmony of Kraftwerk's 'Trans-Europe Express' (1977), a track which as Robert Fink has described, was a significant influence on Afrika Bambaataa & Soulsonic Force's 'Planet

Rock' (1982) and thus an influence on subsequent distinctive harmonic practices in electro hip-hop (Fink, 2005). The dissonant harmonic practices of electro can then be understood to have informed the harmonic practices of Detroit techno and artists such as Juan Atkins and Drexicya, also discussed in Chapter Three, suggesting a continuity in harmonic practice between 1970s synth-pop and contemporary techno. Similarly, the use of harmonic shifts in later styles of machinic dance music is traced back to Donna Summer's 'I Feel Love' (1977) and Kraftwerk's 'The Robots' (1978), again indicating that these early dance tracks have influenced harmonic practice in later styles of dance music. Influential house and techno tracks such as Inner City's 'Big Fun' (1988) and Black Riot's 'A Day in the Life' (1988), which can be understood to have popularised the practice of doubling riffs with chord samples, are discussed in Chapter Five. These tracks then, have been chosen for discussion as they were highly influential on the development of harmonic practices in dance music in the period under consideration.

The examples of machinic dance music presented in chapters three, four and five, have been selected to illustrate use of the harmonic practices that are the focus of each chapter. For example, in chapter three, which focuses on the use of dissonant static harmonies in dance music, only dissonant passages of machinic dance music and film and television music are presented as examples. However, this selection of examples is not intended to imply that all machinic dance music in this period used only the specific types of harmony that are the focus of this thesis. These distinctive harmonic practices were often used alongside more conventional harmonic practices and many machinic dance music tracks did not feature them at all.

For example, only approximately one half of the tracks included on the 1988 compilation *Techno! The New Dance Sound of Detroit*, employ the distinctive harmonic practices discussed in this thesis. Dissonant static harmony is employed in the tracks 'Forever And A Day' (1988) by Blake Baxter, which features a dissonant 8-♭7-♭6-♭5-5 bassline (including a dissonant augmented fourth interval between the foundation note and the ♭5 scale degree) and 'It Is What It Is' (1988) by Rhythim Is Rhythim, which also begins with a dissonant riff containing a scale degree a tritone above the foundation note of the riff. Juan's 'Techno Music' (1988) contains a number of disjunctive harmonic shifts and is discussed in more detail in Chapter

Four, while Inner City's 'Big Fun' (1988) contains dissonant chordal doubling of a riff and is discussed in Chapter Five. However, approximately one half of the tracks on the compilation album do not feature any of the distinctive harmonic practices discussed in this thesis. These harmonic practices, then, were not employed in all machinic dance tracks in this period, but, crucially, can be identified in a significant minority. The use of such harmony was certainly not necessary for dance tracks to be heard as possessing a machinic aesthetic, but the comparative popularity of these practices in styles such as techno, when compared to other dance styles such as house and garage, indicates that they may have been heard as especially compatible with a wider machinic aesthetic, and possibly heard as possessing machinic qualities themselves.

In order to suggest how these harmonic practices may be interpreted in the context of machinic dance music, chapters three, four and five identify similarities between these harmonic practices and examples of earlier and contemporary popular music, art music and film and television music. These additional examples from outside of the dance music genre are intended to function as Interobjective Comparison Material (Tagg, 2012, p. 592), examples of passages of music that are objectively similar to the musical structures being analysed, and which may indicate how these structures are likely to be interpreted.

This thesis, then, assumes that the stylistic conventions of film and television music, within genres such as science fiction, were well-known by the dance music producers and audiences of the 1970s-1990s, due to the popularity of cinema during this period. As such, comparison of certain aspects of dance music with film music examples may help to understand the likely interpretation of similar harmonic practices within the context of dance music. Science fiction films, such as the original *Star Wars* trilogy (1977-1983), *Blade Runner* (1982), *The Terminator* (1984), *Terminator 2* (1991) and *Robocop* (1987) were some of the most popular films during the period of music discussed in this thesis. Evidence that these films resonated with dance music producers in this period is evident in the ubiquity of dialogue, sound effects and soundtrack samples from these films in dance music tracks. For example, Metal Heads' 'Terminator' (1992) contains samples of dialogue from *The Terminator* and Dillinja's 'The Angels Fell' (1995) contains samples of Vangelis' score from the film *Blade Runner*. The conventions of Hollywood film music scoring may therefore have been alluded to by dance

music artists in order to create specific affects and meanings, in the knowledge that these allusions would likely be understood by listeners.

Harmony in dance music tracks may also be understood to refer to whole styles and traditions of film music, rather than to individual works. Chromatic harmony in dance music may be heard more widely as evocative of the larger style conventions of cinematic 'space music' or music associated with the evocation of the supernatural or fantastical, a possibility which is discussed in more detail in Chapter Five. The use of examples of film and television music, then, in chapters three, four and five, is intended to indicate harmonic similarities between some machinic dance music tracks and widely known styles of film music, similarities which may clarify how harmonic practices in dance music are likely to be interpreted. In addition to examples of 1970s-1990s dance music, and to film and television music, some parts of chapters three, four and five discuss more recent examples of dance music, which may be heard to refer back to 1970s, 1980s or 1990s dance music, using these harmonic practices as style flags.

This research has, in part, developed naturally out of my previous personal and academic interests, through which I had become aware of some of the distinctive aspects of dance music harmony and their associations with machinic styles. As a musician and producer, I often tried to reproduce aspects of electro and techno styles, and as a result, became aware of certain riffs, transpositions, and chord progressions that sounded particularly 'techno', and which were unlike the chord progressions in rock-and-pop focused textbooks. A parallel interest in DJing and 'harmonic mixing' led me to try and better understand the harmonic practices that were most common in dance music to facilitate smooth mixes between tracks. This enthusiasm for DJing, like my enthusiasm for production, gave me an appreciation of the variety of harmonic practices in dance music and acquainted me with a range of dance tracks using different harmonic practices that could be discussed in this thesis.

As a fan of styles such as electro and techno, I had also noted a possible connection between some of the more distinctive harmonic practices in dance music and the harmony of film and television music. As science fiction imagery is so central to electro and techno music, it seemed plausible that the harmony of dance music might also be heard to allude to science fiction music. To test this possible connection, I listened to many television and film

soundtracks for this study, in the process finding many similarities between harmonic practices in dance music and film music. Dissonance is particularly central to harmonic practice in both film music and machinic dance music, and the possible meanings of dissonant harmony in dance music is discussed in depth in Chapter Three. The use of disjunctive shifts and chordal chromaticism in dance music also has parallels with film music harmony, and these similarities are discussed in chapters four and five.

As a study of the potential meanings of harmonic practices in dance music, this research project primarily focuses on identification of structural elements and features that have been commonly employed across historical dance music styles. This focus on the most common features of harmony in dance music, rather than the most exceptional, means that this research necessarily neglects the many genuinely experimental works that have been recorded by dance music producers. But, as Philip Tagg has argued, musicological analysis of a style should begin with study of those practices that are most common and central to it:

> It would seem to make more sense to start by analysing mainstream musical codes (such as middle-of-the-road pop, music for film, TV and advertising), and to have some viable hypotheses about how these work before proceeding to the discussion of meanings and functions in subcultural, counter-cultural or `alternative' musical codes - be it hip-hop, folk revival, string quartets or any other genre `contradicting' or `complementing' rather than `belonging to' the dominant mainstream of musical uses in any culture. Using exceptions as a basis for establishing rules may be fun but it is not the most reliable intellectual strategy' (Tagg, 1987, p. 5).

This research project, then, considers relatively conventional harmonic practice in recordings that may have historically been regarded by dance music writers as commercially oriented, or aesthetically inferior, such as house, trance, and Eurodance music, in addition to considering the use of this harmonic practice in more critically celebrated styles, such as Detroit techno and UK hardcore. This analysis of a wide range of examples allows the use of harmonic practices to be traced across dance music styles, and structural continuities between styles to be identified.

This research project regards dance music primarily as a 'grammar-oriented' style, containing recurring elements that may be meaningful to listeners. Chapter One argues that dance music tracks typically make use of elements that are recognised as variations of familiar musical structures, and which may have acquired established meanings due to their continuing use over time within a style. Analysis of the meaning of these common structural elements may

involve the tracing of an 'etymophony of musematic structures' (Tagg & Clarida, 2003, p. 666), describing the 'origins and development of a non-verbal sound's meaning' (Tagg, 2012, p. 588), creating a plausible theory of how a particular musical structural element has been interpreted over time, and how similar structures might be interpreted within a given work.

Adam Harper has similarly argued that some level of incorporation of familiar structural elements, or the recurring 'specifics of style' is often necessary for music to be meaningful to listeners. Harper argues that it is these conventionalised elements of a style that may acquire specific meanings or associations with non-music concepts over time: 'the recurring specifics of style unite disparate musical performances, unite musical development with that of our general lives, unite groups of people and unite music with the non-sonic meanings it embodies' (2011, p. 97). Although he also warns against the 'hardening' of style conventions 'through too much of the (re)enforcement of repetition' (2011, p. 97), Harper's work argues that any style of popular music will, necessarily, contain certain recurring structural elements that are meaningful to audiences.

However, a radically different understanding of machinic dance music, as an object of study, is evident in the writing of Kodwo Eshun and Simon Reynolds. These authors have repeatedly argued that machinic dance music should be regarded as a radically avant-garde style, that rejects the historical structural conventions of popular music. Simon Reynolds, for example, has described the styles of dance music belonging to a proposed 'hardcore continuum' as 'modernist' and 'avant-garde', and has contrasted this family of styles with others regarded as post-modern and conservative (1996). Elsewhere, Reynolds has suggested that the hardcore continuum, 'propelled itself headlong thanks to an internal temporal scheme of continual rupturing' (2009a) constantly breaking all structural connection to earlier styles of music. Eshun has similarly claimed that, 'sonic Futurism doesn't locate you in tradition; instead it dislocates you from origins' (1998, pp. -001).

This position can be criticised, however, for exaggerating the differences between machinic dance music styles and other styles of dance music, and for proposing that machinic styles can be separated from the wider history and conventions of dance music. The structural continuity of machinic dance music with other styles of dance music is evident, for example, when considering the harmonic organisation of these styles. This thesis argues that the use

of specific harmonic practices such as dissonant static harmony and disjunctive harmonic shifting may be heard as unusual and distinctive aspects of harmonic practice in machinic dance music, but these distinctive practices may simultaneously be understood as only relatively superficial modifications of practices in other styles of dance music, and popular music more generally. For example, dissonant riffs in machinic dance music can be understood as related to consonant riffs in other styles of popular music, but differentiated only by the addition of dissonant pitches to the same pentatonic framework common in rock and R&B.

It is therefore an exaggeration to suggest that rhythmic, timbral and harmonic practice in machinic dance styles represent a fundamentally avant-garde practice that is entirely unconnected to other styles of popular music. The analysis of machinic dance music presented in this thesis treats these styles as grammar-oriented, containing stylistic features that may be distinctive, but are also widely distributed, and which are related to practices in other styles of popular music and film music. It also assumes that these recurring structural elements have acquired meanings within these styles over time and so may function as musical signs. This understanding of machinic dance music is fundamentally different to the model of continual 'rupture' proposed by Reynolds and Eshun.

However, while machinic dance music styles are not, typically, structurally avant-garde, dance music may be regarded as 'modernist' in a different sense. As is explored in more detail in Chapter Two, some dance music styles may be heard to evoke the sounds or movements of industry and machines, and as a result can be linked to a tradition of 'machine aesthetics' in twentieth century design and architecture (Jencks, 1985, pp. 274, 326). Chapter Two argues that machine aesthetics in dance music may have some commonalities with early twentieth century modernist music such as George Antheil's *Ballet Mécanique* (1953), and that these features may be important in the perception that dance music is evocative of machines and technology. Machinic dance music, then, may be heard as stylistically related to earlier styles of twentieth century 'modernist' music, but should not be regarded as radically avant-garde.

In order to describe the harmonic systems commonly employed in dance music styles, and the specific harmonic practices that may be associated with a machine aesthetic, this thesis engages with theories of harmony that have been primarily developed to describe harmonic

organisation in other styles of popular music, such as rock and R&B, as well as orchestral and film music. The lack of systematic scholarly analysis of harmony in dance music to date means that it has been necessary to engage with harmonic theory from rock and classical musicology and to apply that theory to a different corpus. An objection to this approach has previously been articulated by Jeremy Gilbert and Ewan Pearson, who have argued that the methods of 'classical musicology' are inherently inappropriate for the study of dance music. Gilbert and Pearson have cited musicologist Middleton as suggesting that 'classical musicology is at best of little value in the study of popular music because of its formal and notational obsessions with tonality and harmony and its relative neglect of such issues as rhythm, timbre, micro-tonality and so forth' (1999, p. 54). They have also claimed that the harmonic focus of 'classical music discourse' is an 'attempt to suppress the materiality and physicality of music' (1999, p. 54), which they believe to be central to the aesthetics of dance music.

Gilbert and Pearson's argument, that the methods of classical musicology are not appropriate for the study for the study of dance music, is based primarily on a reading of Richard Middleton's earlier account of a 'musicological problem' in popular music studies, in which Middleton argued that the discipline of musicology, which at that time had largely focused on the analysis of Western orchestral music, has tended to either neglect, dismiss or misunderstand popular music. Middleton suggests that traditional musicologists, when engaging with popular music, may expect to find musical forms that they are familiar with from orchestral music, and so 'they generally find popular music lacking' (2002, p. 103). The 'notational centricity' of classical musicology further risks reducing the materiality of recordings or performances to 'silent', written notation, leading to the neglect of un-notated parameters such as rhythmic feel and instrumental timbre. These criticisms can be levelled at the language that musicologist Walter Everett uses in describing rock harmony, which he often describes in terms of its similarity or difference to common practice tonality, repeatedly described as 'normal' tonality, or 'as basic, ageless principles of tonality that are more or less reflected in all subsequent styles' (2004, p. 2). Such research can be criticised for imposing a set of norms on popular music harmony that may not be relevant for popular music producers or audiences or appropriate to the style under consideration.

However, Gilbert and Pearson's objection to the methods of musicology fails to consider the possibility that new musicological methods appropriate to the study of popular music may be developed which allow dance music to be better understood on its own terms. Middleton, contrary to how his position is represented by Gilbert and Pearson, explicitly states that 'it is not my intention to argue that musicology cannot understand popular music, or that students of popular music should abandon musicology' (2002, p. 104). Instead, he identifies problems that can arise when classical musicological methods are applied to the study popular music and proposes the development of a more appropriate 'new musicology'.

The lack of prior harmonic analysis of dance music can also be linked to a deliberate resistance to the application of the methods of Western musicology in dance music studies. As Maria Perevedentseva has noted, the harmonic analysis of dance music, as part of a wider project of 'analytical or theoretical work that may attempt to locate specificity in its sounds and systematise its aesthetics' (2022, p. 23), may be viewed by some dance music theorists as imposing a Eurocentric analytical framework onto an Afro-Diasporic musical tradition. But as Perevedentseva also notes, binaries between Afro-Diasporic music and styles such as rock and Western art music, must be 'treated with caution. If not, they can end up exoticising musical practices for all the ways they are perceived to differ from the dominant culture' (2022, p. 24). The systematic neglect of harmonic analysis of dance music risks reinforcing an assumption that dance music harmony is somehow inherently 'unknowable' as it embodies a different harmonic logic to that found in rock and pop. Dance music writers and scholars have correctly identified a relative absence of discursive harmony in dance music tracks compared to dance music 'songs' and much pop and rock music, but this relative difference should not be taken as evidence that the harmony of dance music tracks is beyond the scope of musicological analysis.

Dance music scholars, such as Mark Butler, Kodwo Eshun and Jeremy Gilbert and Ewan Pearson, in assuming that static harmony in dance music is entirely unlike harmonic practices in rock, may, inadvertently, reinforce the assumptions of rock musicologists that rhythmically focused Afro-Diasporic popular styles such as dance music and hip-hop, are not amenable to close harmonic analysis. Trevor de Clerq and David Temperley, for example, excluded Public Enemy's 'Bring The Noise' (1987) from their analysis of rock harmony, on the grounds that it

contained no conventional chordal harmony. According to de Clerq and Temperley, 'Bring The Noise' did not 'contain any triadic harmony, and was therefore not included' in their analysis of harmony in a corpus of rock songs (2011, p. 59).

While it is true that 'Bring The Noise' does not contain any conventional chord progressions, it does feature sections of static harmony, each based on a chordal harmony that is also common in rock and R&B harmony. The track begins with a static BM^9 harmony, followed by a static DM^7 harmony and finally a static C♯ Dorian or C♯m^7 harmony. This static harmony is not, then, entirely unrelated to harmonic practice in rock and R&B and may be meaningful precisely because it is heard to refer to the harmonies of late 1960s and early 1970s funk (the track samples Marva Whitney's 'It's My Thing' (1969) and James Brown's 'Give It Up Or Turnit A Loose' (1970)). De Clerq, Temperley and other rock musicologists, then, risk exaggerating the harmonic differences between rap and dance styles and rock by excluding such music from their analyses.

Musicological theory, if applied appropriately, may, instead, allow important features of dance music style to be identified and described. Butler's work on rhythm in dance music draws on many sources from the field of traditional 'classical' musicology, but such references are used to develop a theory of rhythm that is appropriate to describe rhythmic practices in dance music. Butler notes the relative lack of musicological interest in dance music style, and thus his research often cites research from classical musicology, such as Harald Krebs, Richard Cohn, David Temperley, and Fred Lerdahl and Ray Jackendoff. However, the inclusion of such musicological research is justified, as it allows Butler to better describe the rhythmic properties of dance music texts.

Similarly, in order to be able to accurately describe the harmonic organisation of dance music it has been necessary, in this thesis, to draw on research that has already been carried out on harmony in rock, R&B, film, TV and orchestral music. The model of harmonic systems in dance music developed here, is indebted to Walter Everett's research on 'tonal systems' in rock, particularly his distinction between static and chordal tonal systems, and his discussion of melodic doubling in a static context. Despite Everett's tendency to describe these systems in terms of their deviation from 'normal tonality', his scheme identifies many of the harmonic distinctions that are also found in dance music styles. My understanding of functional and

non-functional chordal harmony in dance music is based on research on chordal harmony in rock and R&B styles by Walter Everett (2004), Allan Moore (1992, 1995), Philip Tagg (1994, 2012, 2018), Christopher Doll (2017) and Martin Pfeliderer (2019). The present description of static harmony in dance music is primarily based on prior research on static harmony in blues, R&B and rock styles by Peter van Der Merwe (1989), Richard J. Ripani (2006), Everett (2004) and David Temperley (2007). The concept of 'harmonic shift', discussed in Chapter Four, was originally developed by van Der Merwe (1989, p. 209) to describe harmony in folk music, but has been adapted, here to describe similarly abrupt transpositions and changes of scale in electronic and dance music. The distinction between consonant and dissonant static harmony, on the other hand, engages with David Temperley's theory of the 'supermode' (2011) and Dmitri Tymoczko's concept of macroharmony (2011).

This thesis' analysis of structure in dance music is developed from Ralf von Appen and Markus Frei-Hauenschild (2015) and von Appen and André Doehring's (2017) research on structure in popular music and Guy Capuzzo's research on sectional tonality and sectional centricity (2009). Chapter Five argues that the transposition of fixed chords in dance music can produce chromatic progressions that resemble chromatic chord progressions in film and orchestral music, and this analysis draws on research by Chris McDonald (2000) and Capuzzo (2004) on chromaticism in rock progressions, Richard Cohn (2012) and Tymoczko's (2011) studies of chromatic harmony in orchestral music and Frank Lehman (2013, 2014, 2018) and Scott Murphy's research on chromaticism in film music (Murphy, 2006, 2014).

The discussion of harmonic organisation in this thesis is linked to the possible meanings that this harmony may possess for listeners. This thesis uses theory from music semiotics to analyse harmonic structures in dance music as potentially functioning as musical signs. The theory of musical signification employed here is primarily developed from research by Nick Crossley (2019) and Philip Tagg (2012). In Chapter One, this semiotic theory is discussed in relation to theories of intertextuality in music, primarily the theory of 'transphonography' developed by Serge Lacasse (2018) and the concept of the matrix, suggested by Peter van der Merwe (1989). The chapter argues that dance music tracks often make use of recurring structural elements that are likely to be heard as musical signs. A listening test was also carried out, to test listener responses to different harmonic practices in dance music. This test

was based on Philip Tagg and Bob Clarida's listening test method (2003). Although, due to the design of the test, the conclusions that could be drawn from this test were limited, Chapter Six presents a discussion of the test results and argues that dissonant static harmony was interpreted differently in comparison to other more conventional forms of harmony presented in the test.

Ultimately, engagement with harmonic theory from other areas of musicology outside of dance music studies is required to develop a theory of dance music 'harmonic systems' that is more fine-grained than the distinction between 'songs' and 'tracks' discussed above and captures differences in harmonic organisation within the ubiquitous 'track form'. Using a theory of harmonic system, this research identifies a variety of harmonic organisation in sections of dance music that are musematically repetitive and lack discursive structure. This research does not to attempt to argue that dance music harmony is especially complex, but rather argues that simple harmonic distinctions may be meaningful within the context of dance music styles. If track forms are ubiquitous in dance music, or as Garcia argues, 'one of the most widely used prototypical forms in EDM' (2005, p. 7) then it might be expected that the use of different types of harmonic organisation within that ubiquitous structural framework are likely to be considered a highly important stylistic variable for dance music listeners.

In discussing the potential for harmony to function as an external sign in dance music, this thesis primarily uses terminology developed by Philip Tagg, specifically the terms 'anaphone' and 'style flag' (2012). The term 'style flag', describing a musical sign that functions due to prior association with a style or tradition of music making, has, then, been preferred to the similar term of 'style topic'. William Echard has defined a topic as a musical sign that 'must be highly conventionalized within a listening community, and… must rely for a large part of its meaning on indexicality of the content' (2017, p. 17). This definition a of style topic is similar to Tagg's definition of a style flag as an indexcial musical sign which 'uses particular sounds to identify a particular musical style' (2012, p. 522). It was felt that switching between these terms may create confusion, and to avoid this, Tagg's term has been preferred throughout the thesis.

Tagg's terminology was also felt to be more appropriate to this research as, for Tagg, style flags belong to a larger system of musical signs and are understood to function alongside other types of musical signification. As Tagg notes, structural elements that may function as style flags 'often include structures that simultaneously work as anaphones, episodic markers or both' (2012, p. 522). So, while the possible indexical meanings of these harmonic practices, as genre synecdoches of science fiction film music, horror film music, machinic dance styles and non-western music are considered in chapters three, four and five, these indexical meanings are considered alongside their possible internal and iconic meanings, types of meaning which have not traditionally been the focus of topic theory.

As Robert Hatten has argued, meaning in music may be both *stylistic*, describing recognition of tokens of indexical style topics or style flags, and *strategic*, describing the subjective interpretation of the perceived qualities or properties of individual musical structures or works (2004, p32). Strategic meanings therefore differ from the recognition of style topics as they imply the active subjective interpretation of musical meaning rather than the instantaneous identification of 'tokens' of known style topics. As Hatten argues, 'the strategic level of individual tokens and their interpretations in actual works involve far more than mere recognition' (2004, p32). Stylistic meaning, by contrast, is often described as immediate, transparent and without interpretation. Tagg has described style flags as functioning 'instantaneously' (2012, p. 522), while Eaton has suggested that style topics 'are valuable because they offer seemingly transparent signification to an audience competent in these codes' (2014, p. 3). Eaton also states that, the connotations of musical topics are 'set' or 'fixed' through enculturation (2014, p. 3). By considering the strategic meanings of harmonic practice in dance music in addition to their possible stylistic meanings, this analysis attempts to avoid the sense that the meaning of musical structures is always 'fixed' or 'set', as a purely stylistic analysis may seem to imply.

Like stylistic meaning, strategic meaning can also be understood to rely on cultural knowledge regarding how musical structures should be 'correctly' interpreted. For example, in chapter two, it is argued that aspects of dance music may be interpreted as possessing mechanical qualities due to listeners' knowledge of the codes of earlier styles of 'machine music' in film and television. However, such anaphonic meaning ultimately relies on the subjective

interpretation of the qualities of musical structures by listeners, and so differs from the identification of style topics. Strategic meanings, then, may be neglected in analysis that focuses primarily on stylistic meaning in music. For these reasons it was felt that use of the term 'style flag' instead of 'style topic', better reflected the analysis presented in this thesis, which considers strategic meanings in addition to stylistic meaning.

As has been previously stated, this research is concerned primarily with identification of distinctive harmonic practices in machinic dance music and discussion of the meanings that listeners may attribute to this harmony. Purely musical parameters of expression, such as harmony, may be understood to communicate independently of any accompanying paramusical texts, by functioning as iconic, indexical or internal musical signs. Chapters three, four and five discuss a number of plausible interpretations of how these distinctive harmonic practices may function as musical signs.

As a result, while critical theory is not the central focus of this research, research on the likely meanings of harmony in machinic dance music may have implications for future critical readings of machinic dance music. While, as Tagg argues, 'precision of musical meaning can never be the same as precision of verbal meaning' (2012, p. 171), the question of whether a harmony is heard, for example, as broadly emotionally negative or positive, or whether it is heard as referring to a particular style tradition, may be of great importance to how a recording is interpreted, and ultimately what it might be understood to be 'saying' about society and technology.

A question of musical meaning that has direct relevance to critical readings of dance music, and one that is returned to throughout this thesis, is whether dissonant harmonies in machinic dance music are likely to be interpreted as expressive of negative emotional states, or whether such harmonies have the potential to be interpreted in other ways. For example, an interpretation of dissonant static harmony as expressive of negative emotions is central to Karen Collins' reading of industrial music. Collins argues that industrial music typically evokes a cyberpunk dystopian setting, defined by the presence of a technologically empowered 'totalitarian elite' (2005, p. 171). Collins argues that within this context, dissonant static harmonies, similar to those identified in machinic dance music, may be interpreted as expressive of the pain and anxiety that characterises such a dystopian scenario. Therefore,

according to Collins, dissonant harmony is used in industrial music to evoke a fictional dystopian scenario, which itself is used as an 'oppositional' critique against the real-world misuse of science and technology by political elites (2002, pp. 170-171). An interpretation of the musogenic qualities of dissonance, as expressive of anxiety and pain within a wider machine aesthetic, is therefore used by Collins to argue that, in the context of industrial music, science and technology may be primarily associated with domination, exploitation and suffering, rather than with social progress or empowerment of individuals.

This pessimistic understanding of the social consequences of technological development, which Collins argues characterises industrial music, echoes Adorno and Horkheimer's *Dialectic of Enlightenment,* in which the authors argue that scientific and technological advancement only allows greater exploitation and domination, or that 'what men want to learn from nature is how to use it in order to wholly dominate it and other men' (1997, p. 4) A purely pessimistic and dystopian depiction of technology may also imply that rejection of technology might lead to future social progress. While Collins denies that industrial music implicitly promotes rejection of technology, arguing that industrial's 'anti-technological stance is not one of a literal neo-Luddite tradition' and that 'technology in cyberpunk is also viewed as potentially liberating' (2005, p. 172), Collins also emphasises that in a typical dystopian cyberpunk scenario that technology 'has been employed that enslaves humankind' (2005, p. 172) and that there is a 'totalitarian elite controlling the masses through technology' (2005, p. 171). Richard Pope has argued that Detroit techno possesses a similarly dystopian aesthetic, which he argues is an artistic reflection of the regression of Detroit into a 'dystopian capitalist reality' (2011, p. 26). Pope argues that many Detroit techno tracks feature dissonant siren-like melodies that may be heard as warning of 'the technological future' (2011, p. 40). Pope therefore supports his reading of Detroit techno with a suggestion that dissonant harmony is expressive of fear and anxiety.

However, while dissonant harmony in machinic dance music may be interpreted as expressive of emotional pain or suffering, many counter-examples can be identified for which this interpretation is inappropriate. Many machinic dance music tracks combine dissonant static harmony with paramusical texts that refer to the pleasures of dancing, or with texts that are positive or ambiguous about the role of technology in society. As is argued in Chapter Three,

dissonant static harmonies are likely to be heard as inherently harsh and unstable, and it is unlikely that such harmonies will be heard as unproblematically expressive of the 'warmth' and stability associated with consonant harmonies. However, a variety of alternative interpretations of dissonant static harmony are possible, beyond the interpretation that it is singularly expressive of negative emotions. Chapter Three discusses a number of different possible interpretations of musogenic meaning that have been discussed in relation to dissonant harmony in machinic dance music. These alternative interpretations of dissonant harmony include the possibility that it will be heard as evocative of machine noise; the possibility that it is heard as style flag for 'machine music'; and the possibility that it may now be heard as a style flag for synth-pop, electro and techno styles. Crucially, these alternative interpretations of dissonant harmony, discussed in detail in chapter three, may better explain how this harmony is often heard in the context of machinic dance music. For example, the Detroit electro track 'Let's Dance' (1993) by Aux 88 (an example discussed in Chapter Three), features a dissonant Locrian mode riff throughout, but here the dissonant harmony may be heard as expressive of machine noise, and understood to suggest that dancing bodies have a machine-like quality. There is no paramusical indication that this track should be read as having a dystopian character, or that its harmony is expressive of emotional pain.

Similarly, in the paramusical texts of many machinic dance music tracks that employ dissonant static harmony, technology is often presented as the means by which humans may transcend 'natural' human identities and develop new powers and capabilities. The use of pop-cultural images of transhumanism such as replicants, clones, mutants, aliens, which abound in the paramusical texts of machinic dance music, can be read as reflecting a more optimistic and curious attitude towards science and technology, rather than reflective of a purely dystopian and pessimistic Adornian view. Alternative interpretations of the musogenic meanings of dissonant harmony, then, may be heard to support alternative, non-dystopian readings of the representation of science and technology in machinic dance music. However, as is discussed in Chapter Six, emotionally negative interpretations of dissonant harmony may, in some cases, still be preferred by many listeners.

Such alternative interpretations of the musogenic meaning of dissonant harmony in machinic dance music may be more compatible with Afrofuturist critical writing on techno, by Kodwo

Eshun (1998) and Ben Wiliams (2001) in which technology is presented as something that can potentially be incorporated into a cyborg identity, rather than feared or rejected. Williams has argued that techno music is often framed by paramusical texts that present technology in positive or ambiguous terms, and that this 'cyborg' attitude does not suggest a fear of technology (2001, p. 167). For Williams, rather than expressing a need to reject technology, Detroit techno may instead be understood as expressive of a desire to find a new identity 'within the global electromagnetic sphere of postindustrial communications technologies' and of the desire to find ways to adapt 'to the ever-shifting technologies of capitalist innovation' (2001, p. 166).

Eshun and Williams' suggestion that Detroit techno may be understood to express a 'cyborg' relationship with technology, in which technology is incorporated and used rather than feared or rejected, echoes earlier writing on this subject by feminist critical theorist Donna Haraway (2000). Haraway has argued that individuals in modern capitalist societies should be understood as cyborgs, 'creatures simultaneously animal and machine' (2000, p. 291), for whom the rejection of technology and the return to 'innocent' pre-modern 'natural' identities is no longer possible (2000, p. 315). Illustrating her own cyborg identity, Haraway suggests that 'I have a body and mind as much constructed by the post-Second World War arms race cold war as by the women's movements' (2000, p. 310). Within the era of cyborg modernity, then, the use of modern technology for both social progress and political reaction are possible. Haraway acknowledges that, 'from one perspective, a cyborg world is about the final imposition of a grid of control on the planet', but contrasts this pessimistic possibility with the hope that, 'from another perspective, a cyborg world might be about lived social and bodily realities in which people are not afraid of their joint kinship with animals and machines, not afraid of permanently partial identities and contradictory standpoints' (2000, p. 295).

Much machinic dance music, then, is characterised by a similarly ambiguous or open attitude towards technology, acknowledging both its progressive and reactionary potential and remaining 'poised between anxiety and endorsement' (Noys, 2014). For Benjamin Noys, Detroit techno is 'one of the most fascinating and most aesthetically successful instances of cyberpunk phuturism' (2014, p. 58) because it captures both the dystopian and utopian potentials of technological advances, or combines 'the utopian, if not kitsch, elements of sci-

fi futurism' with 'the dystopian fragmentation of the of the city space' (2014, p. 59). Much machinic dance music, then, highlights the ambiguities and contradictions that technology represents rather than clearly adopting an oppositional or accepting attitude towards it. For example, the paramusical text of the album *Wireless Internet* (2002) by Arpanet, a Drexciya side-project, points to the origins of the modern internet in the earlier ARPANET US military communications network. It therefore draws attention to the development of modern communications technology from military technology and its lack of political 'innocence', but rather than suggesting clear opposition to it, the album's first track begins with spoken dialogue that argues for the potentially liberating potential of modern wireless communications technologies. The album's paramusical text, which combines utopian and dystopian sentiments, then, cannot be described as adopting either a straightforwardly utopian or dystopian attitude towards communications technology.

In this context the use of dissonant static harmony, in the Arpanet track 'Illuminated Displays' (2002) has the potential to be interpreted in multiple ways: as expressive of negative emotional states, as evocative of machine noise, or as style flag for the electro style. It is possible, then, to hear the harmony as expressive of anxiety and emotional disturbance, and to suggest a dystopian reading of this track and its depiction of technology, but the multiplicity of possible meaning of the harmony, combined with the ambiguity of the paramusical text, suggests that work can be read in other ways. This thesis then, argues against an interpretation of dissonant static harmony as purely expressive of negative emotional states and suggests that an ambiguous and open depiction of technology is characteristic of the majority of machinic dance music.

4. Chapter summaries

The first chapter of this thesis summarises theories of musical meaning that are applicable to the analysis of the meaning of harmony in dance music. This chapter argues that harmonic structures in dance music may function as musical signs, heard to either referring to other structures within the same musical text, or to non-musical objects external to it. This chapter also argues that dance music tracks typically make use of numerous 'matrices', or structural elements that are common throughout dance music styles.

Chapter Two focuses on how structural elements in dance music, including harmonic elements, may be heard as musical signs that specifically evoke the workings of machines and technology, and how these elements may, in combination, be heard to construct a 'machine aesthetic' in dance music. It then describes how this machine aesthetic may be used in dance music to indicate various cyborg and machine subjectivities.

Chapter Three begins by presenting a set of criteria for separating consonant and dissonant static harmonies in dance music. It then describes, in detail, the different types of dissonant static harmony most common in dance music, noting the use of similar harmonic organisation in machine music in film and television music. This chapter considers dissonant static harmony as a potential 'anaphone', expressive of 'machine noise' or alternatively, painful emotions or tension. Finally, it evaluates Philip Tagg's claim that dissonant static harmony in dance music may be heard as a genre synecdoche for non-Western musical styles.

Chapter Four describes the practice of 'disjunctive' harmonic shifts in dance music, a practice in which a static riff is abruptly transposed up or down the chromatic scale. This practice in dance music is differentiated from transposition of riffs in rock and R&B, which typically follow discursive chord progressions. This chapter argues that abrupt transpositions in dance music may be heard as anaphonically evocative the unpredictable and abrupt operations of machines and technology.

Chapter Five outlines two related practices in dance music, both relying on the use of sampled or otherwise 'fixed' chords. The first of these practices, the doubling of static riffs with a sequence of identically voiced chords, is described as adding mechanical 'noise' to static riffs. A second practice, the creation of chromatic chord progressions through repeated transpositions of a fixed chord voicing, is described as related to the evocation of the 'fantastic' or supernatural in machinic dance music.

Chapter Six presents the findings of a listening test, indicating how the harmonic practices described in chapters three, four and five are interpreted by listeners. This data is compared to the claims made elsewhere in this thesis regarding the potential meanings of these harmonic practices.

Chapter One – Meaning and Transphonography in Dance Music

To investigate the potential meanings of harmony in the context of dance music this thesis adopts a music semiotics approach, suggesting that musical structural elements have the potential to function as musical 'signs' and so to be heard as expressive of non-musical concepts. This chapter discusses the research relevant to a semiotic analysis of popular music, and clarifies the methods used in this thesis to suggest the possible meanings of harmony in dance music. The possibility that structural elements in dance music tracks may be heard as 'signs' and therefore heard as 'something that stands for something else to someone in some way' (Turino, 1999, p. 222) is contrary to Jeremy Gilbert and Ewan Pearson's claim that dance music is primarily affective rather than meaningful. Gilbert and Pearson suggest that listening to music produces two types of response; 'affect' and 'meaning' (1999, p. 39), before arguing that dance music is primarily affective and possess little in the way of 'meaning'.

However, Gilbert and Pearson's use of the term 'meaning' differs from how the term has been used in music semiotics research. Gilbert and Pearson's argument, rather than describing a process of musical signification, is instead based on Simon Frith's earlier distinction between 'aesthetic' listening and 'sensuous' listening strategies. According to Frith, 'aesthetic' listening was promoted by nineteenth century musical discourse as the correct listening approach to Western art music, which, as promoted by Eduard Hanslick and Adam Smith, urged the listener to be intellectually aware of music as a non-representational object, pattern or system, and to be intellectually aware of how that system might produce specific aesthetic effects, without responding to the work sensually or emotionally (Frith, 1996, pp. 249-268). This contemplative listening strategy was promoted over a 'sensual' listening strategy in which the listener experienced emotional and bodily sensations in response to the music, without intellectual contemplation of the musical processes taking place. For Gilbert and Pearson, therefore, the term 'meaning' describes the result of a listening strategy of intellectual contemplation, which can be contrasted with non-intellectual 'affective' listening strategies. According to Gilbert and Pearson, then, to suggest that dance music could be meaningful to listeners is to suggest that it should be listened to aesthetically, and to suggest that listeners remain trapped within a repressive and 'puritanical' discourse that would deny the existence of the body and 'affect'.

However, this understanding of 'meaning', as exclusively produced by an intentionally contemplative and reflective listening strategy, and 'affect' as produced by an unreflective, 'sensual' listening strategy, is contrary to the process of semiosis as understood in music semiotics. In music semiotic research, musical signs are understood to produce both affective and intellectual responses, suggesting that musical 'meaning' cannot be separated from 'affect'. Philip Tagg has argued that the process of 'semiosis' can be described as 'intuitive', as 'music affects body and emotions without seeming to involve much, if anything by way of intellectual reasoning (2012, p. 69). So, for Tagg, even though musical signs are interpreted according to learnt cultural codes rather than pure 'instinct', the intuitive process of interpretation of musical signs largely happens below the level of 'intellectual reasoning' and may result in emotional or affective responses. Similarly, Thomas Turino argues that the emotional affects of music are produced as an intuitive response to musical signs, suggesting that '[Charles Sanders] Peirce's semiotic theory helps in the analysis of signifying musical forms. But it's even greater significance is as an avenue for understanding musical affectivity' (1999, p. 249). Turino emphasises that, for Peirce, much signification is understood to take place below the level of 'language-mediated thought' (1999, p. 233), and that these levels of signification may be highly affective to listeners. Tagg and Turino's research suggests, contrary to Gilbert and Pearson's argument, that unreflective and affective listening still involves interpretation of musical signs, although this process takes place intuitively, automatically, and often unconsciously. The potential for musical elements to function as signs is not tied, in music semiotics, to listening strategy, and is assumed to always take place when listening to music, regardless of the intention of the listener or their listening strategy. The process of semiosis has been described by Tagg and Turino as not requiring reflective contemplation to take place, and instead has been described as intuitive, taking place automatically without any conscious effort. In the context of music semiotics, the term 'meaning' describes how a musical sign is interpreted by a listener, a process which does not require the listener to be consciously aware of how the meaning has been produced by the musical sign and may also involve emotional or affective responses.

The idea that musical structures may function as signs, and that the interpretation of signs may produce affect, suggests that, in theory, affect may be linked to the presence of music structural elements in a relatively consistent fashion, within the limits of a particular culture

in a particular historical period. However, Tagg and Turino's observations suggest that while the process of musical signification may be highly meaningful or affective, most listeners do not consciously link these meanings or affects to musical processes in a systematic way. A reflective or analytic listening strategy is therefore one in which special attention is paid to how the process of musical signification takes place and which attempts to systematically link meanings to the presence of musical signs. Such an analytical listening strategy is not typical when listening to music, and may, as Turino suggests, be less enjoyable than normal, unreflective, listening. As Turino argues, 'When people shift to symbolic thinking and discourse to communicate about deep feelings and experiences, the feeling and reality of those experiences disappear and we are *not* satisfied' (1999, p. 250). Turino therefore reinstates the division between aesthetic, intellectual 'symbolic' listening and the 'deep feelings' of unreflective affective listening, however, unlike Gilbert and Pearson, Turino does not suggest that any listeners other than musicians and scholars are likely to listen to music 'symbolically', and contrary to Hanslick and Smith, suggests such a listening style is actually inferior and less satisfying than unreflective affective listening. Turino, then, suggests that while musicians and scholars may attempt to intellectually understand the process of music signification and musical events as 'part of generalizable, predictable, mediated categories and processes' (1999, pp. 248-249), for 'average "untrained" listeners' (1999, p. 248) music has an almost 'mystical quality' in producing affect. Crucially, despite their 'mystical' quality, affective responses may still be linked to the presence of music structural elements, or musical signs, by musicians and scholars.

The analytic approach to musical meaning taken in this research, then, is an attempt to understand and describe how musical signification in dance music takes place and does not make any normative claims regarding how dance music should, or should not, be listened to. An analytic musicological approach can attempt to understand how musical texts are likely to be meaningful to most listeners, but it is not suggested that this analytic approach is a normal or preferred way of listening to dance music. While dance music may be inherently meaningful, a contemplative listening strategy is not required for audiences to engage with those meanings.

1. Types of musical sign

This section surveys prior research on musical signification, understood as the potential for purely musical structural elements to function as musical signs, producing what Philip Tagg has termed 'musogenic meaning' (2012, p. 171). Musogenic meanings, produced by musical signs are, according to Tagg, fundamentally different to the 'logogenic meanings' produced by text and images. For Tagg, 'music and language are not interchangeable sign systems' and 'precision of musical meaning can never be the same as precision of verbal meaning' (2012, p. 171). This difference in precision of meaning is due to the different ways in which musical signs and lexical signs function, with musical meaning relying 'largely on connotation and iconic or indexical signs' (Tagg, 2012, p. 171), while lexical signs can be understood to function as 'symbols'. These various types of musical signs are discussed in more detail below. This chapter surveys research on purely musical meaning, providing a theoretical framework for the analysis of the meaning of harmony in dance music presented in the subsequent chapters.

According to Nick Crossley, purely musical meaning may be understood to have 'both internal and external dimensions', with musical signs either pointing to non-musical objects outside of the musical text (external meaning) or other musical structures within it (internal meaning) (2019, p. 107). Internal meaning, according to Crossley, 'is centred upon the way in which the parts of a piece of music fit together' (2019, p. 121), and describes a model of musical meaning developed by Leonard Meyer. For Meyer, listening to individual musical works allows the listener to build up knowledge of the conventions of musical styles and ultimately allows the listener to predict how other works in that style will progress, while 'music in a style with which we are totally unfamiliar is meaningless' (Meyer, L. as cited in Crossley, 2019, p. 122) Crossley argues that, 'we can't follow a piece in an unfamiliar style because what we hear has no association for us and fails to generate expectations about its likely direction.' (2019, p. 123) Internal musical signs therefore refer to future events within a musical work, rather than non-musical objects outside it. In Meyer's words, 'what a musical stimulus or series of stimuli indicate and point to are not extramusical concepts and objects but other musical events which are about to happen. That is, one musical event (be it a tone, a phrase a whole section) has meaning because it points to and makes us expect another musical event' (Meyer, L. as cited in Crossley, 2019, p. 121).

As Crossley observes, 'Meyer's theory suggests the need for a balance of un/predictability in music, if it is to be experienced meaningfully and pleasurably by listeners' (2019, p. 122), or that it needs a mixture of met expectations and un-met expectations, based on the knowledge of the style in which the work is understood to operate. This 'dialectic' of stylistic expectation and difference is developed by Hatten, who suggest two 'competencies' for understanding the meaning of a particular musical work, the stylistic and the strategic (2004, p. 30). Stylistic competency describes the ability of listeners to recognise the style of the work, its expected structure, and the general 'meaning' of that style, while strategic competency describes the ability of listeners to interpret the specific, individuated meaning of entities 'actually manifested in musical works' (Hatten, 2004, p. 30) and an awareness of how artists play with style conventions in the composition or performance of an individual work. Hatten argues that the interpretation of individual figures is 'mediated' by the 'ground' on which it is heard to take place, describing the stylistic expectations against which it is heard (2004, p. 243).

Internal meaning has been described as important to understanding meaning in dance music. Crossley argues that 'the internal meaning of music is often grasped in dance' and that the enjoyment of listening to dance music is particularly related to its internal meaning. For Crossley this offers another way of arguing against Gilbert and Pearson's claim that dance music is meaningless, as for him, 'the dancer doesn't reflect upon the music. They find its patterns and interpret it by tuning into and moving with it. But this is still a matter of semiotic meaning, as each moment in a song triggers anticipation of what is to come.' (2019, p. 123). Luis-Manuel Garcia argues, similarly to Crossley, that dancing to or engaging with repetitive dance music may create what he terms 'process pleasure' (2005, p. 6), arising from the active engagement with rhythm and taking pleasure in 'manifesting capacity, control and proficiency in dance as an activity' (2005, p. 6), activities which are closely related to the prediction of future musical events as a track progresses. Mark Butler's research on rhythm in dance music can also be regarded as primarily focused on the internal meaning of dance music rhythms. For example, Butler describes syncopation in dance music rhythms as 'the tension between perception of a note's position and our sense of where it *should* be' which 'creates a kind of gravitational pull towards the beat, a sort of negative emphasis on the position from which the note is displaced' (2001, p. 99). The suggestion that listeners are aware of where the beat 'should' be describes an internally meaningful discrepancy between the actual rhythmic

pattern and listener expectations of how a dance track is likely to progress. Butler's various areas of focus, including metrical ambiguity, metrical dissonance, and changes in the perceived downbeat of a rhythm ('turning the beat around') are all related to the production of internal meaning.

Descriptions of internal meaning in musematically repetitive dance music tracks have tended to focus on how listeners engage with rhythmic and timbral aspects in the 'extended present' and have indicated that, in this context, melodic or harmonic organisation is absent or unimportant (Butler, 2001, pp. 17, 20). But this thesis argues that melodic and harmonic relationships may still be internally meaningful even within the context of the musematically repetitive extended present of melodic riffs or short chord progressions. The perception of dissonance within a static harmony, for example, can also be understood as an interpretation that a particular pitch is not where it *should* be (a note may be heard as 'wrong' or out of place), and this may produce an expectation that this static harmony will eventually 'resolve' to a more consonant harmony. Similarly, the practice of introducing unprepared, disjunctive harmonic shifts to sections of static harmony, by transposing a melodic pattern up or down the chromatic scale, may be understood to produce an unanticipated or unexpected change in the foundation note of a melodic pattern, that is heard to confound stylistic expectations. The quality of 'unexpectedness' in these harmonic shifts therefore indicates that such practices may be heard as breaking stylistic expectations and, as a result, may be heard as internally meaningful to listeners.

Although analysis of internal meaning is crucial to understanding the potential meanings of dance music, an exclusive focus on internal meaning risks neglect of the important role that external meaning plays in dance music. Stan Hawkins' analysis of Lil Louis' house track 'French Kiss' (1989) , for example, focuses on the internal meaning produced by the track, primarily describing engagement, through dance with the internal meaning of the rhythm, suggesting that clubbers 'party to the point of complete immersion in the beat' (2003, p. 98). Although this may accurately describe the experience of dancing to the track, such an analysis disregards the possibility that the track may simultaneously be heard to contain signs that refer to external objects. The possibility that the track's 'almost obligatory syncopated keyboard chordal rhythm figure.' (Hawkins, 2003, p. 92) may be heard as indexically

associated with disco, jazz, or R&B styles (and therefore functioning as a 'style flag'), is not explored. Similarly, Hawkins does not investigate whether the track's rhythm or drum pattern, or the choice of drum sounds, might be heard as evoking any other style or work, despite the similarity of the 'French Kiss' drum pattern to those used in countless other house and dance tracks. Using Tagg's terminology, then, Hawkins does not consider the possibility that any elements of 'French Kiss' may be recognised as 'style flags' and may be meaningful in that dimension.

Engagement with the internal processes of dance music rhythm, then, is not the only way in which dance music is meaningful to listeners. Dance music tracks may also contain elements that are heard as external signs, and these elements may also be important to listeners and dancers. For example, Richard Dyer suggests that one of the most important characteristics of disco music is its 'romanticism' or its ability to produce associations of glamour and extravagance that 'negates the dreariness of the mundane and everyday' (1990, p. 416). The evocation of romanticism in disco music, for Dyer, is often related to the use of 'massed violins' which 'takes us straight back, via Hollywood, to Tchaikovsky, to surging, outpouring emotions' (1990, p. 416). The very suggestion that this aspect of the music takes the listener 'back' suggests that the massed violins are heard as an indexical external sign, referring to a pre-existing association that is understood to hold between the massed violins, 'golden-age' Hollywood soundtrack music, nineteenth century romantic music and the various non-musical associations that these associations possess (romance, glamour, opulence, sophistication etc.). Again, using Tagg's terminology, the 'massed violins' may be considered a style flag, specifically a 'genre synecdoche' referring to Hollywood film music. This external sign therefore does not point to future, internal aspects of the musical text, and instead points to objects external to it. This suggests that although internal meaning may be central to the activity of dancing to dance music, other, external meanings can be produced by dance music texts, parallel to the listener's engagement with the purely internal meanings of the music.

Theories of external meaning in music have, largely, developed from the semiotic theory of Charles Sander Pierce. Peirce's theory of the sign, and the sign types of icon, index, and symbol, has been utilised music semiotics as a model for analysing signification and expression in music. The process of signification itself, is understood to function through

another trichotomy, that of sign, object and interpretant. Therefore, although terminology may often differ, much musical semiotic research has been developed from Peirce's model of the sign. Musical signification resides in the potential for any musical element to be heard as a sign, 'indicating or representing something other than itself' (Tagg, 2012, p. 155). Any stylistic element can be regarded as a potential sign but should only be considered to function as a sign if it has some effect on the listener. As Turino notes, 'not everything happening in music necessarily functions as signs all the time' (1999, pp. 224-225).

For Robert Hatten, a musical structure can be regarded as a potential sign if it is differentiable from other musical structures that already act as signs, creating a musical-structural 'opposition' that allows an 'expressive opposition' to be mapped on to it. He therefore argues that musical expression is made possible through 'mappings of expressive oppositions onto oppositions in musical structures' (2004, p. 30). This suggests that any audible structural difference between two musical structures (for instance, the audible difference between a major and minor triad) can create a structural opposition and that 'basic semantic oppositions in a culture' can be mapped onto these structural oppositions. (2004, p. 30). A similar theorisation of a musical sign is Tagg's concept of the 'museme', describing a 'minimal unit' of potential musical meaning. (2012, p. 234) According to Tagg, a museme can describe any single structural oppositions heard in the dimensions of rhythm, instrumentation, harmony, or such diverse phenomena as hearing a performance by 'professional symphony orchestra in classical vein' rather than a pub rock band (2012, p. 236). Tagg's musemes and Hatten's structural oppositions therefore both describe the potential for distinct musical structures to function as musical signs.

According to Peircean semiotics a signs may function as icons, indices or symbols, but Turino suggests that, 'for the most part, musical sounds that function as [external] signs operate at the iconic and indexical levels.' (1999, p. 228). This is not a standard Peircean position, but one that has been adopted in music semiotic research. Tagg, for instance, has argued that 'arbitrary signs [Tagg's term for Peircean symbols] are rare in music' (2012, p. 163) and that apparently arbitrary connections between musical signs and what they signify may, in fact, often be explainable as based on iconic or indexical connections (2012, p. 164). Accordingly, Tagg explicitly divides signification into two categories, the 'musogenic', describing iconic and

indexical external meaning, and the 'logogenic' which he uses as a synonym for symbolic meaning. As was noted above, for Tagg, musogenic meaning can never have the 'precision' of logogenic meaning, however, the precision of musical meaning can 'become more focused when heard along with words, actions are pictures' (Tagg, 2012, p. 171). The possible external meanings of harmony in dance music, then, are primarily musogenic rather than logogenic, and might be understood through analysis of its possible function as an iconic or indexical sign.

According to Peircean semiotics, 'icons' are understood to function through formal resemblance to their object. For example, rising pitches may be heard to iconically signify an object moving upwards, or more poetically, emotional, or spiritual 'uplift'. Indices, alternatively, function through the association of a sign with an object, which it has previously co-existed with, and which the listener has experience of. For example, mariachi trumpets may be heard as an indexical sign referring to Mexico, as the listener may have previously heard mariachi trumpets in Mexico, or in a film or television show depicting Mexico. Tagg's related typology of musical signs separates iconic 'anaphones', described as signs which resemble movements or gestures, from 'style flags' (style indicators and genre synecdoches) which are indexical signs, relying on the previous association between musical signs and particular styles or genres (2012, p. 486). Tagg's term for an external iconic sign in music is an 'anaphone', a term which highlights the heard analogy between the musical sign and the signified object (2012, p. 487). Tagg identifies five different categories of anaphone, each supposed to function through a different dimension of similarity between the signifying sound the signified object, these dimensions being 'sonic, tactile, kinetic or spatial, composite or social' (2012, p. 486).

Tagg's theory of anaphonic meaning, then, can be used to link descriptions of dance music to structural elements in particular tracks. For example, the drum machine rhythm of Model 500's early Detroit techno track 'No UFO's' (1985), which has been described as possessing an 'industrial' quality (Brewster & Broughton, 2006, p. 352). These reported connotations of the rhythm might be understood as describing Brewster and Broughton's response to the drum machine pattern of the track, heard to function as a type of anaphonic sign. Firstly, the timbres of the individual drum sounds may be heard as 'sonically' analogous to the sounds

produced by an industrial process or machine, if they are heard to 'boom' or 'hiss' like a machine, or otherwise be heard as a 'musical stylisation' of sounds 'that exist outside the discourse of music' (Tagg, 2012, p. 487). Secondly, the drum machine sounds may be heard as 'tactile' anaphones, if they are heard to possess 'rough', 'metallic' or 'abrasive' qualities in contrast to 'soft' or 'smooth' instrumental timbres. This 'hard' quality of the drum machine sounds may be heard as evoking the hard metallic surfaces of an industrial machine, for instance. Thirdly, the drum machine pattern may function as a 'kinetic' anaphone if it is heard as 'moving' like a machine. The rhythm of 'No UFO's' might be heard as mechanically 'chugging' or otherwise expressive of fast and repetitive mechanical movement. These sonic, tactile, and kinetic dimensions of the drum machine rhythm may collectively be heard as a 'composite' anaphone, signifying an 'industrial' sound. Finally, the relationship between the 'industrial' sound of the drum machine and the human voice of the vocalist, Juan Atkins, may be heard as a 'social' anaphone, signifying 'the relationship of an individual to an environment' (Tagg, 2012, p. 514). For example, Atkins' vocal performance may also be heard to possess a mechanical or robotic quality, matching the 'industrial' rhythm in the musical presentation, suggesting a blurring of traditional distinctions between humanity and technology in contemporary society. Importantly, all of these potential and hypothetical meanings rely on some heard resemblance between the musical sign and its non-musical object.

Tagg's concept of a 'style flag' describes a musical sign that functions through a heard indexical connection to another work or style. A 'style flag' is defined by Tagg as the use of 'particular sounds to identify a particular musical style and often, by connotative extension, the cultural genre to which that musical style belongs' (2012, p. 522). Therefore, a trumpet playing a solo melody, for example, may typically be heard as a style flag signifying 'jazz'. Style flags, according to Tagg, can be of two types: 'style indicators', if they are heard as establishing the 'home' style of the work, or 'genre synecdoches' if they are heard to refer to a 'foreign' style.

Style flags may also suggest a series of additional connotations, related to the style they refer to. A trumpet sound, for example, may be heard as a genre synecdoche of 'jazz', but this signification may also connote jazz nightclubs, 1930s-1950s fashion, film noir soundtracks or

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any other concept which the listener may understand 'jazz trumpet' to 'co-exist' with. This chain of indexical associations, associating jazz with concepts such as '1930s' or 'prohibition' for example, is described by Tagg as a process of 'connotation', (2012, p. 165) or 'to mean or signify by association' (2012, p. 585).

2. Transphonography and matrices

Musical signification may also be closely related to the use of 'transphonographic' practices in popular music recordings. Serge Lacasse uses the term 'transphonography' to describe intertextual practices within the context of popular music or, more specifically, 'a set of eight intertextual perspectives for recorded popular music' (2018, p. 10). 'Transphonography' can be understood to describe types of compositional or poietic practice enacted by musicians or producers, rather than describing the process of signification or semiosis experienced by listeners, although these two processes are often closely related. For example, Tagg suggests a rhythm may be heard by listeners as a style flag referring to the style of 'tango' (2012, p. 523), but this signification first relies on a transphonographic practice having taken place, namely the incorporation, by musicians, of the pre-existing 'tango' rhythm pattern into a new musical work.

Recognisable types of transphonographic structural elements, then, such as the 'tango' rhythm, may also be described as examples of 'matrices'. The term 'matrix' was originally used by Peter van Der Merwe to describe variants of tunes that are found in folk and early popular music. A 'matrix', therefore, describes a variation on familiar templates, such as instrumental timbres, drum patterns and rhythms, song structures, and riffs, melodies, and chord progressions. Van Der Merwe suggests that a matrix is similar to the idea of the 'theme of the classical set of variations' (1989, p. 94). In his view, a matrix specifically describes a set of compositional rules which ensure that all variations are heard as related to the original stylistic element, or rules to describe the familial resemblance of a series of variations. He suggests that 'there are details which change, and something basic to every variation that does not change' (van Der Merwe, 1989, p. 94), and the matrix describes the aspects that do not change.

Transphonographic matrices, then, due to their incorporation into multiple recordings, are likely to acquire relatively stable anaphonic interpretations and indexical associations. For instance, the 'breakdown snare roll' is an example of a transphongraphic matrix that was common in 1990s trance music (appearing, for example, in Energy 52's 'Cafe Del Mar (Three'n One Remix)' (1997). This matrix, due to its ubiquity, acquired relatively stable external meanings in the context of trance music, functioning as a style indicator, but also as an anaphone associated with 'rising excitement or intensity'. So, while internal processes do play an important role in creating meaning in dance music tracks, the external meanings of anaphones and style flags are also significant, and this external signification is often related to the widespread use of transphonographic matrices in the production of dance tracks.

Dance music, then, can be regarded as generally more 'grammar-oriented' than 'text-oriented'. According to this distinction, 'grammar-oriented' styles can be described as producing works which are less individuated when compared with 'text-oriented' works, which are defined as more idiosyncratically structured (Middleton, 2002, p. 173). The distinction between 'text-oriented' works and 'grammar-oriented works', according to Middleton, has historically been 'associated with the growing divergence, from the nineteenth century, between increasingly 'autonomous', aesthetically-orientated 'art' music and more 'conventional', functionally-orientated 'popular' music' (2002, p. 173). Middleton therefore suggests that most popular music styles, such as dance music, may be regarded as grammar-oriented or highly coded: 'beneath the flux of syntactic, semantic and cultural change and contradiction, there is a level which preserves major conventions: and indeed, such continuity may be more solid at this 'popular' level than at levels higher in the socio-cultural structure, with their greater propensity to change' (2002, p. 119). Middleton goes on to argue that 'popular music… seems relatively highly coded or overcoded: controlled not only by tight, explicit general codes (for instance, a harmonic code governing chord vocabulary and sequence) but also, within these, by more specific codes as well (thus many styles use particular, conventionalised chord-progressions, such as the twelve-bar blues)' (2002, p. 173). Middleton therefore suggests that overcoded or grammar-oriented styles may be characterised by their widespread use of conventionalised and familiar style elements.

The relative lack of individuation of dance music works, in particular, has been noted by Tony Langlois, who has suggested that dance 'records are deliberately repetitive, lengthy and fairly indistinct from one another' (1992, p. 229). Similarly, Mark Butler has suggested that 'certain shared musical characteristics permeate almost all electronic dance music' (2001, p. 9). Individual dance music tracks can still be regarded as individuated works, to a greater or lesser extent, and many are highly experimental, but the majority of dance tracks can be understood to employ numerous structural elements that are variants of matrices common to other dance music tracks. The prevalence of matrices in dance music, describing variations of common rhythms, harmonic grammars, and tune families, also indicates that anaphones and style flags may play an important role in producing meaning in dance music.

Several prior studies of meaning in popular music have adopted a grammar-oriented approach. Justin Williams has described how, in the early 1990s, hip-hop producers used stylistic elements that were likely to be associated with jazz music to create the self-consciously 'highbrow' genre of 'jazz rap', a style that was recognisably stylistically distinct from other hip-hop genres, such as '"gangsta" and "pop rap"' (2010, p. 436). Williams writes that, 'a jazz code falls under what Philip Tagg calls a genre synecdoche— an instrument or musical structure that is shorthand for an entire style or genre' (2010, p. 443). Williams argues that quotations in jazz rap will be recognised as synecdoches of the jazz style if they are recognised by listeners as employing jazz 'codes' (2010). Therefore, Williams suggests that these elements will typically be heard as signifying 'jazz' style rather generally, rather than always being heard as quotations referring to specific texts.

Tagg's brief study of early 1990s dance music style, discussed in the previous section, is perhaps the first to investigate harmonic matrices in dance music may function as style flags (1994). He suggests that while some harmonic systems in dance music are likely to be heard as genre synecdoches of disco and R&B styles, the differing harmonic system of 'European techno-rave' is not likely to be heard as referring to R&B style traditions in the same way. This leads him to speculate that the harmonic system of 'techno-rave' may be heard as a genre synecdoche for 'non-Western' styles of music. However, Chapter Three of this thesis argues against this reading of harmony in 'techno-rave' music and suggests that dissonant static

harmony in dance is music is not typically heard as a genre synecdoche for 'non-Western' music**.**

3. Transphonography in dance music

The idea that styles of dance music such as techno and electro might construct a 'machine aesthetic' through the use of transphonographic matrices is contrary to an argument often made in dance music criticism. This line of thinking holds that while house and garage styles of dance music are clearly grammar-oriented, 'machinic' styles such as techno and hardcore are radically modernist or avant-garde in form and cannot be analysed in terms of their connections to other texts.

For Butler, house is clearly grammar-oriented as it refers to the conventions of disco, funk and gospel music: 'house reveals its disco roots in the gospel-style of its vocals and the funk of its bass lines' (Butler, 2001, p. 17). Similarly, for Jeremy Gilbert and Ewan Pearson, house music is notable for its 'gospel-inspired utopianism' and 'funk-informed corporeality' (Gilbert & Pearson, 1999). But, by contrast, techno and hardcore styles have often been described as lacking any stylistic precedent or any connection to past musical styles. Chris Kempster, for example, has claimed that 'techno's driving force was its innovation. In its purism, its emphasis on stepping into the unknown, it as modernist as cubism' (Kempster, 1996, p. 17). Simon Reynolds similarly suggests that techno and rave styles' use of music technology is 'a pop echo of the twentieth-century classical avant-garde's project of pushing the envelope of what is conventionally regarded as 'music', via the incorporation of noise-sound and environmental sonorities' (Reynolds, 2007, p. 313). For Reynolds, the formal radicalism of techno and rave styles can be regarded as 'modernist', a term, that as defined by Malcolm Bradbury, describes literary works that are unconstrained by 'traditional genre and form', are 'aesthetically radical' and 'contain striking technical innovations' (Bradbury, 2006, p. 145). For writers such as Reynolds, the characterisation of certain styles of 1980s and 1990s dance music as modernist or avant-garde is used to argue for their elevated aesthetic value compared to house, garage and R&B. Reynolds has claimed that rave 'evoked forward-motion, violence given focus and discipline. The feeling of being in the vanguard, in both the artistic and military senses' (Reynolds, 2009a).

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Reynolds also contrasts the modernism of rave, with the 'blight of postmodernity' (Reynolds, 2009a), which he claims characterises other styles of dance and popular music. Reynolds has argued against the aesthetics of postmodernism elsewhere, defining postmodernism as 'art that's based around pastiche and citation' (Reynolds, 2009b, p. 81) and has noted 'the malaise of postmodern pop' in which 'there is a profound connection between meta-ness (referentiality, copies of copies) and stasis (the sensation that pop history has come to a halt)' (Reynolds, 2009b, p. 146). Regarding the supposedly radical modernist nature of rave music, Reynolds has argued that:

> You could see rave as a whole, and the nuum [the 'Hardcore Continuum'] in particular, as modernism's last stand, or unexpected comeback, long after the ideals of modernism had been abandoned, eroded, questioned, everywhere else (including in pop music). Various factors enabled the nuum to evade the general drift towards postmodernism (factors perhaps shared by other black musics such as hip hop and dancehall). Amazingly it was able to evade the blight of postmodernity (irony, referentiality, citational aesthetics) even as it embraced and explored to the hilt the potential of what would on the surface seem to be the ultimate postmodern sound-machine, the sampler (Reynolds, 2009a).

It is not clear, however, why rave should be regarded as non-referential or non-citational even when transphonographic practices such as sampling are regarded as central to the style. Maria Perevedentseva has previously criticised Reynolds' 'hardcore continuum' for treating 'musical developments from Hardcore to Dubstep/UK Funky as separate from or adjacent to ordinary historical time' (Perevedentseva, 2022, p. 169), and Reynolds' insistence on the non-referentiality of rave, can be regarded as part of this effort to disconnect rave from the wider history of popular music.

In fact, the analysis of harmonic matrices in dance music, as presented in this thesis, indicates that rave music often employs transphonographic matrices that directly link it to styles of popular music outside of the 'hardcore continuum'. For example, the piano chord progression to Liquid's 'Sweet Harmony' (1991) (i–♭VI–v–iv–♭VII, (in A)), may be heard as a style indicator for 'piano rave' music, as non-functional, modal chord progressions of this type, realised with piano sounds, were common in early 1990s rave music, such as the i–♭VII–v–iv (in E) progression of Baby D's 'Let Me Be Your Fantasy' (1992). It is possible, then, that the piano progression of 'Sweet Harmony' may be heard to refer only to other music within the hardcore continuum. However, the progression might be recognised by some listeners as an interpolation of a similar progression from CeCe Rogers' earlier deep house song 'Someday'

(1987), linking it to a dance styles other than rave, outside of the hardcore continuum. The progression may also function as a genre synecdoche for disco or gospel music, as the progression is harmonically and timbrally similar to those found in soul, R&B, and disco, such as the chorus progression to Chic's 'I Want Your Love' (1978), (i^7–v^7–$\flat VI^{Maj7}$–iv^7–v^7 (in A)). By claiming that rave was somehow able to 'evade the blight of postmodernity', Reynolds inhibits analysis of the use of transphonographic matrices in rave music, and how they may refer to earlier styles of popular music. Analysis of these matrices may identify the presence of musical signs that are significant to dance music audiences explicitly because they are 'citational' and suggests that rave music cannot be separated from house and garage on the grounds that it is non-referential.

In contrast with Reynolds', who attempts to create a clear divide between 'modernist' and 'post-modernist' styles, the approach taken in this thesis, to understanding the meaning of dance music, assumes that all music, throughout history, has the potential to be heard as referential and citational, and so this approach can be taken to music regardless of any question of its formal innovation or perceived aesthetic value. Such an approach, assuming that rave for example, may be heard as referential, therefore, is not intended to make any claims regarding the aesthetic value of the style, or whether it should also be heard as modernist and innovative, but to allow better understanding of what this music means to its audiences.

However, this thesis does argue that styles such as rave, electro and techno may possess their own stylistic conventions and employ transphonographic matrices that are not commonly employed in garage and house styles. As is discussed in Chapter Three, while the dissonant riffs and bass patterns common in electro, techno, and hardcore styles be regarded as variations or modifications of the consonant minor pentatonic riffs common in house and garage styles, these dissonant riffs may still be distinctive enough to function as style indicators of machinic dance music. Techno and rave tracks may also be heard as referring to an alternative family of earlier style traditions, such as electro, synth-pop, and science fiction film music, just as house and garage styles have been understood to refer to R&B and disco styles. Transphonographic matrices functioning as anaphones and style flags can, therefore,

be regarded as central to such machinic styles of dance music, and analysis of these elements may be understood as appropriate to understanding the meanings of these styles.

To illustrate this point, Hillegonda C. Rietveld has also argued that acid house music can be heard to break with the style conventions of disco and house music, suggesting that the UK acid house track 'Voodoo Ray' by A Guy Called Gerald, breaks with the 'nostalgic' grammars of house music; 'with its unusual bassline and deconstructed voices, 'Voodoo Ray' inverts and breaks with (nostalgic) representation while the groove keeps dancers moving forward, to the future.' (Rietveld, 2014, p. 167) Yet, as Rietveld's analysis elsewhere makes clear, 'Voodoo Ray' is not without stylistic connections to other styles and traditions. As Rietveld notes, her analysis identifies 'some of the many genealogical connections that made 'Voodoo Ray' possible and meaningful, including jazz dancing, electro breaking, a house music approach, an embrace of Detroit techno, and the contexts of Situationist urbanism, acid house parties and the Madchester myth' (Rietveld, 2014, p. 166).

Rietveld's analysis suggests that acid house music may be grammar-oriented to a similar extent as garage and house styles, but crucially, that 'machinic' styles can be distinguished from house and garage due to their engagement with an alternative set of style conventions. The difference, therefore, between the supposed 'nostalgic representation' of house and garage styles and the 'dislocated' character of acid-house, techno and electro styles can be explained by their differing set of 'genealogical connections' (Rietveld, 2014, p. 166). Whereas house and garage songs may typically refer to R&B, funk, soul and disco styles, machinic tracks such as 'Voodoo Ray' often refer to styles such as electro, techno, acid house, synth-pop, and science-fiction soundtrack music. Aspects of 'Voodoo Ray' such as its 'unusual bassline' may therefore be regarded as typical grammatical elements within the context of such styles. This conclusion is contrary to Reynolds' assertion that these styles of dance music are radically non-referential.

4. Codal competence and interference

It is worth clarifying the point that musogenic meanings are always subjectively formed and depend upon the factors of 'codal competence' and 'codal interference'. According to Tagg, codal competency can be split into two categories, 'poietic' competence, describing knowledge of composition, performance and production processes, or how music is made, and 'aesthesic' competence (Tagg, 2012, p. 119), describing knowledge of how musical signs are typically expected to be interpreted within a culture. Tagg suggests that, despite aesthesic competence being neglected as an area of study in music pedagogy, most listeners are highly aesthesically competent, and adept at decoding and interpreting most mass media stylistic codes. Ben Malbon, similarly, suggests that 'listeners are in one sense no less talented as 'musicians' than those who have produced the music to which they are listening. The labelling of the majority of the population as 'non-musical' while at the same time a tiny minority are afforded the status of 'musicians', is, [John] Blacking suggests, a gross misrepresentation based upon flawed concepts of supposed expertise' (Malbon, 1999, p. 82) Malbon goes on to suggest that this aesthetic competence is central to engagement with dance music 'An excellent example… can be found in the practices of clubbing and of the engagement of clubbers with clubbing music through dancing… Dancing, in these terms, is a prominent form of creative listening, relying on shared knowledges of music, common appreciation of certain musical forms, and distinctions between the many differing forms of music on offer.' (Malbon, 1999, p. 82)

Aesthesic competence may describe an individual listener's prior knowledge of style codes and understanding of how common musical signs are to be interpreted within that style. For Meyer and Hatten, the internal processes of a work cannot be meaningfully followed without knowledge of the expectations attached to the style of which it is a part. External signification is also dependent on knowledge of the 'store of signs' related to that style, or how these signs are typically interpreted as anaphones or style flags. The typical interpretation of musical signs may therefore change over time. The use of dissonant static harmony in early electro hip-hop, for example, may have initially been heard as an allusion to earlier synth-pop music, and therefore as a genre synecdoche of that style. But later uses of the same harmonic system may have been heard as typical aspects of electro hip-hop style, and therefore as a style

indicator of the 'home style' of electro hip-hop, possessing no association with synth-pop. A similar process of change of meaning is described by Tagg, who notes the incorporation of 'Hawaiian' guitar sounds into country and Western music in the 1920s and 1930s, 'from originally connoting things like Hawaii and Sunshine, those stell guitar glissandi (swooping, sliding sounds) were gradually incorporated into the C&W mainstream and ended up as style indicators of country music without the Hawaiian connotations.' (Tagg, 2012, p. 158)

Codal interference, however, describes differences in interpretation of a musical sign, depending on the tastes and beliefs of the listener (Tagg, 2012, p. 182). For example, Luis-Manuel Garcia has described the 'process pleasure' of listening to highly repetitive dance music, and this interpretation of the pleasurable nature of repetition is likely to be shared by many listeners to dance music, but some listeners may, instead, find repetition monotonous or tedious. The possibility of codal interference suggests that any interpretation of likely signification in music can always, in practice, be rejected by listeners, and the interpretations suggested in this thesis as the most likely interpretations of modified static harmony can always only be presented as 'possible' or 'likely' interpretations.

5. Conclusion

This chapter has argued that musical structural elements in dance music may function as musical signs, pointing to 'internal' objects either within the musical work, or to 'external' objects outside it. It is not necessary for listeners of dance music to adopt any kind of aesthetic or reflective listening strategy for musical structures to be heard as meaningful, as musical signification can be understood to function intuitively and automatically. Consequently, the analysis of the likely meanings of aspects of dance music presented in this thesis is relevant to understanding typical unreflective or sensual listening experiences.

The chapter also argues that dance music tracks typically feature numerous 'transphonographic' structural elements, such as instrumental timbres, rhythmic patterns, or riffs, that are likely to be heard as variants of 'matrices', describing types of structural element that are common across dance styles. It has been argued that the consistent use of certain popular transphonographic matrices in dance music allows these matrices to function as musical signs, with relatively stable iconic and indexical meanings. As a consequence, it is

likely that transphonographic matrices in dance music will be heard to function as anaphones and style flags, pointing to external objects, in addition to functioning as internal musical signs. The potential for harmonic structural elements in dance music to be heard as evocative of machines and technology, then, can be understood as dependent on their potential to function as anaphones, heard as resembling in some way, the workings of machines and technology. The role that harmony plays in establishing a machine aesthetic in dance music is discussed in the next chapter.

Chapter Two – Harmony and Machine Aesthetics in Dance Music

Dance music styles such as electro, techno, acid-house and drum and bass have often been described in dance music writing as possessing a 'machinic' aesthetic evocative of the workings of machines and technology. This chapter describes the role that harmony plays in constructing this machine aesthetic in dance music, and the interpretation of that aesthetic, in the literature, as representing a post-human, machine subject.

1. Machine aesthetics in art music, film music and popular music

Kodwo Eshun (1998, pp. -005) and Simon Reynolds (2007, p. 313) have both described certain styles of dance music as types of 'machine music'. Reynolds, for example, notes that 'electronica goes further [than rock and other styles of popular music] by defining itself as machine music. This is upfront in the genre name of 'techno' (Reynolds, 2007, p. 313). As is discussed in more detail below, the term 'machine music', has also been used elsewhere in music scholarship to refer to styles of art music, film music and popular music that have been heard to evoke the mechanisms and workings of machines. Machinic dance music, possessing a 'machine aesthetic', may be similarly defined as any dance music that is heard to anaphonically evoke the workings of machines or technology. The use of this label also suggests possible structural and expressive commonalities between machinic dance styles and other styles of twentieth century machine music.

The term 'machine music' was first used to describe a tradition of avant-garde and modernist art music, originating in the 1920s, and a style of film music developing in the 1930s. These styles of machine music have been defined by the perception that they evoke the workings of machines. Film music scholar William Rosar has suggested that film machine music is music that is heard to imitate 'the sounds and/or movements of machines—a parallel and largely unrelated development to the machine music movement in the 1920s that produced such works as Honegger's *Pacific 231*, Antheil's *Ballet Mécanique*, Mosolov's *Iron Foundry*, Meytus's *Dnieper Dam*, and Carlos Chavez's *Horse Power'* (Rosar, 2006, p. 409). Rosar identifies several examples of later, filmic 'machine music' in Leith Stevens's scores to the science fiction films *Destination Moon* (1950) and *When Worlds Collide* (1951) (Rosar, 2006).

Alison Wente similarly defines machine music as 'music written to sound like or imitate the machine' (Wente, 2018, p. 1). She considers examples of early twentieth century film music from *Metropolis* (1927) and *Modern Times* (1936) as well as twentieth century orchestral art music, such as George Antheil's *Ballet Mécanique* (originally premiered in 1926 and revised in 1953) as examples of machine music (Wente, 2018).

In both Rosar and Wente's definitions of machine music the style is defined by its ability to imitate machines and technology anaphonically. This definition of the style supposes that particular musical structural elements within these works will be heard as anaphonic signs which are heard to resemble the workings machines and technology in some way. These structural elements in early twentieth century machine music may include 'high-register woodwinds, over-emphasized percussion, and excessive repetition' (Wente, 2018, p. 3). Structural elements functioning as signs of machines and technology may also be identified in the 'eighteenth and nineteenth-century classical tradition', for example, the 'repetitive eighth notes in the second movement of Haydn's Symphony no. 101 (1794)' which have been interpreted as representing the mechanisms of a clock (Wente, 2018, p. 3).

Numerous twentieth and twenty-first century popular music styles, from punk to disco, new-wave and hip-hop, have also been described as types of 'machine music'. Karen Collins, for example, has described the 'machine aesthetic' of industrial music (Collins, 2002, p. 77). She also notes the influence of earlier experimental rock music on the industrial aesthetic, noting the influence of Lou Reed's *Metal Machine Music* (Collins, 2002, p. 170). Tagg has also argued that heavy rock and heavy metal may also be heard as evocative of machines and technology, suggesting that Black Sabbath's music may sound like 'power drills or motorbikes' (Tagg, 2012, p. 439). Similarly, Alexander Weheliye has noted a 'penchant for the machinic' in contemporary R&B (Weheliye, 2002, p. 33).

'Machinic dance music', then, may be defined as any style of dance music, or an individual track, that may be heard as anaphonically suggestive of machines and technology. This definition does not assume that producers of 'machinic' dance music are always intending to 'depict' or represent machines and technology but does define 'machinic dance music' as dance music which has the potential to be heard as evocative of the sounds and movements of machines and technology. This anaphonic evocation of machines and technology may also

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rely on the use of music structural elements that have previously been employed in other styles of 'machine music' and which have consistently been interpreted as referring to machines. Collins has, for example, argued that electronic sounds in popular music may be interpreted using the same codes listeners use to interpret electronic sounds in science fiction film:

> One of the most important – and yet perhaps most often overlooked – influences on the development of electronic music is that of science fiction cinema, where mechanical and electronic sounds had been used to represent the future, the alien, and in particular became associated with many of the rationalisation narratives of Red Scare cinema. Predating many of the mechanised synthesiser sounds of Suicide and Kraftwerk were the electric and electronic pioneers like Delia Derbyshire ('Doctor Who', 1963) Louis and Bebe Barron ('Forbidden Planet', 1956), Harry Lubin ('One Step Beyond', 1959) and Bernard Herrmann ('The Day the Earth Stood Still', 1951) (Collins, 2002, p. 118).

Machinic dance music, is therefore likely to make use of transphonographic matrices that are also employed in film music, art music and in other styles of popular music, which have often interpreted by listeners as anaphones of the movements, workings and sounds of machines and technology.

A possible objection to the view that machinic styles of popular music may be defined primarily by their perceived anaphonic or iconic 'resemblance' to machines, is that such machine music does not accurately resemble the sounds or rhythms of real machines. However, Philip Tagg suggests that it is not necessary for musical structural elements to accurately resemble real-world sounds in order to be heard as anaphones, noting that 'sonograms of Schubert brooks or of Beethoven thunder share very little objectively in common with the real sounds those musical stylisations are supposed to represent' (Tagg, 2012, p. 488). Instead, such interpretations of the meaning of musical elements are typically guided by 'cultural convention and social experience' (Tagg, 2012, p. 488). It is clear, then, from the above attributions of machinic qualities to examples of historic machine music, that it has not been necessary for such music to accurately resemble the sounds of real machines and technologies to be heard as possessing machinic or mechanical qualities. Instead, the perception that particular musical structural elements or gestures resemble the movements or sounds of machines is guided by cultural conventions, and traditions of musical representation in popular culture. Aesthesic competence relating to this established tradition of musical meaning in wider popular culture, then, may ultimately lead to the perception that

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specific aspects of dance music are anaphonically suggestive of machines and technology, even when such music it is not presented alongside visual paramusical texts, and is not necessarily intended to have any representational purpose.

The possibility that purely musical aspects of dance music may function independently as anaphones of machine movement and noise can therefore be understood to rely upon the application of interpretative codes which developed in earlier art and mass media in which music was presented in combination with visual images of machines and technology. Nicholas Cook has argued that the presentation of music with images may create the sensation that aspects of the music metaphorically mirror aspects of the images, or that 'the very fact of juxtaposing image and music has the effect of drawing attention to the properties that they share' (Cook, 1998, p. 73). Cook argues that 'in other words, the coupling of image and sound contextualizes, clarifies, and in a sense analyses the music' (Cook, 1998, p. 74). Crucially, for Cook, these perceived correspondences or similarities between music and image can be regarded as primarily iconic. Cook suggests that, 'all these examples of enabling similarity can be described as iconic in one way or another, although the nature of the iconic relationship varies widely', and further argues that, 'it is probably fair to say that iconic relationships in multimedia overwhelmingly outnumber others' (Cook, 1998, p. 76). Film music that accompanies images of moving machinery, then, may often be perceived to iconically reflect aspects of those images. For example, Allison Wente has argued that particular features of Gottfied Huppertz's machine music in *Metropolis* (1927) are likely be heard as musical analogues of the parallel moving images, such as the 'spinning chromatic flurry in the upper woodwinds' echoing spinning gears or pistons, 'the layering of dissonance' as an anaphone of machine noise, and the 'constant accents at the eighth note level' which resemble the steady repetitive movements of the machine (Wente, 2018, p. 6). This perceived correspondence between the music and image, relies on a series of perceived iconic or anaphonic resemblances, even though, as Wente notes, 'the music does not directly map the noise of the machine onto the score; rather, the music picks and chooses certain features of mechanical sound and applies them to create a musical representation of the machine' (Wente, 2018, p. 6). The fact that Huppertz's music does not accurately imitate real machine movements or sounds is, therefore, no barrier to its structuration being perceived as related to the accompanying images of machines.

Perceived iconic or anaphonic correspondence between music and images of machines, then, is fundamental to the sense that film scores possess mechanical or machinic qualities. Cook argues that this sense of correspondence is most often perceived in relation to impressions of movement, as 'any alignment of music and moving image that reaches a threshold of similarity between the two can readily effect a transference of kinaesthetic qualities between one and the other' (Cook, 1998, p. 78). Suggestion of the movements of machines, then, has been a central concern of both cinematic and concert machine music. A machine can be defined as 'a piece of equipment with moving parts that uses power to do a particular job' (dictionary.cambridge.org, 2024) and so may be defined by its capacity to operate independently of humans and animals and to move in distinctive ways. Music that accompanies depictions of machines in art and cinema has, therefore, tended to emphasise the qualities of movement which have been understood to differentiate mechanical or machinic movement from the movements of humans, animals or natural phenomenon. For example, the moving parts of factory machines are often extremely fast, highly repetitive and possess a strength, endurance and power that humans and animals are incapable of. As Rebecca Eaton has noted, with respect to Philip Glass's score for the film *Koyaanisqatsi* (1982), perception of these qualities in a performance may suggest that a work is expressive of machines or the mechanical:

> The tempo blazes by at a vivace M.M. 190, correlating with the time-lapse film. The background woodwind arpeggios, fiendishly difficult at this tempo, cycle continuously. One never hears the performers take a breath; this bodily aspect has been removed from the soundtrack. Errorless performance at this tempo is either humanly impossible, or makes the performer seem like a machine (Eaton, 2014, p. 8).

However, machine movement may, simultaneously, be regarded as limited or restricted in comparison to human movement, lacking nuance, sensitivity, variation or individuality. Some aspects of music accompanying images of machine movement, then, such as extreme rhythmic precision, regularity and repetition, lack of swing and rhythmic imperfections, are likely to be heard as iconically mirroring these distinctive qualities of the movements of machines.

Early twentieth century machine music was often written to musically depict machines such as factory machines, and modern vehicles such as trains, aeroplanes and cars. As was noted above, Huppertz's machine music in *Metropolis* (1927) was written to accompany moving

images of factory machinery. Similarly, Anthiel's *Ballet Mécanique* (1953), was originally intended to accompany Fernand Léger and Dudley Murphy's short avant-garde film of the same name, which also contained moving images of different types of early twentieth century machinery. Later machine music, in the second half of the twentieth century, accompanied images of new technologies such as computers, and depictions of imaginary technologies such as robots and spaceships. However, this later machine music was similar to earlier examples of the style in that it was also typically written to reflect the movements of such technologies as presented on screen. Computers were often depicted visually in film and television of this period as having moving parts, with banks of flashing lights, or moving computer card readers or tape reels, and it is these movements which are evoked or mirrored in musical terms. For example, two examples of film music which are cited in chapter three, Bernard Herrmann's 'Space Control' (1951), Leith Stevens' cue 'Zyra and The D.A.' (1951), underscore scenes involving computers with moving lights or mechanical components (in the case of 'Space Control' the computers depicted are largely without motion but are shown to produce regularly pulsing lights). Such musical representations of computers, then, are clearly different to what real computers sound like, but were intended to mirror the way that computers were depicted visually and sonically in popular culture at the time.

Musical representations of machines may also anaphonically resemble the non-musical sound-design of machines, using static, repetitive and often dissonant harmonies as a way of reflecting the depicted sounds of machines. For example, Wente has noted how dissonance may be used to suggest the 'noise' of factory machines (Wente, 2018, p. 6). Similarly, musical representations of computers and technology may employ clock-like rhythms that resemble the sound design of computers in films and television. After the Sputnik 1 satellite was launched in 1957 by the Soviet Union, the sound-design of computers in film and television often featured similarly regular bleeping sounds, for example, the bridge sound effects in *Star Trek* (1966). As a result, the regular 'clock-like' rhythms of machine music and use of electronically generated timbres may be heard to anaphonically mirror the sound design of film computers as well as their visual depictions.

Even in the absence of accompanying images, then, particular musical characteristics or structural elements might still be expected to be heard to anaphonically suggest the

movements or sounds of machines, due to the culturally established nature of these musical-visual associations. For example, discussing the work of minimalist composers such as Steve Reich and Philip Glass, Eaton has argued that minimal music is often heard as possessing machinic or mechanical qualities due to its perceived resemblance to the 'working of machines':

> Minimalist music features a regular, steady pulse. It is not melodically based, but repetition-based. It typically displays limited dynamic contrast. All of these musical attributes are also characteristics of the working of machines, be they manifested in sound, visually observed motion, or in ternal process. Minimalism, then, functions as an iconic sign, or what Phillip Tagg calls a sonic or kinetic anaphone (Eaton, 2014, p. 6).

Aspects of dance music recordings, then, may also be heard to anapahonically evoke the workings of machines and technology, whether this interpretation is intended or not. For example, a clock-like, repetitive and rhythmically precise drum pattern may be heard to possess mechanical qualities, because in its precision and repetition it is perceived to resemble the precise, repetitive movements of a machine.

However, some authors have argued against the central importance of iconic or anaphonic signification in machinic styles, suggesting, instead, that music often refers to machines and technology through the employment of style topics. Despite having noted that minimal music may anaphonically suggest the workings of machines, Eaton argues that the frequent use of minimal music in cinema and television commercials has led to its 'solidification as a style topic' which is now immediately associated with images of technology (Eaton, 2014, p. 10). The harmonic practices discussed in this thesis may also function as topics or style flags, and this possibility is discussed in chapters three and four. However, while certain aspects of popular music, art music and film music may now be perceived as style topics or style indicators of 'machine music' and, as a result, may be immediately associated with images of machines and technology, such topical associations can be understood to have developed from earlier, foundational traditions of anaphonic musical representation. Topical meaning can be understood to have developed as a result of the continued association of particular musical structural elements with images of machines of technology in art music, film music and popular music, but this indexical association can be understood to have taken place only because these structural elements were first heard to anaphonically mirror the movements and sounds of machines.

The examples of art music, film and television music that are cited in chapters three, four and five are, therefore, intended to illustrate structural similarities between dance music and earlier machine music, and so suggest that aspects of machinic dance music are likely to be similarly interpreted as anaphonically suggestive of machine sounds or movements. Further, it is argued in Chapter Five that some examples of dance music harmony may be heard as expressive of the supernatural or fantastic, due to structural similarities between such harmony and chromatic film music harmony. Again, it is argued that while such harmonic structures may function as style flags, they primarily function as iconic signs of the fantastic, mysterious or the uncanny.

Whether purely musical aspects of dance music are heard as anaphonically expressive of machines and technology may also have consequences regarding whether such music is judged as 'authentic' by audiences. Mark Katz has described how music technology capable of producing metronomic and quantized rhythms, such as drum machines and sequencers, has often been viewed with suspicion, suggesting that 'these tools have raised serious concerns about the loss of musical individuality and freedom and the homogenization of practices and styles' (Katz, 2022, p. 55). As a consequence, since the 1980s, many music technologies have incorporated tools that are capable of eliminating the sense that a rhythm is 'overly' metronomic or 'inhumanly' precise. According to Katz,

> Music created with MIDI starts out inhumanly precise. Most digital audio workstations now have a function designed to counteract the effect of relentless precision and consistency. This is the so-called humanize function. It allows for a randomization of different parameters of the music, slightly changing a note's length, position, or emphasis (Katz, 2022, p. 55).

The use of humanisation functions, then, may be used by music producers to reduce the impression that music produced using music technologies is 'robotic' or 'machinic', or even to conceal the method of its production from most listeners.

Simon Frith has similarly identified historical fears among professional musicians that technologies such as drum machines could take 'the place of a musician' (Frith, 1986, p. 264). Music technologies have been criticised for their perceived limitations in comparison to human performance, and synthesisers and drum machines were criticised for leaving 'no room for individual 'feel' or 'touch' (Frith, 1986, p. 265). However, Frith notes that dance music artists have often celebrated the sense of artificiality that is produced by these

technologies, suggesting that Frankie Goes To Hollywood's 'techno-flash disco' sound was part of a wider 'gleeful celebration of their own artifice' (Frith, 1986, p. 268). Kodwo Eshun has taken this celebration of artifice further, suggesting that an embrace of artificial sounds defines machinic dance music in contrast to rock. Eshun highlights the centrality of overtly mechanical or artificial sounds in his discussion of Kraftwerk and their influence on later electro and techno:

> Standardization, mechanization , automation , enervation , inhibition, radiation! Trad rock 's drive comes from repelling such vampiric processes of capital. But giving in to the machines, this is what's so compelling here , how Kraftwerk went into the bionic heart of the machine , what came out the other side. Instead of denying the automatic, Kraftwerk exaggerate it. They operate synthesizers, but really technology is synthesizing them. They don't resist the synthetic, they give in to it, enslave themselves, allow technology to reprogram them, to resequence them, to extrude them as the Servomechanisms of the Synth. Showroom dummies, menschmaschines, robots and models (Eshun, 1998, pp. 068-069).

Eshun's celebration of the artificial, then, reverses the prejudice against conspicuously machinic sounds that Frith identifies in jazz and rock, and implies that, in the context of dance music, that the use of musical elements heard as anaphonically evocative of machines and technology may instead be heard as 'authentic'. These audibly machinic sounds may be understood to highlight and emphasise the technological means by which dance music is produced, rather than concealing it, as Frith argues is the case in rock music (1986, pp. 269-272).

The next section of this chapter firstly outlines some of the timbral and rhythmic structural elements in dance music that have been identified, in criticism and scholarship, as most central to the evocation of the machinic, before identifying how harmony may play a role in this process, an aspect of 'machine aesthetics' that has been largely overlooked in dance music scholarship.

2. Timbral signs of machines and technology in dance music

Maria Perevedentseva has argued that 'timbre is one of the primary means through which EDM creates variety in its repetitive, harmonically static form' (Perevedentseva, 2022, p. 12), suggesting that timbre is likely to play an important role in the construction of a machine aesthetic in dance music. Simon Reynolds has suggested that machinic dance music tends to highlight instrumental timbres that are 'blatantly synthetic and artificial-sounding' (Reynolds,

2007, p. 314) contrasting this use of electronic timbres with practice in rock and other styles of popular music. Dance styles that foreground electronic timbres can thus be contrasted with styles that foreground recognisable acoustic and electric instrumentation (for example, piano, bass guitar and acoustic drum-kit and percussion sounds), which is typically the case in deep house and garage styles.

The music of German synth-pop band Kraftwerk, for example, whose paramusical texts often explicitly refers to robots, computers, and other technology, since the album *Autobahn* (1974), was almost exclusively realised with synthesisers, drum machines and other electronic instruments (with the notable exception of Florian Schneider's flute). In some of Kraftwerk's music, electronic sounds are used as direct sonic anaphones of machine sounds. For example, Kraftwerk's 'Autobahn' (1974) famously features a section in which the Moog synthesiser is used to imitate the 'doppler effect' sound of passing cars. Kraftwerk's earlier, and unsettling 'Vom Himmel Hoch' (1970) uses synthesiser sounds to imitate the engines of bomber aircraft, air-raid sirens, and of bombs dropping to the ground and exploding.

Other electronically generated sonorities, however, may also be heard as signifying technology, due to their recognisability as electronically generated sounds, and regardless of whether these instruments, such as synthesisers and drum machines, are used to closely imitate real-world technological sounds or not. Lisa Schmidt, for example, has argued that 'the use of a machine to generate electronic sounds' was particular appropriate in science-fiction film music, due to the inherent 'aural spectacle' of electronically generated sounds, which can be heard as produced by modern technology. As Schmidt notes, 'alongside any 'inherent' eeriness they might convey, electronic sounds have a quality of aural spectacle, as sound that is recognized and therefore potentially celebrated as human invention' (Schmidt, 2010, p. 36). Schmidt suggests, then, that 'electronic sounds' are likely to be recognised as sounds originating from specifically electronic sources such as synthesisers, theremins, drum machines or tone generators. Electronic sounds in 'machine' dance music, then, as in film music, are often intended to be recognised as electronic sounds, explicitly evoking the machinic and the technological by referring to their own technological production and timbral difference to acoustic instrumentation.

The sources of these 'artificial' electronic sounds are often identified specifically within the paramusical texts of dance tracks. 1980s dance and hip-hop tracks such as 'Drum Machine' (1982) by Drum Machine, 'Beat Box' (1984) by The Art of Noise, 'Jam The Box' (1984) by Pretty Tony, 'Rock The Box' by Sylvester (1984) and 'Work The Box' (1986) by Santos, for example, all refer to the drum machines that produced the rhythms of these tracks. The Kraftwerkesque 'Electronic Performers' (2001) by French group Air, contains the lyrics 'We are the synchronizers, Send messages through time code, MIDI clock rings in my mind, Machines gave me some freedom, Synthesizers gave me some wings, They drop me through twelve-bit samplers, We are electronic performers, We are electronics,' explicitly describing the electronic production of the sound that the listener is hearing, and linking it to particular electronic sources.

Electronic timbres in dance music may also function as tactile anaphones, expressive of an artificial 'surface' that is perceived as cold and lifeless in contrast to the 'warmth' of humanity, and other animals. The Giorgio Moroder produced disco track 'I Feel Love' (1977) by Donna Summer, for example, has been described as possessing 'icy electronics' (Schütte, 2020, p. 137). Derrick May has described his use of string sounds in Rhythim is Rhythim's 'It Is What It Is' (1988) as 'very cold, very callous' (Trask, 1990, p. 52). In contrast, the more conventional acoustic sonorities of house and garage styles have often been understood to construct a 'warm' and 'feel-good' musical texture (Larkin & Ogg, 1994, p. 242).

The association of electronic sounds with a dangerous and threatening 'coldness' contrasted with the emotional warmth of acoustic instrumentation, is one that is also often made in science fiction film scores. For example, when the character of Sarah Connor is first introduced in *The Terminator* (1984) (on her way to work as a waitress at a Los Angeles restaurant), Brad Fiedel's score plays a short, major-key piece, led by familiar acoustic piano and guitar sonorities (the cue 'Sarah On Motorbike' (2016)). This cue may be interpreted as depicting the 'warm' and comfortable qualities of Sarah Connor's normal everyday existence. This primarily acoustic cue contrasts with the threatening, electronic sonorities elsewhere associated with the character of the Terminator. The association of electronically produced timbres with 'cold' and emotionless machines or technology, then, may be one that has been carried over into the interpretation of timbre in dance music.

3. Rhythmic signs of machines and technology in dance music

Many dance tracks feature prominent and repetitive rhythmic and melodic patterns that are metronomically precise in their timing and are metrically 'straight' or un-swung. The prevalence of metronomic, unswung rhythms in 1970s and 1980s dance music may be due to the widespread use of music technologies, such as pattern sequencers and arpeggiators, which were often unable to produce metrical variations such as swing, or other variations in timing.

The metronomic quality of early sequencing technology was often deliberately emphasised in synth-pop and early dance music styles through the use of repeated patterns that triggered notes or drum sounds on every 8th or 16th note, and the use of notes with short attack and durations. Such patterns can be found in a number of styles that were influential on early electronic dance music, such as the bass pattern of Donna Summer's 'I Feel Love' (1977), the synthesiser metronome in Herbie Hancock's 'Nobu' (1974), and the synthesiser patterns of Tangerine Dream's *Rubycon* (1975). Straight metronomic rhythms are also common in machinic dance music, such as the drum and synthesiser parts of KLF's 'What Time Is Love? (Pure Trance)' (1988) and the 'Moroder-esque' bass pattern in the second half of Jeff Mills' 'The Bells' (1997). The characteristic unswung sound of early pattern sequencers may also be incorporated into later dance tracks through the sampling of earlier recordings. 'Invasion Of The Techno Snatchers' (1991) by Prophet 5, for example, samples a melodic pattern from 'Arpégiateur' (1982) by Jean-Michel Jarre.

Straight and metronomic rhythms in Western art music have often been understood as anaphonically evoking the regular workings of clocks and clockwork mechanisms and the similarly regular internal movements of machines. As was noted above, classical composers such as Haydn have produced works that have been interpreted as evoking clockwork mechanisms and early twentieth century modernist works such as Honegger's *Pacific 231* (1923) and Antheil's *Ballet Mécanique* (1953) have also employed 'clock-like' rhythms to evoke the workings of machines. Other notable examples of machine music in science fiction film and television music, include the repeating ostinatos in the cue 'Space Control' (2016) from Bernard Herrmann's soundtrack to *The Day The Earth Stood Still* (1951), which depicts the controls of an alien spacecraft, and cues accompanying the alien space craft in the *Star*

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Trek episode 'The Corbomite Maneuver' (1966), composed by Fred Steiner. These examples of science fiction machine music feature short repeating ostinatos with straight rhythms, which can be interpreted as evocative of the regular workings machines or technology. The use of early sequencing technology in dance music then, and the repeating, rhythmically straight arpeggiations and patterns it produces, may recall the mechanical ostinatos of earlier machine music, and may similarly be heard to imitate the movements or workings of a machine.

Unswung drum patterns in dance music have often been described as possessing similarly 'mechanical' qualities. Brewster and Broughton, for example, suggest that Model 500's 'No UFO's' (1985) possesses an 'Industrial four-to-the floor rhythm' (Brewster & Broughton, 2006, p. 352). Reynolds describes the track as 'motorik' (Reynolds, 1998, p. 10). These interpretations of the rhythm as having a mechanical quality are likely due to its regular, straight, clockwork-like rhythm. The drum machine pattern of 'No UFO's', shown below as a waveform, is straight and metronomically precise, as can be seen from the regular and even placement of 16th notes:

Figure 1: *Serato* waveform display of drum pattern from Model 500 - 'No UFO's' (1985)
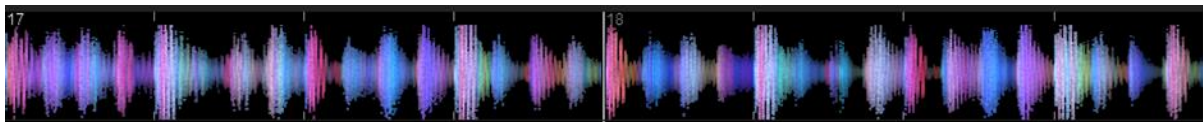
Such straight, 'mechanical' sounding drum patterns in dance music can be contrasted with the highly swung rhythms of some garage house tracks, such as Morel's 'Let's Groove' (1993) from *Morel's Grooves Part 4*, which features highly swung 16th notes. In the two-bar section shown below, the snare drums placed on the even 16th notes are visibly delayed and closer to the subsequent 16th notes than they are to the preceding note.

Figure 2: *Serato* waveform display of drum pattern from Morel - 'Let's Groove' (1993)
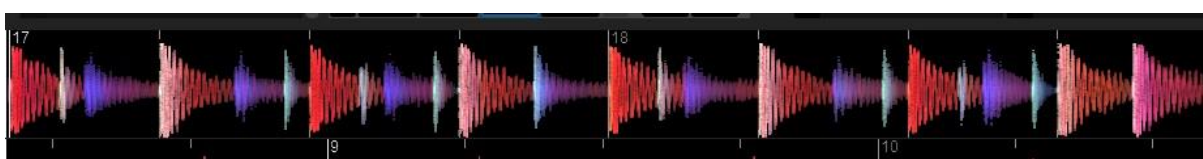
Mark Butler has contrasted house and garage dance styles, which 'use features such as swing-quantized rhythms to create a more "natural feel', with machinic styles of house and techno whose 'creators clearly found something attractive in the "unnatural" aesthetic of drum machines and synthesizers' (Butler, 2001, p. 17). Eshun agrees that the limitations of early drum machines and samplers, and their incapability of capturing a human rhythmic feel, has often been deliberately emphasised in dance music to create an aesthetic that is marked by the use of technology: 'the machine forces music into inhuman directions, and compels the human towards inflexible, impalpable parameters' (Eshun, 1998, p. 20). Simon Reynolds has argued that 'in electronic music, the cold precision and uninflected regularity of drum-machine beats and sequenced basslines aren't considered unmusical or lacking in 'swing'' (Reynolds, 2007, p. 314).

4. Harmonic signs of machines and technology in dance music

It is uncontroversial to note that rhythmic and timbral structural elements in dance music are highly likely to be heard as musical signs associated with machines and technology, as this aspect of the machine aesthetic has been previously discussed in the writing of Eshun, Reynolds, and Butler. However, this thesis argues that, in addition to timbre and rhythm, harmonic practices in dance music also may be heard as evocative of machines and technology.

Chapters Three, Four and Five of this thesis consider harmony in machinic dance music in more detail, discussing three harmonic practices which have been heard as associated with the evocation of machines and technology. These practices include the use of dissonant static harmony, disjunctive transpositions of static riffs, and the doubling of static riffs with chords. However, this section will briefly consider how dissonant static harmony has been interpreted as evocative of machine movement and sound in art music and film music, and in electronic dance music.

'Static' harmonic systems may be distinguished from chordal harmonic systems due to their repetition of a single, repeated chordal harmony. Dance music static harmony often features multiple riffs layered on top of each other, but the resulting combination of riffs can still be defined as harmonically static if these riffs do not combine to suggest movement between a

series of chordal roots. Static harmony, then, can be understood as a harmonic system that is entirely based on the short-term musematic repetition of melodic riffs and does not suggest a series of chordal harmonies. As such, the term 'static harmony' also describes the short-term syntax of a section of dance music in addition to describing its harmonic organisation.

Static harmony has been identified by Wente as a key stylistic feature of early twentieth century concert machine music. According to Wente, 'the term machine aesthetic became tied to Antheil, an aesthetic that, according to Linda Whitesitt (1983, 116), consists of "motivically conceived melodies and propulsion to his chordal ostinato patterns within a dissonant, yet static, harmonic framework"' (Wente, 2018, p. 11). This harmonic stasis may be heard as expressive of the functioning of machines due to the extended 'mechanical' repetition of a single harmony. Repetition is elsewhere identified by Wente as a crucial means of evoking the workings of machines and technology. Wente suggests, discussing Antheil's *Ballet Mécanique* (1953), that, 'a steady, relentless rhythm—essential to the industrial machines themselves—acts as the most basic ingredient to the early twentieth-century machine aesthetic.' (Wente, 2018, p. 12) The importance of rhythmic feel to the machine aesthetic has been discussed above, but the use of extended musematic repetition and harmonic stasis can also be understood as anaphonically representing the repetitive, steady workings of industrial machinery. Elsewhere Wente notes that 'excessive repetition' may be heard as imitating 'the smooth, steady function of a machine' (Wente, 2018, p. 3) and this may be achieved through the use of static harmony, which is 'steady' in the sense that it 'endlessly' repeats a single chordal harmony and contains no harmonic 'drive' to develop or change.

Many dance music tracks extend the harmonic stasis of an individual section into an unsegmented, open, 'track form'. Track form can be described as creating a seemingly 'endless' static repetition, and therefore similar to the evocation of machines in art music. Wente notes that a common stylistic feature of machine music, in 1920s-1930s art music, is its use of 'excessive repetition or perpetual motion (which often manifests in continually repeated notes or gestures)' (Wente, 2018, p. 3). Julia Schmidt-Pirro has similarly noted that Antheil referred to the form of the *Ballet Mécanique* '"almost endless," and "gigantic"' (Schmidt-Pirro, 2006, p. 413). Schmidt-Pirro also notes that Antheil suggested the *Ballet*

Mécanique possessed a '"gigantic AAAAAAA-form," which does not only fill hours, but whole days' (Schmidt-Pirro, 2006, p. 413). This excessive repetition may be interpreted as a machinic quality, as unlike human performers, a machine may theoretically run continuously and, seemingly, endlessly. This description of the form of the *Ballet Mécanique* has striking similarities to 'track form' in dance music, which can also be described as an 'endless' AAAA… form, and in both contexts this repetition may be heard as expressive of the 'perpetual motion' of machines. In many examples of machinic dance music these features of the music are in fact produced by 'machines' such as drum machines, samplers, and sequencers, which will play musical 'loops' continuously until they are instructed to stop.

Engaging with the machinic, repetitious nature of track form has often been interpreted as producing a similarly 'mechanical' psychological state. Reynolds has celebrated the 'brutally dehumanized and machinic tracks' of Chicago house producer Larry Heard (Reynolds, 1998, p. 24) and elsewhere has suggested that ''jack tracks', and the 'acid tracks' can be described as 'machine music that turned you into a machine. Its mind-nullifying repetition offered liberation through trance-dance' (Reynolds, 1998, p. 19). As was noted in the introduction, Reynolds has described machinic dance tracks which feature this structural repetition as possessing the quality of 'depersonalised functionalism' (Reynolds, 1998, p. 19). Similarly, Butler has suggested dance 'tracks' utilize the 'mechanistic capacities of drum machines to their full advantage' (Butler, 2001, p. 17). Track form might therefore be understood to emphasise the non-human capabilities of these musical machines, i.e., their ability to repeat musical patterns over extended periods of time without any variations. This endless repetition of a single harmony, described by Butler and Reynolds as 'mechanistic' and 'dehumanized', may therefore be heard as musically depicting a non-human subject, the machine, rather than human movement or emotional life.

In addition to being understood as static and repetitive, harmony in both machinic dance music and twentieth century machine music, is often dissonant. Ben Williams has noted that techno took 'experiments in dissonance further' than other styles of dance music (B. Williams, 2001, p. 162). However, Williams describes 'dissonance' in a similar way to Reynolds, whose understanding of 'dissonance' as arising from an absence of tonal organisation was noted in the introduction. Williams similarly describes 'dissonance' as a reduction of tonal

organisation, intentionally introduced so that listeners can focus more on properties of timbre and rhythm: 'eschewing samples of live instruments in favour of raw, mostly atonal machine noises, techno's vocabulary involved a heightened emphasis on texture and rhythm and an approach to sound elements as building blocks' (B. Williams, 2001, p. 162). Again, like Reynolds, Williams suggests techno is 'atonal' and therefore harmonically unorganised, and understands dissonance as an absence of melody and harmony: 'the music subordinated almost all its elements to rhythmic functions; the exception being its blocks of synthesized sound, which functioned more as atmospheric texture than melody' (B. Williams, 2001, p. 162).

However, rather than understood to arise from an absence of meaningful harmonic organisation, dissonance can instead be understood as a highly meaningful property of harmony that may contribute to the construction of a machine aesthetic. Crucially, dissonant static harmony in machinic dance music may function as a sonic anaphone of 'machine noise', in a similar way to dissonance in twentieth century art music. Wente has described the use of dissonance as an anaphone of machine noise in an example of machine music from Gottfried Huppertz' score for the film *Metropolis* (1927): 'the layering of dissonance—of superimposing audiovisual dissonance upon harmonic and metric dissonance—are characteristics derived from the machine: the music borrows the machine's indifference to artistic forms of balance and regularity to give the impression of musical noise' (Wente, 2018, p. 6). Wente notes Huppertz' use of a' a jagged whole-tone melody' which possesses a 'machine-like in its indifference to standard melodic resolutions and practices' and features 'the leap of a minor seventh' (Wente, 2018, p. 6). Wente has also noted that machine music often features 'jagged melodies with dissonant leaps that defy musical convention' (Wente, 2018, p. 3).

Honegger's *Pacific 231* (1923) is likewise constructed from numerous static melodic patterns that are often internally dissonant and possess dissonant relationships with each other. For example, in the measures immediately after 'rehearsal number 7', a dissonant diminished second relationship between the notes of e and f is emphasised, with these notes played by the cors anglais and cellos in a static, oscillating melodic pattern. The cello pattern may be heard to suggest the note of e as the tonal centre of this passage, and so the note of f may be heard as a dissonant, flatted second scale degree relative to it. Similarly, in the first six bars

of the *Ballet Mécanique*, four piano parts play a series of repeated chords and melodic patterns. These repeated patterns create an overall nine note pitch collection of g,a♭,a,b♭,b,c♯,d,e♭,f, which contains a five note chromatic pitch collection (g,a♭,a,b♭,b) and three note chromatic pitch collection (c♯,d,e♭). These static harmonies can both be considered dissonant by the criteria discussed in Chapter Three, as they contain dissonant scale degrees (such as the flatted second) or chromatic pitch collections.

The above examples of dissonant static harmony may be heard as ways of representing, with tones, the noise of machinery such as trains and factories. The 'roughness' of harmonic dissonance can be regarded as an analogue for the harsh noises that these machines are associated with . This understanding of dissonant static harmony as a sonic anaphone of machine noise may be applied to the interpretation of its use in machinic dance music. For example, Kraftwerk's 'Trans-Europe Express' (1977), like *Pacific 231* uses dissonant Phrygian macroharmony to suggest the harsh noise produced by the locomotive of the track's title. The use of dissonance in electro and techno styles may be interpreted in a similar fashion. For example, Jeff Mills' techno track 'The Keeping Of The Kept' from the album *Metropolis* (2000), inspired by the Fritz Lang film, was originally presented on the record label Axis' website with a video clip taken from a scene in the film in which the workers of Metropolis operate machines inside a factory. In the track an Fdim chord is held over a tonal centre of B, emphasising a tritonal relationship between the notes of f and b, and a semitonal relationship between b and b♭. This dissonant static harmony may be heard as an anaphone for the noise of the machinery shown in the accompanying clip. Harmony in dance music, then, in addition to timbral and rhythmic elements, may also refer to the functioning of machines and technology, and so may also play a role in the construction of a machine aesthetic.

5.   **Harmony and subjectivity in dance music**

While the preceding sections of this chapter has described various ways in which music structural elements in dance music, including harmonic elements, may be heard as anaphones of machines and technology, the remaining parts of this chapter outlines how these machinic signs, in combination with paramusical texts, such as lyrics, liner notes and artwork, may be heard as expressive of particular types of subjectivity. This section outlines three types of

'cyborg' or 'machinic' subjectivities in dance music and describes the important role that harmony plays in their construction.

Much discussion of the meaning of machinic dance music in academic scholarship has focused on its evocation of post-human machine subjectivities, and how this machine subject relates to the depiction of subjectivity in the work of Afro-Diasporic artists in popular music more generally. For Kodwo Eshun, the foregrounded use of machinic aesthetics in dance music, in what he refers to as both 'alien music' and 'machine music' is understood to construct a 'posthuman perspective' and represents a break with the 'humanist' traditions of R&B and soul (Eshun, 1998, pp. -006--005). He writes that the 'Postsoul Era has been characterized by an extreme indifference towards the human. The human is a pointless and treacherous category' (Eshun, 1998, pp. -008). For Eshun, this indifference to traditional musical evocations of 'human' subjectivity is evident in many dance music producers' choice to adopt an explicitly machine aesthetic, heard as evocative of machines and technology rather than the qualities of a traditional human subject.

For Eshun, the development of a non-human musical aesthetic is part of a project by which a new post-human Afro-Diasporic subject can be imagined. Eshun contrasts this new post-human subjectivity with that of the tradition of 'present day R&B' music which is locked in a 'perpetual fight for human status, a yearning for human rights, a struggle for inclusion within the human species' (Eshun, 1998, pp. -005). Eshun's conception of an alien or machine dance music is described as bypassing this struggle for recognition, by constructing a new, post-human subjectivity. This new subject is regarded as possessing power, but also as lacking a traditional humanistic moral framework, which it replaces with 'nothing whatsoever' (Eshun, 1998, pp. -003). As a result, it is described as adopting 'a cruel, despotic, amoral attitude towards the human species' (Eshun, 1998, pp. -005), which it has left behind or superseded.

However, Eshun's assertion of a clear distinction between a 'humanist' R&B and an 'alien' post-human dance music aesthetics, has been critiqued, by Alexander Weheliye, Ben Williams, and Maria Perevedentseva. Weheliye has argued against the straightforwardly humanistic position that Eshun suggests characterises soul and R&B music and notes that 'while both of these schools of Afro-Diasporic cultural discourses (Afro-Diasporic futurism and humanist future-shock absorbers) surely exist, they are not quite as categorically antagonistic

as Eshun imagines them to be' (Weheliye, 2002, p. 30). He argues that, rather than depictive of a unified 'human' subjectivity, since the 1960s, 'technological mediation and creation' has become 'part and parcel' of soul and R&B styles (Weheliye, 2002, p. 31). Weheliye further argues that, 'even though numerous cultural discourses have done their best to authenticate and naturalize the soul of black popular music, the musical practices themselves frequently defy these authenticating mechanisms by embracing new technologies, hybridities, and self-consciousness about the performative aspects of soul' (Weheliye, 2002).

Ben Williams has made a similar argument regarding the supposed radical aesthetic difference of machinic dance music styles from R&B and soul styles, suggesting that Eshun may be responsible for fetishizing 'otherness' (B. Williams, 2001, p. 173), and so overestimating the break between techno and other forms of Afro-Diasporic popular music. While Weheliye argues that machinic and non-machinic elements typically co-exist in R&B and soul styles, Williams' description of a 'cyborg' dance music, similarly acknowledges the co-existence of machinic and non-machinic elements in much electronic dance music (B. Williams, 2001, p. 167). Quoting film scholar Claudia Springer, Williams has suggested that a cyborg subjectivity may be heard to 'erase the distinctions previously assumed to distinguish humanity from technology' (Springer, 1991, as cited in B. Williams, 2001, p. 167). Perevedentseva has also argued that tracks with a strong 'machine aesthetic' are still likely to contain traces of the 'human' traditions of Afro-Diasporic popular music that Eshun is keen to suggest they have broken from. With reference to a reversed snare sound in Drexciya's 'Digital Tsunami' (2002) which may be heard to evoke hip-hop turntablism, she notes that 'ultimately the human hand still appears to have the power to derail the mechanical groove' in most dance tracks, and the 'idea that these musicians eradicated any trace of the human body and let the machines take over' can be regarded as an exaggeration (Perevedentseva, 2021) .

Taken together, these authors suggest that much machinic dance music, and other styles such as R&B and soul, may be understood to freely combine musical signs of the human, such as the voice, with musical signs of the machine, and so articulate a type of technologically mediated subjectivity that it is not conceived of or heard as radically non-human. Weheliye suggests that 'Instead of dispensing with the humanist subject altogether, these musical formations reframe it to include the subjectivity of those who have had no simple access to

its Western, post-Enlightenment formulation, suggesting subjectivities embodied and disembodied, human and posthuman' (Weheliye, 2002, p. 40). Wiliams 'cyborg' subjectivity similarly imagines an incorporation of the technological with the human (B. Williams, 2001, p. 167).

However, while much dance music may be interpreted as evoking this 'cyborg' subject, extreme cases of machinic dance style can still be identified which do attempt to evoke a radically non-human machine subject. Williams, for example, contrasts 'cyborg' subjectivity in dance music with a more extreme 'robot' subjectivity (B. Williams, 2001, p. 167). Similarly, Weheliye notes a distinction between styles that 'do not explicitly announce themselves as Afrofuturist, such as R&B' (Weheliye, 2002, p. 39) and those that do, such as the more stylistically extreme examples of machinic dance music. Thus, a more thoroughly machinic aesthetic, attempting to evoke a radically non-human machinic subject, can be contrasted with 'cyborg' aesthetics that are heard as evoking a 'composite' subject. Importantly, harmonic distinctions, that result from the association of chordal harmony with 'human' subjectivity, and forms of Afro-Diasporic music with religious roots, such as gospel, soul, and R&B, and from the association of dissonant static harmony with the depiction of machines and machine noise, can be understood to play a significant role in constructing and differentiating these cyborg and machine subjectivities in dance music.

Many styles of dance music combine conventional aspects of the pop song, most notably the singing voice, and verse/chorus song structure, with harmonic structural elements that are likely to be heard as machinic, such as dissonant static harmony, and the other 'machinic' harmonic practices described in chapters Three, Four and Five. These machinic harmonic practices may therefore be central to the establishment of a 'cyborg' subjectivity, combining both machinic and 'human' elements. In many styles of dance music that retain features of the pop song, the use of 'machinic' harmonic practices may be heard as expressive of the machinic aspects of a technologically augmented cyborg humanity. Electro hip-hop and Miami bass tracks, for example J.J. Fad's 'Supersonic' (1988), Imperial Brothers' 'We Come To Rock' (1984), and Sir Mixalot's 'Baby Got Back' (1992), have often used machinic dissonant static harmony, in combination with electronic sonorities and unswung rhythms, to suggest a mechanical, cyborg dancing body.

House and techno music, featuring extended passages of static harmony, has also often made a similar link between dance and the movements of machines. The consonant static harmony of Mr Fingers' 'Washing Machine' (1986) or Cajmere's 'Percolator' (1992) suggest a likeness between the endless repetitive mechanical movements of domestic appliances and the repetitive movement of the dancing body. Blake Baxter's techno track 'Sexuality' (1987) combines dissonant static harmony with the repeated lyric 'sexuality, let your body be free' taken from the Prince song of the same name, and here the dissonance of the harmony may strengthen the metaphor of the body as a machine. The more recent Detroit techno track 'Eye Contact' (2001) by The Other People Place (an alias of James Stinson from Drexciya) combines the doubling of a riff with minor triads (a 'machinic' harmonic process discussed in Chapter Five) with playful lyrics describing the protagonist as possessing a very literal cyborg body: 'what do we have here? Wow! Something's happening to my transmitters, they're starting to overload.'

The use of machinic harmonic structural elements, then, in the above examples, alongside other timbral and rhythmic elements, are often important to the construction of a cyborg subjectivity in these vocal dance music tracks. The lack of conventional chordal harmony in many of these tracks denies the traditional evocation of human subject, replacing this with an evocation of the human body as machine, through the use of 'machinic' dissonant static harmony.

A second type of cyborg subjectivity can be termed the 'astral', after Ben Williams' description of a particular style of techno produced by the Detroit collective Underground Resistance, which he contrasts with their 'militant' style. For Williams, in 'astral' dance music, 'mastery of the machines shades into transcendence of and through them; a certain analogy of freedom paradoxically arises from the rigidity of techno's relentless beats' (B. Williams, 2001, p. 166). For Williams, the 'global electromagnetic sphere of postindustrial communications technologies' are regarded as capable of facilitating 'cosmic rapture' or contact with the 'technological sublime' (B. Williams, 2001, p. 166). Astral dance music, then, might be heard as evoking a cyborg subjectivity in which machines represent 'utopian' information technologies which empower and augment the traditional human subject.

'Astral' techno therefore represents another way in which the human and machine might be heard to fuse, by combining the harmonic traditions of Afro-Diasporic popular music with electronic sonorities and other musical signs of the machine. In contrast to the previous examples, astral techno often uses harmony to establish a sense of a human subject, in the context of an otherwise extremely machinic style. Williams suggests that 'the keynote here is rapt awe: an astral aesthetic that often owes as much to the cosmic jazz of the early seventies as it does to Kraftwerk and P-Funk' (B. Williams, 2001, p. 166). Williams contrasts the astral aesthetic of Underground Resistance with their 'militant' sound, suggesting that astral music possesses 'a more fluid and less mechanical sound than on their more militant recordings' (B. Williams, 2001, p. 167). Moreover, the stylistic fusion of astral dance music has often been referred to in discussions of the style. Underground Resistance producer Mike Banks has referred to his music as 'hi-tech jazz' (B. Williams, 2001, p. 167). A 2006 documentary about Detroit techno is titled 'High Tech Soul: The Creation of Techno Music'. Various tracks by Mike Banks, combine highly machinic techno elements with more 'human' elements from Jazz and R&B styles.

The use of chord harmony is evidently central to the evocation of this technologically enhanced human subjectivity, whether alluding to practice in jazz, or the gospel and soul derived traditions of deep house and garage. For example, the Underground Resistance track 'Jupiter Jazz' (1992), begins with a transposed techno 'stab' sample, an example of the type of machinic transpositional harmony that is discussed in detail in Chapter Five. However, this machinic harmonic element is quickly combined with a jazzy piano progression, Gm^7-Am^7/E-Fm^7/B♭-Em^7/A, in which the Em^7 may be regarded as a subdominant chord resolving back to the tonic chord of Gm^7. As a result, this chordal harmony contains the types of resolution that have traditionally been heard as associated with the expression of 'human' emotion and spirituality in jazz, R&B, and gospel.

Vocal performances in astral techno may also feature gospel inspired lyrics similar to those found in deep house and garage. 'Ocean to Ocean' (1990) by Model 500, combines a 'deep-house' chord progression, that can be reduced to a repeated iv–i^7 motion, with an optimistic spoken-word lyric:

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Can you imagine a world where all men will be free? You be you and I'll be me. To be free.
It all seems like a dream, far away possibility. But I tell you my friend, its closer than you
think.

The use of a iv-i subdominant harmony in this track, then, may be heard to link the track to gospel-derived traditions of Afro-Diasporic music. Model 500's 'Infoworld (1990)', despite its highly machinic timbres, and instrumental nature, is based around a i–♭VII modal chord progression, another form of subdominant chordal progression that may equally be heard as evocative of a traditional 'human' subjectivity.

Finally, chord progressions in astral techno that are produced by transposition of a single chord voicing (a potentially 'machinic' practice, discussed in Chapter Five), typically use major or minor seventh or ninth chords (all of which contain the notes of a major triad), rather than bare minor triads used in other styles of machinic music. These progressions are likely to sound positively-valenced and possessive of human 'warmth' in contrast with the minor triad progressions prevalent in machinic dance music. In these 'astral' tracks, then, the use of chordal harmony, featuring dominant or subdominant to tonic resolutions, and emotionally 'warm' chord qualities, plays a part in establishing the 'human' aspects of a cyborg subjectivity.

The two types of 'cyborg' subjectivity discussed above can be distinguished from a more thoroughly machinic style in dance music that is often framed, through paramusical text, as representing a radically non-human, machine subject. This post-human machine subject can often be distinguished from the astral cyborg subject through the use of dissonant static harmony and absence of chordal harmony. It can also be distinguished from song-based 'cyborg' dance music by its lack of vocals and other traditional musical signs of human subjectivity.

Much machinic dance music can be described as 'militant', using a term that Ben Williams has used to describe a style of Underground Resistance tracks. According to Williams, 'this shifting collective was militantly self-conscious, adopting the image and rhetoric of guerrilla warfare in order to combat economic exploitation by major record labels' (B. Williams, 2001, p. 164). In the 'militant' style the machine subject is regarded as a symbol of physical strength and the

transcending of human limitations. Williams highlights the sense that this music suggests a desire to become robotic as a way of transcending the physical limitations of the human, becoming more powerful, or becoming a weapon: 'becoming robots was, for African American musicians, a subliminally political act, the ramifications of which can be read as both a form of self-empowerment and an identification with otherness, whether technological or racial. The historical recognition of oneself as a robot—or, following [Tricia} Rose, a unit of capitalist labour—is accompanied by the simultaneous inversion of that identity so that it becomes a form of power; robots, after all, are stronger, tougher, and more enduring than mere humans' (B. Williams, 2001, p. 161).

The science-fictional mythology of Detroit techno producers Drexciya is populated with futuristic military technologies and vehicles, such as the military helicopters shown on the vinyl release of *Aquatic Invasion* (1995), which features the track 'Wavejumper'. This track uses dissonant static harmony throughout, to suggest the alien, machinic and non-human character of the character of the alien, machinic 'Wavejumper'. The use of dissonant static harmony in militant techno, then, may be a powerful way of suggesting the absence of a traditional, emotional, human subject and the presence of a new, powerful, and distinctly machinic subject. In other words, the use of dissonant static harmony in 'Wavejumper', without any kind of 'human' chordal harmony may be heard as evoking an entirely post-human subject lacking any traditional human emotional qualities.

Importantly, this thoroughly machinic dance music does not construct a traditional human subjective position from which to criticise the warfare and violence suggested in its paramusical texts. The sleeve notes to the album *The Quest* (1997), for example, make it clear that the post-human Drexciyans are more advanced than humans, and have the strength and capability to 'terrorize' the human race: 'have they been spared by God to teach us or terrorize us?' (B. Williams, 2001, p. 168). However, the use of dissonant static harmony throughout Drexciya's more thoroughly machinic tracks, such as 'Wavejumper', means that no position of human subjectivity from which the potential 'terrorization' of the human race might be criticised or opposed may be constructed. The use of dissonant static harmony, and complete exclusion of conventional chordal harmony is therefore central to the construction of a thoroughly post-human subjectivity in machinic dance music.

The lack of a human subjective position in machinic dance music can be contrasted with the incorporation of human subjectivity in some examples of industrial music, as an 'opposition' to machinic elements such as dissonant static harmony. For example, the industrial track 'Serene Image' (2001) by Flesh Field, features a dissonant static riff that is similar to many used in machinic dance music, but unlike in machinic dance music, a human voice is heard to establish a position of opposition to the machinic harmony. For Karen Collins, the musical opposition between human and machine subjects offers allows industrial music to criticise modern capitalist society. She notes, for example, that static harmonies and repetitive rhythms were used by industrial music artists in the 1980s as a means of critiquing an 'alienating' capitalist society (Collins, 2002, p. 377). In industrial music, then, machinic musical signs such as dissonant static harmony, are often understood to represent a technological dystopia against which the human subject is opposed. Collins' view of industrial music presupposes that 'the machine came to be used as a symbol for the modern condition in a distinctly dystopian way' (Collins, 2002, p. 93).

The lack of any clear 'opposition' in machinic dance music, then, may be understood to result from the post-human perspective which it establishes and inhabits, partly through the use of dissonant static harmony and the absence of conventional chordal harmony. The use of dissonant static harmony may be heard to suggest that this new machine subjectivity is cold, lacks compassion, and may be dangerous or lethal to traditional human subjects, but unlike in industrial music, the machine subject of dance music is often associated with empowerment, the transcending of human limitations, and the possibility of creating a new technological future substantially politically different to the past.

6. Conclusion

This chapter has argued that styles of 'machinic dance music' can be defined primarily by their use of structural elements that may be heard as iconically or anaphonically evocative of the sounds and movements of machines and technology. It argued that the anaphonic evocation of machines and technology relies on conventions of musical signification that developed in earlier art music, popular music and film and television music. This chapter argues that harmony, in addition to timbre and rhythm, plays a previously underappreciated but important role in establishing a machine aesthetic and in musically constructing various

cyborg and machine subjectivities in dance music. It is argued that the use of highly static, repetitive and dissonant harmony may be heard as anaphonically evocative of machines and technology.

This analysis suggests that harmony is an important component in the evocation of human and post-human subjectivities that have previously been identified in dance music scholarship. The use of dissonant static harmony, associated with machinic signification, is contrasted with the use of more traditional jazz and R&B harmony, which is unlikely to possess such associations. It is also argued that in the context of machinic dance music, unlike in industrial music, musical signs of the machine are often incorporated into composite cyborg subjectivities, rather than 'opposed' by recognisably 'human' aspects of the style. The following chapters, Three, Four and Five, go on to discuss the role that 'machinic' harmonic practice plays in constructing meaning within various styles of dance music in greater musicological depth.

Chapter Three: Dissonant Static Harmony in Machinic Dance Music

The previous chapter argued that passages of dissonant static harmony in dance music may function as anaphonic musical signs, heard as evocative of the workings of machines and machine noise. It also outlined how this harmonic system has been used in dance music as part of a machine aesthetic and how it may play a role in the evocation different types of cyborg and machine subjectivities. This chapter describes the use of dissonant static harmony in dance music in greater depth, presenting a set of criteria for identifying dissonance in static harmonies and outlining four types of dissonant riff that are commonly employed in machinic dance music. This chapter also considers dissonant static harmony as an internal sign and as a style flag, in addition to more detailed discussion of its meanings as an anaphone.

1. Defining dissonance in static harmony

As was suggested in the introduction, and in Chapter Two, the harmonic system of 'static harmony', describing passages of musematically repetitive riffs built on the notes of a single chord, can be divided into two further harmonic systems: consonant static harmony and dissonant static harmony, depending on whether the static harmony is heard as consonant or dissonant. This section, then, sets out a series of criteria for identifying static harmonies that are likely to be heard as 'dissonant' in dance music.

Dmitri Tymoczko, defining 'dissonance', notes that 'Western listeners tend to agree that certain chords sound stable or restful, or consonant, while others sound unstable and harsh, or dissonant' (2011, p. 61). Tymoczko's definition of dissonance contrasts the perceived qualities of 'rest' and stability in consonant harmonies with the perceived qualities of 'tension' and instability in dissonant harmonies. Tymoczko also suggests that dissonant harmonies in Western music often create an expectation that they will 'resolve' to consonant harmonies; 'it is reasonable to say that in many musical styles, dissonant sonorities tend to resolve to consonant sonorities' (2011, p. 61). He also notes that 'consonant sonorities tend to appear as musical destinations or at points of rest, while dissonant sonorities tend to be more active and unstable' (2011, p. 61).

Some static harmonies may, then, be heard as more consonant or dissonant than others. Consonant static harmonies are more likely to be heard as stable, and as a 'point of rest' than dissonant static harmonies, which are more likely to be heard as 'unstable' or 'harsh'. However, unlike in many styles of music, dissonant static harmonies in dance music often fail to 'resolve' to consonant harmonies. A dance music track may repeat a section of dissonant static harmony throughout its entire duration. Despite this distinctive aspect of dance music harmony, a passage of static harmony in one dance track may still be perceived as more or less dissonant than a passage of static harmony in another dance track.

A passage of static harmony in dance music can also be understood to produce a 'macroharmonic collection', by which is meant the collection of all of the notes that appear during that passage of static harmony. 'Macroharmony' is defined by Tymoczko as 'the total collection of notes used over moderate spans of musical time' (2011, p. 4), and in the context of static harmony in dance music, can be used as a term to describe the total collection of pitches that are used in the riffs in that section. A macroharmonic pitch collection, then, may be identical to a scale or mode, but may also be understood as a single chordal harmony, and Tymoczko has suggested that, 'fundamentally, a scale is a large chord, and a chord is just a small scale' (2011, p. 153). For example, a macroharmonic collection of the pitches 1,♭2,♭3,4,5,♭6,♭7 could be described as a Phrygian mode collection, or, alternatively, as a single m♭9 chord with an added 11 and ♭13. As a result, definitions of macroharmonic dissonance in dance music may draw on research into the perceived consonance or dissonance of single chords, and the perceived consonance or dissonance of modes or scales.

Consonant and dissonant static harmonies in dance music may be distinguished, depending on whether a macroharmonic collection meets three criteria of consonance. An initial criterion of consonance for static harmonies in dance music, suggested by previous studies of perceived consonance and dissonance, is that a consonant macroharmonic collection must be based on either a major or minor triadic harmony. According to empirical research by Johnson-Laird et al. triads can be ranked in terms of consonance in the order; major triad, minor triad, diminished triad, augmented triad (2011, p. 27). The same ordering of triads in terms of perceived 'tension' of chords has been reported by Lahdelma and Eeron, with diminished and augmented triads heard as possessing the most tension (2016b, p. 44). Any

macroharmonic collection based on a diminished or augmented triad, rather than a major or minor triad, then, can be regarded as dissonant, for example, a hexatonic whole tone scale or a diminished or octatonic scale.

A second criteria of consonance, also suggested by previous studies, is that consonant macroharmonic collections must fit within a diatonic scale. This principle is suggested by Johnson-Laird et al, who suggest that 'chords occurring in a major scale should be less dissonant than chords occurring only in a minor scale, which in turn should be less dissonant than chords occurring in neither sort of scale' (2011, p. 24). For Johnson-Laird et al., the 'major scale' is used as a synonym for the diatonic scale, and the 'minor scale' is used to describe a flexible scale that moves between the diatonic Aeolian scale and the non-diatonic harmonic minor scale. Therefore, the authors imply that chordal harmonies which fit within a diatonic scale can be considered more consonant than those that do not. This criteria for consonance is supported by Lahdelma and Eeron's research, which indicates that, out of fifteen tested chords, the two chords which did not fit into a diatonic scale were reported as the most dissonant (these chords are the Neapolitan pentachord and the $C^{7\#11}$ chord) (2016a, p. 8). Any static harmony that contains notes that do not fit within a diatonic scale or contains chromatic pitch collections (three or more consecutive scale degrees of the chromatic scale, (e.g., c,c♯,d) can, as a result, be considered dissonant.

These two criteria, taken together, imply that six of the seven diatonic modes can be considered consonant static macroharmonies (the Locrian mode can be considered dissonant as it is based on a diminished triad). However, a third criteria of consonance may be added to the first two, which suggests that the Phrygian and Lydian modes will also be heard as dissonant. This criteria is based on David Temperley's theory of the 'supermode', which suggests that the scale degrees of the ♭2 or ♯4/♭5, if present within a macroharmonic collection, will be heard as 'foreign and destabilizing to the tonal center' of that harmony (2011, p. 3).

Temperley has argued that, in pop-rock styles, macroharmonies which can fit within the Ionian, Mixolydian, Dorian and Ionian diatonic modes are the most commonly used, while the three remaining diatonic modes are likely to heard as unusual and 'chromatic'. He has termed

this composite scale, combining the four most common diatonic modes, as the 'supermode'. It should be noted that Temperley himself did not define the supermode using the term 'macroharmony', but this term has been used throughout this thesis for clarity. Temperley argues that the concept of a supermode, in pop and rock music, is supported by evidence collected in *A Corpus Analysis of Rock Harmony* (de Clerq & Temperley, 2011), which presents a statistical analysis of chord progressions from 100 songs, which are themselves taken from a list of *500 Greatest Songs of All Time* complied by Rolling Stone magazine. De Clerq and Temperley's analysis shows that chords with roots built on the scale degrees ♭2, and ♭5 are the least commonly found in the analysed music (♭II, ♭ii, ♭v and ♭V chords).

De Clerq and Temperley's conclusions are based on analyses of chord progressions rather than passages of static harmony. However, Temperley argues that the concept of the supermode may be understood to apply to sections of primarily melodic static harmony, as well as to chord progressions. In the article *Scalar Shift in Popular Music*, (2011) Temperley translated the data from the earlier corpus analysis into a 'a scale degree distribution for rock', showing that the scale degrees ♭2 and ♯4/♭5 are the least commonly occurring scale degrees in the analysed music. Perhaps unsurprisingly, the scale degrees 1,4, & 5 were the most common in the analysed corpus. Temperley notes that ♭2 and ♯4/♭5 are the only two scale degrees that are not included in either the major or minor keys in common practice music and as they are 'not diatonic within either mode' they are heard as 'therefore unavoidably chromatic' (2011, p. 3). The Locrian, Phrygian and Lydian diatonic modes, which contain either one or both of these scale degrees are, therefore, excluded from the supermode.

Temperley therefore argues that, macroharmonies containing the non-supermodal ♭2 or ♯4/♭5 scale degrees 'have an exotic effect, decidedly alien from the usual vocabulary of rock' (2011, p. 4), suggesting an inherent instability akin to dissonance. This third criteria, then, that macroharmonies containing the ♭2 and ♯4/♭5 scale degrees can be considered dissonant, can be used to distinguish between the diatonic modes, and to suggest that the Locrian, Phrygian and Lydian modes will be heard as dissonant in the context of static harmony in dance music.

The hypothesised distinction between diatonic modes is supported by Temperley and Tan's research into the perceived 'happiness' of diatonic modes, with the Phrygian mode heard as

the least 'happy' (the Locrian mode was not tested). However, in Temperley and Tan's research. the Lydian mode was reported as similarly expressive of happiness as the Mixolydian mode. This research suggests that the Lydian mode should, in fact, be considered a consonant macroharmony. As the Lydian mode contains no flat scale degrees and one sharp scale degree (the ♯4), this suggests that only the ♭5 should be regarded as a dissonant scale degree, and the ♯4, within the context of the diatonic Lydian mode, should be considered consonant. As a result, the Lydian mode can be regarded as a consonant scale. This understanding of the Lydian mode as consonant is supported by the music textbook *Jazzology*, in which the authors suggest the modes can be arranged on a scale from 'dark' to 'light' with the Locrian mode as the 'darkest' and the Lydian mode the 'lightest' (Rawlins & Bahha, 2005, p. 24). This spectrum orders the modes according to the number of sharp notes in a scale.

Applying these criteria to dance music suggests that any macroharmonic collection, heard in relation to a perceived tonal centre or foundation note, which is a subset of the Lydian, Ionian, Mixolydian, Dorian, or Aeolian modes, can be regarded as consonant, with all other macroharmonies considered dissonant. These five modal scales can be considered consonant as they are based on a major or minor triad, fit within diatonic scales, and do not contain ♭2 or ♭5 scale degrees relative to a foundation note.

2. Centricity

Whether a diatonic scale or subset of a diatonic scale macroharmony in dance music is heard as consonant or dissonant, then, can depend on the perception of which note of the scale is heard as the tonal centre or foundation note. Tymoczko defines 'centricity' as describing 'the phenomenon whereby a particular pitch is felt as being more stable or important than the others' (Tymoczko, 2011, p. 16). Tonal centres in sections of static harmony in dance music, by definition, cannot be established by tonal processes, such as by a chordal cadence, because static harmony is defined by its lack of chordal motion. In this context, a foundation note must be established by 'non-tonal', processes. Tymoczko offers two explanations for how tonal centres are established in popular music:

> Broadly speaking, theorists have explained centricity in two ways. Internal explanations assert that the structure of a group of notes is sufficient to pick one out as a tonal centre, without any effort on the composers part. External explanations focus on what composers do, asserting that composers make notes more prominent (or stable) by playing them more frequently, accenting them more rhythmically or dynamically, placing them in registrally salient positions, and so on (Tymoczko, 2011, p. 177).

Most scholars of popular music agree that tonal centres in popular music are established by the use of external processes. Walter Everett strongly asserts that tonal centres in 'pop-rock' are almost always established through one or both of two 'tonal' external processes, either by functional chord progressions or by voice leading (typically, the simultaneous stepwise motion of melodic parts to a foundation note). Everett does, however, accept that it is, in theory, possible in pop-rock music, to establish a tonal centre or foundation note through 'non-tonal' means. Everett admits that in the case of his 'type 5' and 'type 6' tonal systems (describing static harmony) that centricity is 'dependent primarily upon assertion' (2004, p. 6), but this, in Everett's view, would seem to apply to only 2% of the 'pop-rock literature' (2004, p. 2).

Capuzzo similarly argues that a tonal centre within a passage of popular music may be established by non-tonal processes. He suggests that Joseph Straus's theory of non-tonal tonic reinforcement, originally developed for the analysis of the works of 20th century composers, including Schoenberg, Stravinsky, Bartok, Berg, and Webern, is applicable to the analysis of centricity in popular music. Straus describes how the 'non-tonal' establishment of a tonal centre might be achieved: 'In the absence of functional harmony and traditional voice leading, composers use a variety of contextual means of reinforcement. In the most general sense, notes that are stated frequently, sustained at length, placed in a registral extreme, played loudly, and rhythmically or metrically stressed tend to have priority over notes that don't have those attributes' (Straus 2005, p131, as cited in Capuzzo, 2009, p. 160). As Capuzzo states, this theory acknowledges 'the structural overlap of centricity with common-practice tonality while also recognizing its structural independence' (Capuzzo, 2009, p. 160). His line of thinking suggests that in the absence of functional (or stepwise voice leading) processes that tonics in popular music can be established through non-tonal external explanations.

In the examples of the static melodic sequences, or riffs, discussed in this chapter, the foundation note is likely to be established by these non-tonal processes. In many of the below examples, the first and/or final note of a sequence is likely to be heard as the tonal centre. In

other examples, the tonal centre is established by the repetition or emphasis of a particular pitch. In some of the examples given below the tonal centre may be established in other layers of the musical texture that are not described in the example (for example the repeated single-note bassline of Kraftwerk's 'Trans Europe Express' (1977), which provides a sense of foundation note in each section of the track, against which the melody is heard).

The perception that a diatonic macroharmony is Phrygian or Locrian, and therefore dissonant, rather than a consonant mode such as the Ionian mode, depends on the subjective perception of which note in the pitch collection is the foundation note. While it is acknowledged that the process of 'hearing' a particular pitch as the tonal centre or foundation note is ultimately subjective, and some listeners may hear different tonal centres in the examples below, every effort has been made to suggest the most likely perceived, or plausible, foundation note in the below examples.

3. Internal meaning and dissonance in static harmony

As was discussed in Chapter One, 'internal meaning' refers to the potential for music structural elements to act as signs, referring to other elements within the musical text. Internal signs produce meaning by creating, meeting, or failing to meet expectations about how a musical text will unfold. The definition of dissonance given earlier in this chapter, which suggested that dissonant harmonies are unlikely to be heard as places of 'rest', suggests that dissonance can be internally meaningful, creating an expectation of how future harmonic development will take place. The perception that the present harmony is dissonant may create an internal expectation that it will resolve to a consonance, while consonant harmonies produce less expectation of change and are heard as more internally stable.

Temperley's theory of a supermode in pop and rock, also suggests that dissonance may be internally meaningful in popular music. Temperley specifically claims that non-supermodal macroharmonies are likely to be heard as unstable and will, ideally, be 'reinterpreted' as a more stable harmony with an 'alternative tonal centre' (Temperley, 2011, p. 4). Temperley claims that a non-supermodal macroharmony will only be heard as 'chromatic', by listeners, when its tonal centre is continually reasserted, overriding the listener's desire to hear the macroharmony as consonant relative to an alternative tonal centre. In these cases, Temperley

suggests that the 'chromatic degrees have an exotic effect, decidedly alien from the usual vocabulary of rock' (Temperley, 2011, p. 4). Temperley therefore implies that non-supermodal macroharmonies possess an inherent internal instability that motivates rock musicians to typically avoid them or use them as passing tensions which resolve to more consonant 'supermodal' macroharmonies .

Temperley's concept of supermode can be regarded as a form of 'internal centrism', which, as described by Tymoczko, suggests that in any given pitch collection, some possible tonal centres will be preferred to others, depending on the 'internal' scalar properties of the resulting macroharmony (this use of the term 'internal' is distinct from that in 'internal meaning'). According to Tymoczko's second rule of internal centrism, a note is more likely to be heard as a tonal centre 'if it does not form sharp dissonances (tritone, or minor second) with any note in the macroharmony' (Tymoczko, 2011, p. 179).

Tymoczko has argued that such internal tension is weak compared to the other 'external' processes that are used to establish a tonal centre, suggesting that in most cases 'the internal contributions to centricity are relatively weak and can easily be overridden' (Tymoczko, 2011, p. 180). However, while it may be the case that macroharmony has little bearing on the establishment of centricity in dance music, which is typically established by 'non-tonal' means, it may still be the case that dissonant macroharmonies are heard as containing an internal tension that creates an expectation of resolution to a more consonant macroharmony.

Temperley's research also suggests that consonant macroharmonies are generally preferred to dissonant macroharmonies in pop and rock music. This claim is supported by the results of the corpus analysis which suggests that dissonant, non-supermodal macroharmonies are rare in pop-rock music. It also appears to be supported by the apparent preference for consonant macroharmonies in other genres of popular music. The major key and minor key scales of common-practice music both fit within the supermode. Peter van Der Merwe also suggests, when discussing British folk music, that 'the commonest folk modes are the major (but with no harmonic implications), the Mixolydian, the Dorian and the Aeolian' (van Der Merwe, 1989, p. 21), a list of modes which corresponds exactly with Temperley's supermode. Dissonant static harmony in dance music, using harmonies outside of these typical

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macroharmonies, may therefore be heard as unusual within the general context of popular music harmony.

Dissonant static harmony in dance music may, then, be heard as creating an expectation of a future resolution to a consonant harmony. Such resolutions are commonly found in chordal harmony, and so may be found in dance music examples that use a chordal harmonic system. For example, the electro freestyle track 'The Mexican (Dance Mix)' (1984) by Jellybean, begins with a held B Major chord, over which a B Phrygian dominant macroharmony is outlined by a synthesiser melody. This Phrygian dominant macroharmony can be considered dissonant, according to the criteria followed in this thesis, as it is non-diatonic, and contains a ♭9 scale degree relative to the tonal centre of B. This harmony is soon contextualised, however, as the V chord in E minor, and resolves to a consonant E minor tonic chord. In such examples of chordal harmony, dissonance produces an internal expectation of resolution to a consonance, which is soon met.

However, in the context of static harmony in dance music, such expectations are typically frustrated, as dissonant static harmonies are typically repeated throughout a track and do not resolve to a consonance. For example, the dissonant m♭9 harmony in the bass pattern of KLF's 'What Time Is Love? (Pure Trance)' (1988) repeats throughout the track and never resolves to a consonance. In such cases the sense of tension and instability is never relieved, and such examples of dance music may be heard as possessing a sustained tense or unstable quality.

4. Common types of dissonant riff in film machine music and dance music

Dissonant static harmonies in machinic dance music typically belong to one of four types, each type possessing similarities to dissonant static harmonies in film machine music. The first type of dissonant static harmony is based on a single static chord with dissonance produced through the use of riffs that create chromatic macroharmonic pitch collections. The second type of dissonant harmony is based on the chord tones of a minor seventh chord, but with added ♭2 or ♭9 non-chord tones, creating macroharmonies that are subsets of the Phrygian scale. Such harmonies can be considered dissonant due to their inclusion of the ♭2 scale degree. A third type of dissonant macroharmony is the use of non-diatonic, symmetrical scales such as the octatonic or whole-tone scales. These scales can be considered dissonant

due to their often being based on diminished or augmented triads, using non-diatonic scales, and (in the case of the diminished scale) often containing ♭2 or ♭5 scale degrees. Finally, some riffs in machinic dance music may be heard as randomly generated, lacking any strong sense that they are based on single static chord, and often producing chromatic pitch collections.

Many of the examples of dissonant riffs in dance music discussed in this chapter exhibit a tendency to circle melodically by scale-steps around the triadic chord tones, particularly the tonic or fifth. This tendency in dance music has been noted by Tagg, who has indicated that, 'bass riffs, if they occur at all, are usually quite simple, and seem to consist of either repeated or single notes sounding the root position of the overlying chord (usually a triad) or circling stepwise round it' (Tagg, 1994, p. 7). Many melodic sequences in dance music are produced by moving from a chord tone to a non-chord 'neighbour tone', with the upper neighbour tone often a semitone above the chord tone and the lower neighbour two semitones below. If, for example, these non-chord neighbour tones are added to the foundation note, the resulting riff will contain a ♭2 scale degree, and so produces a dissonant macroharmony. This same melodic tendency, to circle around a single note, has been noted in filmic machine music. Allison Wente has observed that, in Huppertz' score to Metropolis, 'the restless pumping of the pistons comes through musically in the offbeat accents and incessant chromatic cycling of woodwind neighbour groups', here describing the melodic movement between the notes of a chromatic pitch collection based on a central chord tone (Wente, 2018, p. 6).

The use of the ♭2 and ♭6 scale degrees in such patterns can be heard as distinctively different to typical riffs in rock and R&B, as, in those styles, minor pentatonic chord tones are typically combined with the non-chord tones of the 2 and 6, both a whole tone above the tonic and fifth, respectively. The ♭2 and ♭6 non-chord tones are each only a semitone above the tonic and fifth, and the ♭2 is also a tritone interval from the fifth. Riffs containing these scale degrees therefore often contain dissonant intervals of the minor second or tritone. The use of the ♭2 and ♭6 scale degrees, in the context of static harmony in dance music often creates macroharmonies suggestive of $m^{♭9}$ or $m^{7add♭6}$ chords, with both chords being very uncommon in popular music generally and likely to be regarded as dissonant harmonies.

There is a possibility, then, that the ♭6 scale degree in the context of static harmony, may also be heard as dissonant, in addition to the ♭2 and ♭5. This is counter to Temperley's view that the ♭6 scale degree, as part of the Aeolian mode, is likely to be regarded as consonant. However, this discrepancy can be explained by considering the use of the ♭6 scale degree in a typical modal rock chord progression. In that context, for example in the common progression ♭VI–♭VII–i, the ♭6 scale degree is not heard in the same chordal harmony as the fifth. It is heard as part of a major triad, and as part of a progression of consonant chords, rather than as part of a dissonant static m^{7addь6} chord. While it is possible that the use of ♭6 scale degree as a non-chord tone in a static harmonic context may be heard as dissonant, the examples chosen to illustrate dissonance in this chapter do not rely upon the perceived dissonance of the ♭6. All of the examples cited in this chapter are dissonant according to the criteria outlined earlier in this chapter.

4a. Dissonant static harmony with chromatic pitch collections

Many examples of machine music in film and dance music feature passages of dissonant static harmony that produce chromatic pitch collections. This type of dissonant static harmony is typically based on a single static chord, but with added non-chord tones that outline at least three successive notes of the chromatic scale. Such macroharmonies are, by definition, non-diatonic and may be considered dissonant.

The use of chromatic melodic patterns in the context of film machine music can be identified in Gottfried Huppertz' score for *Metropolis* (1927). The cue 'I. Auftakt: Maschinen' (2018), which accompanies images of factory machinery, immediately after the opening title sequence, begins with a four-bar section of static harmony based on a static Em triad, the fifth degree of which is chromatically altered in the sequence 5-♭5-♭6-♭5, to create the progression Em-Edim-CM-Edim. A simultaneous high-pitched repeated and rapid, oscillating chromatic pattern is centred on g, the third of the chord, creating the pattern g-a♭-g-f♯ or ♭3-3-♭3-2 (in E). This passage depicts the industrial machinery of Metropolis as noisy and dissonant, through the chromatic alteration of a repeated, static, minor triad, and the addition of chromatic pattern based on the third note of the chord.

The cue 'Space Control' (2016), from Bernard Herrmann's score to *The Day The Earth Stood Still* (1951), is another example of film machine music employing chromatic static riffs. This cue accompanies shots of the interior of the alien Klaatu's spaceship and it's futuristic technology. The rhythm of the cue is metronomic and mechanical, and Rebecca Leydon has suggested that it features 'a clockwork-like rhythmic accompaniment' which 'unfolds in the harps, glockenspiels, vibraphone, celesta and piano' (Leydon, 2004, p. 36). 'Space Control' is based on a chord progression that is first introduced in the main title theme of the film, an oscillation between chords based on the roots of D and E♭, or i-♭ii (in D). As a result, unlike the other examples discussed in this section it is not entirely harmonically static. However, a static, chromatic pattern a♭-a-b♭-a-b♭, or ♭5-5-♭6-5-♭5 (in D), is played by theremin, over the chord root of D. This oscillation, around the fifth, is similar to that employed in 'Maschinen' (this chromatic pattern appears in bars 5-6 and 7-8 in Leydon's transcription (Leydon, 2004, p. 36)).

In a later example of 'machine music' the opening title theme ('Main Title' (2005)) of the television show *Knight Rider* (1982), begins with a chromatic synthesiser motif centred on the fifth, 5-♭6-5-5-♭6-5-5-♭6-5-5-5-♭5-5-5-5, that is subsequently transposed down by a whole-tone to follow the F♯M–Em (I–♭vii in F♯) chord progression. This chromatic riff might be intended to evoke the mechanical nature of the robot car KITT. Marius Constant's famous, second theme from the television show *The Twilight Zone* ('Main Title Theme' (1983)), first broadcast in 1960, also begins with a repeated ostinato containing a chromatic aspect. This first theme can be heard as a repeating 3–4–3–1 (g♯–a–g♯–e) motif over a ♭5 pedal note (B♭), creating a 3,4,♭5 chromatic pitch collection. Jon Burlingame notes that the theme 'began with a series of repeated, intriguingly dissonant, four-note phrases played by two electric guitars' (Burlingame, 2023, p. 118). Jesse Gress has argued that the notes of this first motif 'combine to produce the three most dissonant intervals in the chromatic scale--a major second, a minor second (followed by another major second), and a flatted fifth--giving the intro its characteristic creepiness' (Gress, 2014, p. 110). This ostinato therefore contains a chromatic pitch collection of g♯,a,b♭, which, as Burlingame and Gress argue, is likely to be heard as highly dissonant and potentially unsettling.

In all of these examples of film music, the use of chromaticism may be heard as depicting the noise and disturbance to humans caused by machines. The machines in Metropolis are depicted as endangering the lives of the workers, who are exhausted to the point of near death when operating them. Meanwhile, Klaatu's spaceship and robot protector Gort, are superior military technologies that threatens to destroy all life on Earth unless humans renounce nuclear war. The theme of *The Twilight Zone*, on the other hand, suggests a strange, uncanny, and alien disruption to 'everyday reality'.

Similar uses of chromaticism can also be found in house, techno, and hardcore tracks. 'Infinity (Mystic Mix)' (1989) by Eon, features a one-bar 8-♭9-7-8 synth-riff that oscillates by semitonal steps around the tonal centre of E, and creates the chromatic pitch collection 7,8,♭9. This riff is later joined by a four-bar melody, 8-9-♭10-7 (a quotation of the melody from Toto's title theme for *Dune* (1984) ('Main Title' (1984)). The combination of these riffs creates the highly dissonant macroharmonic collection e♭,e,f,f♯,g (7,8,♭9,9,♭10 (in E)) or a five-note chromatic collection.

A similarly chromatic oscillating pattern is employed in the UK hardcore track 'Some Justice' (1991) by Urban Shakedown Featuring Micky Finn, from 01:10, when a sampled horn sound plays the following four-bar sequence: 8-♭9-8-♭9-7-8... (in D). In the central 'storm' section of The Prodigy's 'Weather Experience' (1992) a high-pitched 'bleepy' synth also chromatically oscillates around the tonic: 8-♭9-7-♭9-8 in F♯ (from 04:49). In Bad Company's drum and bass track 'Seizure' (1999) the two-bar bassline is simply a chromatic oscillation around the tonic 8-♭9-8-7-8 (in B♭).

Chromatic macroharmonic collections in dance music can also be produced when two riffs have different foundation notes and are heard to 'clash' harmonically with each other. The UK hardcore track 'Nightmare' (1992) by Kid Unknown, for example, combine a bass riff with the foundation note of G with a melody on the foundation note of F♯, creating the five-note chromatic collection f♯,g,g♯,a,b♭. A similarly chromatic collection can be identified in 'The Theme (Original Chill Mix)' (1989) by Unique 3. In this track the bassline and synth-string melody have a foundation note of C♯ (bass: 8-♭7-6-5, synth-string: ♭3-2-4-1), however the 'bleep' melody has been tuned down to a foundation note of C (also playing a ♭3-2-4-1 riff).

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This creates a highly dissonant macroharmony containing all of the notes of the chromatic scale, apart from g.

Kraftwerk's 'Home Computer' (1981) also features sections of highly dissonant static harmony containing chromatic pitch collections, that interrupt the other sections of static Phrygian-subset macroharmony. A repeating one-bar rising sequence of notes is first heard at 1:36, featuring the following sequence of rising notes; a♭-a-b♭-b-c-e♭-g♭-a-b♭-d♭-e♭-e-f-g♭-a-c. Each note is of a sixteenth note duration and is either one semitone or a minor third above the previous note. As a result, the sequence is highly dissonant, using ten scale degrees of the twelve-note chromatic scale (all notes of the scale apart from d and g). The sequence contains a Cdim[7] chord within it (c-e♭-g♭-a) but also five note chromatic pitch collections (e.g., a♭-a-b♭-b-c). The resulting sequence is therefore highly chromatic and undermines any clear sense of being based on a particular chord. The rising chromatic motif of 'Home Computer' is imitated in Cybotron's 'Clear' (1983), which also features a rising chromatic motif, rising fully up the chromatic scale from c to e♭ an octave above over a length of one measure, with each note a sixteenth-note in length. The start of the motif is offset from the start of each bar, so that the motif can be represented b♭-b-c-d♭-d-e♭ /c-d♭-d-e♭-e-f-g♭-g-a♭-a, with the / representing the 're-set' point of the rising motif to its lowest note. All of these examples of static harmony in dance music are likely to be heard as dissonant, due to their use of chromatic static harmonies, and therefore depictive of technology that is noisy, unsettling, and disruptive.

4b. Phrygian-subset dissonant static harmony

The use of static harmonies that may be considered a subset of the Phrygian mode, or the scale 1,♭2,♭3,4,5,♭6,♭7, can be identified in examples of film machine music, for example, the cue 'Bellus, Zyra and the D.A.', from Leith Stevens' score for *When Worlds Collide* (1951) which accompanies images of an early computing machine in operation. This cue has been discussed and transcribed by William Rosar, and is based on a short ostinato, 1-1-1-♭2-♭3-4-♭2-♭3-1-♭2-1 (in A), doubled with parallel fifths (Rosar, 2006, p. 409). This short ostinato outlines a static Phrygian macroharmony (the scale degrees 1,♭2,♭3,4 doubled to produce the full A Phrygian scale).

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Perhaps the most well-known example of Phrygian static harmony in machine music is the main theme to the television series *Doctor Who* (1963) written by Ron Grainer and realised by Delia Derbyshire ('Doctor Who (Original Theme)' (2013)). The use of Phrygian macroharmony may be intended to suggest that the alien 'Doctor' and their spacecraft, the TARDIS, is strange, noisy, and inhuman. Like Klaatu in *The Day The Earth Stood Still,* the Doctor is owner of a technologically advanced spacecraft that may initially be considered a possible threat to humanity. In the first episode it is unclear whether 'The Doctor' is a friend or enemy of humanity, so like Klaatu, they are an ambiguous figure, and the TARDIS could be considered a potential 'military technology'. The Phrygian harmony of the *Doctor Who* theme may be understood to represent the strangeness of the alien figure of the Doctor, and their mastery over advanced technology.

The first section of the *Doctor Who* theme consists of two melodic parts: a bass part and a theremin-like melodic part. The theme is based on a static harmony based on E, with the 1,♭3,5,♭7 pitches considered chord tones. The main melodic part moves between these chord tones, except on three occasions the 5 chord tone is preceded by the ♭6 non-chord tone. The main melody can be described as 5-b13-12-b14-12, 12-b10-5-b7-b6-5-b6-5 (in E). The bass part, however, features tonal oscillation around the tonic and fifth, introducing the ♭9 dissonance in the phrase, 8-♭10-♭9-♭7-8 (in E). The melodic and bass parts considered together outline the full E Phrygian scale.

A similar use of Phrygian-subset macroharmony to suggest superior alien technology can be found in Fred Steiner's music for the *Star Trek* episode 'The Corbomite Maneuver' (1966). In this episode the crew of *The Enterprise* encounter a mysterious alien cube, floating in space, followed by a strange planet-like spherical spaceship. On encountering the spherical alien ship (at 17:48 in the episode) the following melodic pattern is heard, 1-♭2-5-♭6, ♭2-1-♭6-5 (in A) over a repeated ostinato: 5-5-8-8-♭6-♭6-♭9-♭9 (in A). Again, the technological character of the alien objects is evoked by the use of repetitive ostinatos, metronomic rhythms, and artificial sounding instrumentation. The disturbing, inhuman and unknowable nature of the superior alien technology, is suggested through the use of dissonant Phrygian-subset macroharmony in a static context.

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Barry Gray's end-title theme music for the 1960s Gerry Anderson children's science-fiction TV series *Captain Scarlet and The Mysterons* (1967) ('Captain Scarlet – End Credits (Original Version)' (2021)), mostly uses a Phrygian dominant macroharmony to suggest the threat of the alien Mysterons. The end-title music from episode one of the series uses functional chordal harmony (with the ♭II chord substituting for the dominant in the opening section) but begins and ends with Phrygian dominant sections that are intended to evoke the alien nature of the Mysterons. The chord progression of the end-title theme is:

CM-B♭m⁷-CM-B♭m⁷-CM-B♭M-A♭M-D♭M/A♭-CM-B♭m⁷-CM

In C: I-♭vii-I-♭vii-I-♭VII-♭VI-♭II-I-♭vii-I-♭vii-I-♭vii

However, in the instrumental end-title version of the theme, after the initial 'Captain Scarlet' melodic motif (8-5-♭6-♭9 in C), the melody is carried by the solo bass guitar, with no chordal accompaniment. This means that the concluding I-♭vii⁷ chord shuttle is replaced with the following bass riff: 8-♭10-♭7, 8-♭10-♭9-12, 8-♭10-♭7, 8-♭10-♭9-12 (in C). This short passage, then, based on the tonal centre of C, may be heard as short passage of static, Phrygian-subset macroharmony, outlining a m♭9 chord. This passage of static harmony, in which the ♭2 is added directly to the tonic chord is very similar, tonally to many of the examples of dance music discussed in this chapter, such as Kraftwerk's 'It's More Fun To Compute' (1981).

The many stylistic similarities between the science-fiction film music of the 1970s and 1980s and machinic dance music of the same period can be partly explained as the result of the fact that many film soundtracks during this period were realised using the same music technologies employed in popular music, and in some cases were recorded by the same artists. Notably, popular synthesiser groups and artists such as Tangerine Dream and Vangelis produced Hollywood film scores in this period as well as continuing to release albums of popular music recordings. Subsequent scores by the likes of Brad Fiedel (*The Terminator* (1984)) and Basil Poledouris (*Robocop* (1987)) featured cues that adopted many of the style conventions of popular synthesiser artists such as Tangerine Dream.

As a result, passages of Phrygian-subset harmony in film music of this period may sound remarkably like passages of Phrygian-subset harmony in machinic dance music. For example,

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a cue from the Barry De Vorzon's soundtrack to the Michael Chrichton technological thriller *Looker* (1981) (heard in the film at 01:05:49), may be heard as stylistically similar to music by Tangerine Dream, due the use of a synthesiser playing a Phrygian-subset pattern over a static D5 chord, outlining a 1,♭2,5,♭7 pitch collection (in D). This dissonant synthesiser pattern may also sound very similar to some of the examples of machinic dance music discussed later in this chapter, such as The KLF's 'What Time Is Love? (Pure Trance)' (1988). Similarly, the cue 'M301_T1', by Don Peake, from the episode 'Deadly Knightshade' of the 1980s TV series *Knight Rider*, begins with a synthesiser sequence, 1-♭2-1-♭3-1-4-1-♭3-1-♭2-1 (in F♯), that again uses a Phrygian-subset macroharmony as a 'marked' theme, depicting the tension and peril of a car-chase scene in the TV show (at 23:48), and is a variation on the main theme of the show, associated with the robot car KITT.

In machinic electronic dance music, the use of Phrygian-subset static harmony has its origins in synth-pop music of the late 1970s. The track '3 A.M. at the Border of the Marsh From Okefenokee' by the German synth-pop band Tangerine Dream (from the album *Stratosfear* (1976)) features a long section of improvised synthesiser performance over short, repeating, machinic synthesiser patterns establishing C as the tonal centre. This section, beginning at 02:40, initially suggests a diminished macroharmony on C, however, from about 03:30 shifts to a C Phrygian diatonic macroharmony. The Phrygian macroharmony is outlined by the improvised synthesiser playing, until 05:10, when a 1-1-♭2-♭3 (in C) pattern, half a measure in length is introduced. This pattern can therefore be considered an example of a Phrygian-subset dissonant riff.

A similar Phrygian-subset riff is employed in Tangerine Dream's 'Vengeance' from soundtrack album to the film *Sorcerer* (1977). A one-bar bass pattern, 8-8-8-8-♭9-♭7(in C) opens the track before being accompanied by synthesiser improvisations that outline a Phrygian mode, in similar fashion to the earlier '3 A.M. at the Border of the Marsh From Okefenokee'. This bass pattern is transposed to a number of different foundation notes throughout the track, a process which will be described in the next chapter.

Kraftwerk's 'Trans-Europe Express' (1977) also features static Phrygian macroharmony. The track begins with melodic motif that rises in fourths, fully outlining the E♭ Phrygian mode and

which concludes with an E♭m triad (1-4-♭7-♭10-♭13-♭16-15 in (E♭)). The main 'chorus' melody (5-♭6-♭9-8, 5-♭6-8-♭7, 5-♭6-♭9-8, ♭7-8 (in C) first heard at 01:33) also includes the dissonant ♭2/♭9 scale degree. These two melodies are heard in combination at 05:23, with the main chorus melody transposed E♭, meaning that the main melody is here heard over static a minor triad. As the two main melodic patterns in 'Trans-Europe Express' are both four bars in length they cannot be considered as typical examples of machinic dance 'riffs' but they are examples of dissonant static macroharmonies that have been quoted in subsequent dance music.

Carsten Brocker, discussing 'Trans-Europe Express' suggests that 'the second theme is notable above all for its use of the minor ninth, which was to be taken up several times on the 1981 album *Computer World* (Brocker, 2010, p. 108). Phrygian macroharmony therefore also characterised the frequently sampled and influential synth-pop tracks 'Home Computer' and 'It's More Fun To Compute', both from Kraftwerk's *Computer World* album (1981). Both tracks include a one-bar bassline with the melodic outline 8-♭11-♭7-♭9-8-12 (in C). 'It's More Fun To Compute' also features a four-bar synth-string melody, 8-♭10-♭7-♭9-8, ♭7-5-♭9-8, which plays over the one-bar bassline.

Similar Phrygian-subset patterns immediately appeared in several synth-pop tracks immediately after the release of *Computer World*. The bassline of 'Transdance' (1983) by British synth-pop group Night Moves uses a macroharmonically identical bass pattern to that found in 'It's More Fun To Compute', 8-♭11-♭7-♭9-8 (in G), but the duration of the riff is extended, creating a four-bar bassline. Similarly, the four-bar synth-string melody of 'Sharevari' (1981) by Detroit group A Number of Names, 8-♭7-♭9-8, 8-♭7-♭10-8 (in G), features a similar melodic pattern to 'It's More Fun To Compute' over a two-bar minor pentatonic bassline. 'Sharevari' however, is notable for combining machinic elements such as the use of electronic timbres and dissonant static harmony, with live drumming and performance, creating an interesting combination of machinic and 'human' elements.

Phrygian-subset static harmony was also frequently employed in the electro style of hip-hop in the 1980s. In some cases, this was the result of direct quotation or sampling of Kraftwerk's music. The melody from Kraftwerk's 'Trans-Europe Express' was, for example, famously quoted as the main melody in the influential electro hip-hop track 'Planet Rock' (1982) by

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Afrika Bambaataa & Soulsonic Force. Rather than direct quotations, many original melodic elements in electro hip-hop can be heard as variants of the melodies from 'Trans Europe Express' 'Home Computer' and 'It's More Fun To Compute', treating these elements as melodic matrices. The track 'Rock The World (Like No Other Girl)' (1987) by B.O.S.E., for example, can be heard as a pastiche of 'Planet Rock' and features a slightly transformed version of the 'Trans-Europe Express' melody, 1-♭3-♭7-6-1-♭3-6-♭6, 5-♭9-8-5-8. This melody is not entirely Phrygian, as it chromatically alters the original melody with a natural sixth as well as flat sixth scale degree but concludes with a Phrygian motif. The eight-bar synth-string melody of Man Parrish's 'Man Made' (1982), 1-5-1-♭2-♭6-♭7-1-5-1-♭6, 1-5-1-♭2-♭6-♭7-1-5-8, (in A), similarly follows the melodic rhythm of the 'Trans-Europe Express' melody but retains its Phrygian-subset character.

Other electro hip-hop tracks use Phrygian-subset macroharmonies, in combination with samples of Kraftwerk, to allude more generally to Kraftwerk's style, or to the electro style itself, as established by 'Planet Rock'. The track 'Professor X (Saga)' (1989) by Professor X (a pseudonym of electro producer The Arabian Prince) features an 8-♭10-♭9-♭7-8 (in C) bassline that is intended to be heard as an allusion to the bassline from 'It's More Fun To Compute' over a sample of the drum beat from Kraftwerk's 'Numbers'. 'It's More Fun To Sample' (1988) by The X-Men similarly samples the bassline and other elements from 'It's More Fun To Compute'.

Static Phrygian-subset harmonies can be identified more generally in electro tracks and may be heard as style indicators. 'We Come To Rock (Club version) (1984)' by Imperial Brothers, for example, after a consonant, minor pentatonic introductory section, features a two-bar bassline with the basic melodic outline 8-♭9-8-♭9-♭7-8 (in E). A very similar bassline (8-8-♭9-♭7-8) appears in some sections of '19 (Destruction Mix)' by Paul Hardcastle. The two-bar bassline of the electro styled 'Panic Zone' (1987) by hip-hop group N.W.A. also features a similar bass riff (8-♭7-8-♭9-♭7-8 (in C)). The electro track 'Crime of Passion' (1985) by Soft Touch (produced by Hashim), features a Phrygian-subset two-bar bassline, 8-♭9-♭10-♭9-♭7 (in F) (from 01:58) and a four-bar synth-string melody (at 02:53) based on the same notes. These riffs and melodies, encircling the foundation note, and using a Phrygian-subset

macroharmony largely restricted to the scale degrees 1,♭2,♭3,♭7, are therefore very macroharmonically similar to It's More Fun To Compute'.

Static Phrygian macroharmony can also be identified in early house and techno tracks, partly due to these style's continuity with electro hip hop. Model 500's 'No UFO's (Vocal)' (1985) (produced by Juan Atkins) for example, has often been regarded as the first techno track (Brewster & Broughton, 2006, p. 351), but this track was originally released with a more conventional electro style track, 'Future', on the B-side, indicating a continuity with the earlier electro style. 'Future', begins with a ♭6-8-5, 1-♭3-♭2 (in E) Phrygian-subset synthesiser riff and bassline similar to the examples discussed above. 'No UFO's', then, can be understood to feature a Phrygian-subset riff similar to those popular in electro hip-hop, but was one of the first tracks in which this type of riff was combined with house or techno style drum patterns. The bassline to 'No UFO's' begins and ends on the note of a, which would typically indicate that this should be regarded as the tonal centre of the track, however, a second riff, heard over the bassline, begins with three successive d notes (with each d note an octave above the last (1-8-15-12-11, in D)). This riff is doubled with minor triads to produce the progression Dm-Dm-Dm-Am-Gm and suggests that D should be heard as the tonal centre. The 'No UFO's' bassline can therefore be described as 5-♭9-♭7-8-5 (in D), and another example of Phrygian-subset macroharmony.

Phrygian-subset macroharmony was subsequently employed in numerous techno tracks in the 1980s. The Detroit techno track 'When We Used To Play' (1987) by Blake Baxter, for example, is built around the repeated two-bar bassline pattern 1-♭3-4-♭2 (in F♯). 'Call It Techno' (1989) by Frankie Bones, features the similar two-bar synth melody 1-8-1-♭9-8-1-8-1-♭10-♭9 (in B♭), over a two-bar minor pentatonic bassline, 8-♭7-8-♭7-♭10-♭7. Phrygian-subset macroharmony remained popular in later Detroit techno tracks, such as Drexciya's 'Lost Vessel' (1999), in which a synthesiser plays the repeated one-bar phrygian-subset riff, ♭3-4-8-♭9-8-8 over a repeated 8-♭7-8-♭7 (in C) bassline.

Phrygian-subset macroharmony can also be identified in some early examples of Chicago house that referred to the earlier style of electro hip-hop. For example, the track, 'Jack'n The House (1985)' by Farley Jackmaster Funk, released on the Chicago based Trax Records label,

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features an 8-♭10-♭7-♭9, ♭9-12 (in C), bassline that is a near quotation of the bassline of Kraftwerk's 'More Fun To Compute', with only slight changes. Chip E's 'Time To Jack (House Mix)' (1986) is based around a repeating one-bar Phrygian-subset bassline, 1-♭2-1-4-♭3-4-1 (in C♯). Quest's 'Mind Games (Street Mix)' (1985) similarly contains a four-bar 8-♭10-♭7-♭9-11 (in C) synth-string melody, that may be heard as similar to the main synth-string melody of 'More Fun To Compute'. Likewise, 'You Used To Hold Me (Kenny's Mix)' (1987) by Ralphi Rosario features a two-bar 1-♭2-♭3-♭2-1 (in C) that, due to its Phrygian-subset macroharmony, may also be heard as similar to riffs used in synth-pop or electro hip-hop.

In 1988 the British band The KLF (under the name The Timelords) released the novelty dance single 'Doctorin' The Tardis', featuring elements from Ron Grainer and Delia Derbyshire's theme tune for the British science-fiction television series. A remixed version of the track, 'Doctorin' The Tardis (Minimal)', which appeared on the B-side of the single, featured a slightly different arrangement of the track and includes a section with a two-bar Phrygian-subset bassline at the 01:33 mark (8-♭10-♭9-♭7-8 (in E)). This bassline pattern is taken from the introduction to the original 1963 version of the *Doctor Who* title theme, which was discussed above. In the same year, The KLF released the track 'What Time Is Love?' (1988), a track which also features static Phrygian-subset harmony. The basic melodic pattern of the two-bar bassline of 'What Time Is Love?' is 8-♭9-♭7-8 (in B♭), which may be heard as melodically similar to the bassline of 'Doctorin' The Tardis (Minimal)' and so to the *Doctor Who* title theme.

Due to the popularity of 'What Time is Love?' and subsequent cover versions and pastiches (some of which are collected on the compilation album *The What Time Is Love Story* (1989)), Phrygian subset riffs became very popular in Belgian new beat and early 1990s techno-trance music. For example, 'Time of War (A.C. Mix)' (1991) by Metropolis, begins with an 8-♭9-♭7-8-♭9-♭10 riff (in D). Phrygian-subset riffs were also employed in the more commercially oriented dance music of the period, that later became known as 'Eurodance', such as the 8-♭9-♭7, 8-♭7-8 (in B♭) riff that begins 'Twilight Zone' (1992) by Dutch dance-pop group 2 Unlimited. Phrygian-subset patterns and melodies subsequently became in common in 1990s trance

music. 'Teleport' (1996) by Man With No Name, for example, features a two-bar melodic riff, 5-8-♭9-♭6-5 (in C) (first heard at 01:03).

Phrygian-subset riffs were also popular in UK hardcore techno and bleep techno. For example, 'Mayday, Mayday' (1992) by Nasty Habits (an alias of producer Doc Scott), features an 8-♭9-♭14-♭7-11 bass riff. Similarly, 'Lords Of The Null Lines (Foul Play Remix)' (1993) by Hyper-On-Experience features a Phrygian-subset melody. At the 03:12 point of the track a synthesiser plays the following eight-bar melody: 8-♭9-♭7-8-4-♭6-5-1, 8-♭9-♭7-8-4-♭6-5-1-♭2-1 (in C), which can be split into two similar phrases of four bars. This melody is heard over a repeated four-bar Phrygian-subset bassline, 8-8-8-♭9-♭7 (in C).

4c. Static Harmony based on diminished or augmented chords

As was suggested earlier in this chapter, static macroharmonies based on triads other than a major or minor triad are likely to be heard as dissonant. Macroharmonies based on diminished triads and the octatonic scale (1,♭2,♭3,3,♭5,5,6,♭7) are common in machinic dance music although macroharmonies based on the augmented scale are far less common. Although the eight-note octatonic scale can only be awkwardly described by the seven-note diatonic scale degrees (1,♭2,♭3,3,♭5,5,6,♭7), this method of representation will be used in this section for the sake of readability.

Static harmonies based on a diminished chord, then, can be regarded as dissonant. However, while the octatonic scale itself may be understood as ultimately derived from a diminished chordal harmony, this scale also allows several different qualities of static foundation chords to be formed from it, so octatonic static harmony may be based on diminished, major or minor chords. The ♭5 scale degree, may therefore, in some cases, be considered a chord tone of a diminished chord, and in some cases a non-chord tone, for example if heard as added to a minor or major triad acting as the foundation chord. Regardless of the quality of foundation chord, in all of the following examples the macroharmonies outline some non-diatonic fragment of the octatonic scale and can be considered dissonant due to the fact that they are non-diatonic, and in many cases contain ♭2 or ♭5 scale degrees.

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Machine music in film and television music has often used diminished or octatonic static harmony to depict machines and technology. For example, an octatonic theme underscores a scene in the *Star Trek* episode 'The Corbomite Maneuver', scored by Fred Steiner, when the crew of *The Enterprise* first encounter the mysterious alien cube (01:27). The first four bars of the cue can be understood to outline a static harmony based on a foundation note of F♯, with the pitch collection 1,♭2,♭3,6,♭7 (in F♯). The following four and a half bars outline a static harmony based on a foundation note of B, with the pitch collection 1,♭2,♭3,6,♭7 (in B). The next eight bars outline a static harmony based on a foundation note of E, with the pitch collection 1,♭2,♭3,♭5,5,6,♭7 (in E). Each of these sections then, outline a five or seven note subset of the octatonic scale. The notes of the two melodic parts, labelled 'Bass note' and 'Ostinato' are listed in the below table.

Table 1: Octatonic harmony in *Star Trek* episode 'The Corbomite Maneuver' (1966)

Measure	Bass note	Ostinato	Foundation Note
1	F♯ (1)	E♭,E (6-♭**7**)	F♯
2	A (♭3)	F♯,G (1-♭**2**)	F♯
3	F♯ (1)	E♭,E (6-♭**7**)	F♯
4	A (♭3)	F♯,G (1-♭**2**)	F♯
5	B (1)	G♯,A (6-♭**7**)	B
6	D (♭3)	B,C (1-♭**2**)	B
7	B (1)	G♯,A (6-♭**7**)	B
8	D (♭3)	B,C (1-♭**2**)	B
9 (half bar)	B (1)	G♯,A (6-♭**7**)	B
10	E (1)	B♭,B (♭5-**5**)	E
11	C♯ (6)	C♯,D (6-♭**7**)	E
12	E (1)	B♭,B (♭5-**5**)	E
13	C♯ (6)	C♯,D (6-♭**7**)	E
14	E (1)	C♯,D (6-♭**7**)	E
15	G (♭3)	E,F (1-♭**2**)	E
16	E (1)	C♯,D (6-♭**7**)	E
17	G (♭3)	E,F (1-♭**2**)	E

The performance characteristics of the piece are very similar to Herrmann's 'Space Control' due to the use of straight rhythms and artificial sounds playing highly repetitive 'cells' of

melodic material. The oscillating, octatonic tonality in this piece is also similar to that found in Robert Hood's 'Minus' (1994) (discussed below).

Similar static octatonic harmony is used to depict the threat of machines in the *Doctor Who* story 'Spearhead from Space' (1970). In episode 3 of the story arc, composer Dudley Simpson accompanies images of the robot antagonists of the narrative, the Autons, with various ostinatos built on diminished chords. In the opening scene of the episode (from 0:30), the Autons are accompanied by a repeated b-c-b-f motif (♭5-5-♭5-1 (in F)), played on an electric guitar. In a later scene (at 13:51), the appearance of an Auton is briefly accompanied by an a-g♭-a-e (♭3-3-♭3-1 in E) ostinato over a held tritone chord based on E, forming an octatonic macroharmony. Both ostinatos can therefore be understood as generated from the diminished octatonic scale.

The first use of diminished or octatonic macroharmony in dance music can be identified in the work of Detroit producer Juan Atkins in the early 1980s. Atkins' bass patterns can be understood to be composed by adding octatonic 'added notes' to the central, static, minor triadic chord tones. In this section the add tones are highlighted for clarity. For example, the four-bar synth melody to Cybotron's 'Cosmic Cars' (1982) (**3**-♭3-**♭2**-♭3, **3**-♭3-**♭2**-1 (in F♯)) is produced by adding an oscillation around the ♭3 chord tone before descending to the tonic. The two-bar bassline to 'Cosmic Cars', 1-**3**-**♭2**-1-**3**-♭3 (in F♯) also uses the same macroharmonic collection. The technique of applying neighbouring octatonic added tones to the ♭3 chord tone of a minor triad is even more evident in the two-bar bassline to Cybotron's 'Clear' (1983), also produced by Atkins: 1-**3**-**♭2**-♭3-1, **♭2**-♭3-1-1, **3**-**♭2**-♭3-1, **♭2**-♭3-1-1 (in F♯). The main melodic movement in the bassline is the descent from ♭3 to the tonic, but this ♭3-1 motion is always preceded by the neighbouring notes of the ♭3 (either **3**-**♭2**-♭3-1 or **♭2**-♭3-1). This bass pattern is heard in combination with a repeated F♯m triad, which emphasises the minor triadic macroharmony and indicates that the ♭2 and 3 should be heard as dissonant additions to this minor triadic static harmony. The two-bar bassline to Channel One's 'Technicolor' (1986), again produced by Atkins, likewise features the same 3-♭2 pattern of neighbouring notes before the first ♭3: 1-**3**-**♭2**-♭3-**♭2**-♭3-♭10. The resulting macroharmony of these three examples

can be described as based on a static minor triad, but with added ♭2/♭9 and 3/♭4 dissonant non-chord tones.

An example of a later electro track featuring octatonic macroharmony is 'Scientist' (1995) by Dopplereffekt (another alias of Detroit producer Gerald Donald from Drexciya). The track can be split into two sections, both sections derived from the same octatonic scale with a foundation note of B. Similarly, Drexciya's electro-style track 'Wavejumper' (1995) features a four-bar diminished melody, first heard at 0:37, 1-6-♭5-♭10-8 (in B), the notes of which outline a dissonant, static Bdim⁷ chord.

Octatonic static macroharmonies can also be identified in house and techno tracks. The four-bar bassline to the Detroit techno track 'Out Of Control' (1987) by Intercity, produced by Kevin Saunderson, outlines a similar macroharmony to the Juan Atkins tracks discussed above. The bassline, 1-♭3-3-♭2-1-♭3-3-♭2-♭3-1 (in A♭) suggests a static minor triad (without the fifth) with added ♭2 and 3/♭4 dissonant non-chord tones. It also features the same 3-♭2-♭3-1 melodic pattern found in 'Cosmic Cars'. A similar macroharmony is found in the influential minimal techno track 'Minus' (1994) by Robert Hood. The track begins with a 1-♭2-1 (in G) bass pattern and a high-pitched synth pattern, 12-b17-5-8 (in G). Both of these riffs loop after every six sixteenth notes and therefore are heard to move in and out of phase with the drum pattern. After one minute and fifty seconds a second 'bleepy' riff is faded into the mix, which alternates between ♭3-3. The overall macroharmonic collection of 'Minus' is 1,♭2,♭3,3,5 (in G), which can be described as a static Gm harmony with added ♭2/9 and 3/♭4 dissonances.

A static diminished seventh chord provides the framework for the one-bar bassline of the Chicago house track 'I Can't Forget' (1987) by Mr Lee (8-♭10-♭12-6-♭7 (in F)), which outlines an arpeggiated diminished seventh chord before returning to the foundation note via a ♭7 lower neighbouring note. This bassline is later joined by a descending one-bar melodic riff, ♭10-8-♭7-6 (in F), which also outlines a diminished triad (6,8,♭10). This macroharmony can therefore be described as based on a dissonant static Fdim⁷ chord with an added ♭7 non-chord tone. A similar two-bar bassline begins Altern-8's 'E-Vapor-8' (1992), 8-♭10-♭9-6 (in E), in which the 1,♭3,6 diminished chord tones are heard (the notes of a Edim7 chord, without

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the flat fifth), and an octatonic feel is created through the use of a ♭9 as a lower neighbouring note of the ♭10. The bass riff of 808 State's 'Cubik' (1990), is based on a minor triad with an added ♭5 dissonance, 5-♭5-♭3-1 in E. This riff is followed by a second 8-1-5-♭5-♭3-1 riff in E. Similarly, the speed-garage track 'Alienz' (1999) by Armand Van Helden features a 'Reese' bassline that can be described as 5-♭5-1-5-♭5-12 (in A), or a perfect fifth, with an added ♭5 dissonance.

Some static riffs in dance music may be heard to outline a macroharmony based on the Locrian scale rather than the octatonic scale. The Locrian scale based on a diminished chord, but differs from the octatonic scale, in that it has a scale degree of a natural fourth below the ♭5 (1,♭2,♭3,4,♭5,♭6,♭7). The bass pattern found at the start of 'It Is What It is' (1988) by Rhythim is Rhythim (Derrick May), for example, 1-♭5-4-1, 1-4-♭5-4-♭5-1 (in B), may be described as having a Locrian character. The same is true for the whole of 'Let's Dance' (1993) by Detroit electro group Aux 88 which begins with the bassline ♭5-1-♭3-4 (in B♭) and features several other riffs based on the same notes.

4d. Non-chordal randomised chromatic patterns

The previous types of dissonant static harmony have described as based, to some extent on conventional minor pentatonic riffs, familiar from R&B and blues traditions. They have therefore described macroharmonies based on familiar chords, either a minor seventh or diminished chord, with non-chord tones added to this chordal framework. However, some non-supermodal static harmonies in dance music are based on randomly generated chromatic melodic patterns, and as a result, can be distinguished from preceding types of static harmony as they do not clearly suggest any underlying chord. Often, the foundation note in these cases is simply suggested by perceived structural emphasis (i.e., the first note of a pattern) or assertion (most common pitch). This is the case as long as the random generated sequence is based on a chromatic scale collection.

Randomised bass patterns are most commonly associated with the acid house style and the uses of the Roland TB-303 synthesiser, which as Brewster and Broughton have suggested, is capable of producing random melodic patterns.

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Random patterns are still employed in contemporary techno styles. A recent music production tutorial video explains how producers can use the randomising function on the 'maxforlive' ML-185 step sequencer in *Ableton Live* to produce melodic patterns that are appropriate for use in techno productions. The tutor suggests, when discussing how to programme a Roland TB-303 bass pattern, that it 'doesn't matter what notes are played' (Verlinden, 2021).

Such randomly generated patterns, then, can be regarded as dissonant if they contain chromatic pitch collections, suggest a macroharmony based on a diminished or augmented triad, or outline the Phrygian or Locrian modes. The paradigmatic example of a random chromatic pattern in acid house is the bass pattern to 'Acid Tracks' (1987) by Phuture. This track features half-bar bass pattern that may be heard as having a foundation note of A (the first note of the pattern), in which case it can be described as having the sequence of notes: 8-1-♭3-♭2-5-10-3-♭2 (in A). This sequence can therefore be described as dissonant, but, unlike many of the other examples discussed in this chapter, there is little sense that this sequence is based on the notes of a particular chord. The first four notes suggest an A minor triad with an added ♭2, but the second four notes suggest an A major triad with added ♭2. The overall macroharmony, 1,♭2,♭3,3,5, however, can be described as an octatonic-subset and dissonant.

The bassline to Armando's 'Downfall' (1988) may be heard as having the tonal centre of G (the first note of the pattern), in which case the single-bar sequence can be described as /8-♭20-18-8/♭13-♭20-18-17/10-x-7-8-/10-18-16-b15/ (with slashes marking the division of the bar into four beats). This pattern outlines the non-diatonic macroharmony 1,♭2,2,3,4,♭6,7 which contains the chromatic collection 1,♭2,2. There is no melodic movement between the foundation note and third at any point, and again the pattern does not suggest any particular foundation triad.

It can ultimately be impossible to know, through analysis of a pattern, whether a particular pattern has been generated by a truly randomised process, but chromatic, non-chordal

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patterns are also common in modern techno. 'Mispress' (2015) by Binny, for example, features a half-bar /9-7-♭12-b17/x-7-11-♭14 pattern over a bassline that asserts a tonal centre of A♭. This 1,2,♭3,4,♭5,♭7 macroharmony contains the notes of an A♭m7$^{♭5}$ chord and can be regarded as dissonant, but the riff itself does not include the tonic note. So, while it may weakly suggest a diminished triad, its lack of familiar ♭3-1 or ♭7-8 melodic elements may also suggest that it has been composed by a random process.

5. Dissonant static harmony as an anaphone for machine noise

As was argued in the previous chapter, dissonant static harmonies may be heard as sonic and kinetic anaphones for the noise and movements of machines and technology, with the harmonic 'noise' of dissonant harmonies heard to anaphonically suggest the acoustic noise of machines. However, in the context of machinic dance music, the anaphonic significance of dissonant harmony is often contextualised and clarified through the use of paramusical texts which suggest specific interpretations of such harmony. For example, dissonant static harmony has often been employed in machinic dance tracks with accompanying paramusical texts that describe a 'computer world'; a futuristic society characterised by an all-pervasive technological environment which has replaced the 'natural' world. In the context of such tracks, then, paramusical texts may guide listeners towards the interpretation of dissonant static harmony as evocative of the specific sounds and movements of that 'computer world'.

The paradigmatic example of the 'computer world' in machinic dance music is Kraftwerk's 1981 album of the same name. As was noted in the previous chapter, the *Computer World* album has often been understood to warn against the dangers of a technologically 'saturated' society. Uwe Schütte, for example, has argued that the album describes 'a future saturated with technology but lacking in human connection' (Schütte, 2020, p. 148) and has quoted Kraftwerk's Raph Hutter, who has indicated that the album was intended to be heard as a critique of the 'reactionary' politics of Western societies:

> 'By making transparent certain structures and bringing them to the forefront – that is a technique of provocation. First you have to acknowledge where you stand and what is happening before you can change it. I think we make things transparent, and with this transparency, reactionary structures must fall' (Schütte, 2020, p. 151).

Pascal Bussy has similarly quoted Maxime Schmitt, Kraftwerk's promoter, as stating that *Computer World* 'was a political album. Totally. The denunciation of the machines, the denunciation of the police and of the financial institutions as you can hear it in the 'Computer World' track' (Bussy, 2005, p. 117).

However, the use of dissonant static harmony in *Computer World* is not closely linked to the paramusical articulation of this social critique and can instead be associated primarily with the anaphonic evocation of the sounds and movements of computer world itself. For example, the lyrics of the song 'Computer Love', in which the narrator of the song laments 'another lonely night', staring 'at the TV screen', clearly suggest a critique of a technology-focused society, but, rather than employing dissonant static harmony, 'Computer Love' features conventional chordal harmony, which may be heard as expressive of the disaffection described in the song's lyrics. Equally, in the two tracks on *Computer World* in which dissonant static harmony is employed, 'Home Computer' and 'It's More Fun To Compute', this harmony is not presented in combination with any explicitly critical paramusical text. Consequently, in these two tracks at least, the 'computer world' is presented more ambiguously than has been suggested by Schütte, Hutter and Schmitt, and the Phrygian-subset riffs of these tracks may be heard, primarily, as anaphonically evocative of the noise and movements that are characteristic of the computer world. For example, the repeated, rhythmically straight synthesiser riffs of these tracks may be heard to suggest the precise clockwork-like operation of a perfectly functioning computer, while the dissonant Phrygian-subset macroharmony of these riffs may simultaneously be heard to connote that such technology is noisy, strange, and inhuman. The use of dissonant static harmony as an anaphone for the sounds and movements of computer technologies, then, may be identified in Kraftwerk's *Computer World*, and in the many subsequent machinic dance music works that feature similar paramusical texts.

The paramusical framing device of the 'computer world' was later adopted and developed by Detroit electro and techno producers such as Juan Atkins. In the track 'Future' (1985) by Model 500, the lyrics describe the 'revolutionary' social changes that will be brought about by the adoption of new digital technologies:

Techno revolution, and fast technology, enter a computer, robotic factories. Brand new innovations, brand new ideas, change is all around us, the future is here. Pocket calculators and TV sets, remote control, and micro-cassettes.

The lyrics are ultimately ambivalent about whether such a 'techno revolution' will be of benefit to society, but the dissonant Phrygian-subset ♭6-8-5-1-♭3-♭2 riff and bassline around which the track is constructed, may be heard, like 'It's More Fun To Compute' as evocative of a technology saturated future environment that is radically different to the 'natural' world of the past and present.

More recent Detroit electro albums have similarly referred to futuristic 'computer worlds' in their paramusical texts. The *Wireless Internet* (2002) album by Arpanet, an alias of Drexciya's Gerald Donald, begins with a track 'The Analyst', in which a synthesised voice describes the radical changes to society that will be result from the adoption of wireless communications technologies, concluding with the claim, 'we are all atomic and sub-atomic particles, and we are all wireless'. The second track on the album, 'Illuminated Displays' (which is included in the listening test, detailed in Chapter Six), begins with a dissonant, Phrygian subset 1-5-♭6-♭7-♭7-♭3-4-5, 1-5-♭6-♭7-♭9-♭2-8-1 melody (in F♯), which concludes with a neighbour pattern highly reminiscent of Kraftwerk's 'Trans-Europe Express' (1977). This dissonant harmony is, again, likely to be heard as evocative of the all-pervasive technological noise of this computer world.

However, some dance tracks have featured paramusical texts that describe a computer world that is characterised by the increased power of capitalist institutions (and therefore presented as explicitly oppressive and dystopian) and have combined these paramusical texts with the use of dissonant static harmony. In these contexts, the technological noise of dissonant static harmony may be heard as particularly harsh, unsettling and oppressive. For example, the techno track '1976' (2014) by Tzusing, combines a Kraftwerk-like 8-♭9-8-♭7 Phrygian-subset dissonant synth pattern with an extended sample of a monologue from the film *Network* (1976), during which the speaker declares 'it is the international system of currency which determines the totality of life on this planet'. The group NRSB-11, made up of members Gerald Donald, Penelope Martin and Sherard Ingram, has similarly used dissonant static harmony in the context of tracks that refer to the oppressive technologies of the global financial system. The album *Commodified* (2013), includes tracks with titles such as

'Consumer Programming' and 'Dead Society'. The track 'Consumer Programming' features a dissonant 8-5-♭9-8, 8-♭7-♭9-8 (in F#) synthesiser melody (from 0:59) whilst a voice intones the slogans, 'mass consumption, mass marketing'. In both of these examples, the use of dissonant static harmony, as part of a wider machinic aesthetic, may be heard to suggest that the future computer world will be one that is harsh and brutal as well as unnatural and artificial.

Separately to these evocations of futuristic computer worlds, dissonant static harmony has also been employed in what Ben Williams (2001, p. 164) and Kodwo Eshun (1998, p. 117) have referred to as 'militant' or 'military' techno tracks. In the context of these tracks, which often feature paramusical texts referring to futuristic weapons and warfare, dissonant static harmony may be heard as specifically evocative of technologically-mediated warfare and violence. Dissonant static harmonies in militant machinic dance music may also be heard as structurally similar to the dissonant harmonies that are common in film 'martial music'. Music depicting armies and aggressive warlike societies in film music has often featured dissonant static harmonies, and so the structurally similar dissonant harmonies in militant machinic dance music may be interpreted in a similar fashion. For example, the brutal and violent nature of the Roman army is suggested through the repeated use of dissonant static harmony in Miklos Rozsa's score to *Ben Hur* (1959) (Hickman, 2011). In the cue 'The Galley (Rowing of The Galley Slaves)' (1996), which underscores scenes of Roman slaves rowing in time to a beating drum, the brutality of this forced labour is emphasised by the dissonance of the repeating octatonic ostinato, 1-5-♭7-♭5-♭2-♭3-1 (in C). In the film *The Magnificent Seven* (1960), similar octatonic diminished harmony is used to suggest the aggressive character of the antagonist 'Calvera', the leader of a group of bandits. Calvera's diminished theme is first heard as 6-6-6-♭7-6-5-6-♭5 (in F) (in the cue 'Main title and Calvera'). Such depictions of martial brutality have also been transferred directly into a science fiction narrative context. The Roman-styled martial alien 'Romulans', in *Star Trek* (1966) are associated with similar octatonic ostinatos. Heard at 14:42 in the Star Trek episode 'Balance of Terror' (1966), the theme for the Romulans consists of a 1-♭2-1-♭3-1-♭5-1 ostinato, followed by a 1-♭3-1-♭5-1-♭7-1 ostinato, suggesting the warlike nature of the Romulans.

The sense that dissonant static harmonies in militant machinic dance music may be heard as evocative of violence may be strengthened if such harmonies are also heard to resemble the

dissonant harmonies of film 'monster music', which have similarly been understood as expressive of violence and aggression. For example, John Williams' 'shark theme' from *Jaws* (1975) (in 'Main Title (Theme From Jaws)' (1975)) begins with a bass ostinato suggesting an 8-♭9-8-♭9 pattern (in E), alternating with an 8-♭9-♭7-8 pattern (in E). In this example, the dissonance of the repeated minor second intervals may be heard as expressive of the ferocity and violence of the shark. According to Emilio Audissino this motif 'effectively represents the shark: a primitive yet proficient killing machine, moved only by the instinct for eating' (Audissino, 2014, p. 112). Alan Silvestri's title theme to the film *Predator* (1987) combines a similar ostinato with synthesised instrumentation to suggest the technological and lethal nature of the alien 'Predator'. This theme features a synthesiser bass sound which plays an ostinato, 1-1-1-♭3-♭2-1 (in E). Over this ostinato a 'martial' horn sound plays a 5-♭5-♭2-♭5-5-(6-♭7) motif, outlining a static octatonic harmony on E. This music is used at the start of the film to establish both the military setting of the film, following a squad of soldiers in a jungle in an unspecified country, but also foreshadows the appearance of the technologically augmented alien 'killing machine' later in the film. As was discussed earlier in this chapter, similar octatonic ostinatos were used to depict the violent nature of the alien Autons, in the *Doctor Who* episode 'Spearhead From Space' (1970), where it may also be heard to suggest that the Autons are unthinking, compassionless, and aggressive 'monsters'.

Dissonant static harmonies similar to those found in film 'martial music' and 'monster music', then, may be identified in many 'militant' machinic dance music tracks. In the context of a wider machine aesthetic such harmony may be interpreted as evocative of war and violence, but within a specifically machinic and technological context. For example, the paramusical texts of numerous militant dance tracks featuring dissonant static harmony, such as Underground Resistance's 'Electronic Warfare (Aux 88 Remix)' (1996), Reese and Santonio's 'Force Field' (1988), Jeff Mills' 'Programmed to Kill' (2011) and 'Sonic Destroyer' by X-101 (1991) suggest that their dissonant static harmonies should be interpreted as expressive of the violence of futuristic warfare. Dissonant riffs have also been employed in early hardcore techno tracks such as 'H-Formula' (1992) by The Vision (an alias of Underground Resistance producer Robert Hood), which features a 1-4-♭5 (in C) bassline (from 0:41) containing a tritone dissonance, and the influential techno track 'Mentasm' (1991) by Second Phase, which is

based around a bass riff that emphasises the melodic motion of 1-5-♭2 (in E♭) (emphasising the tritone interval between the 5 and ♭2). The UK rave track 'Violence' (1991), by Terra Incognita features a 1-5-♭5 riff (in D) that, by emphasising a tritone interval, may be heard as connoting the violence of the track's title. The later UK electro track 'Auton' (2002) by Silicon Scally, begins with a 1-♭5 tritonal bassline (in D), before introducing a diminished scale 1-5-6-♭5 riff and a 5-♭5 string motif. This track therefore utilises the same diminished macroharmony as Dudley Simpson's music for the Autons in 'Spearhead from Space', strengthening the track's evocation of these alien 'killing machines'.

The association of dissonant static harmony, in the context of a machine aesthetic, with the violence of technological warfare, can also be identified in Paul Hardcastle's '19 (Destruction Mix)' (1985). The features two alternating sections that employ contrasting harmonic systems; a chorus section utilising conventional chordal harmony (Em^7-Bm^7/E or i-v (in E)) and featuring plaintive lyrics ('all those who remember the war, they won't forget what they've seen, destruction of men in their prime, whose average age was nineteen'); and a contrasting section with a dissonant Phrygian-subset 8-♭9-♭7-8 bassline (in E). This second dissonant section also features the sounds of air-raid sirens and sampled dialogue of newsreaders describing the deaths of American soldiers in the Vietnam war. This dissonant section, then, might be heard to specifically evoke the violence and danger of technological warfare. The first half of the track contains multiple alternations between these two sections, with the newsreaders' dialogue always accompanied by the dissonant riff.

'19 (Destruction Mix)', then, explicitly maps a paramusical opposition, between 'violent conflict' and 'peaceful compassion', onto a musical structural opposition, between the sections of consonant and dissonant harmony. Dissonant static harmony, in this context, is therefore explicitly associated with war and the 'destruction' of the song's title. This association is further reinforced by a short section (at 06:09), in which a dissonant Fdim chord is repeated over sampled sounds of gunfire and explosions. As a result, even though '19' features a dissonant bassline similar to those used in many 'militant' dance tracks, it is unusual in explicitly criticising the 'militancy' that the riff is associated with. A distinction can be made, then, between the 'oppositional' nature of Paul Hardcastle's '19', and most dance music

tracks, which by constructing no 'natural' human subject, contain no human position from which to critique such violence.

This section has described two types of paramusical framing device that have been popular in machinic dance music, and which have often been used in combination with dissonant static harmony. It has suggested that in both of these contexts, dissonant static riffs may be heard as evocative of machine noise and machine movement, but that these meanings have been made more specific by their presentation with paramusical texts which refer to particular technologies, societies and historical events. In the examples of tracks that refer to a futuristic 'computer world' scenario, dissonant static harmony may be understood to suggest the omnipresent sounds and workings of a technological environment which has replaced the natural world. In the examples of militant machinic dance music this machine noise is often specifically contextualised by paramusical texts as the noise of futuristic war and violence. However, all of the above examples can be heard to use dissonant static harmony to suggest a future in which the 'harmony' of the natural world has been replaced with technological noise, whether the noise of a 'computer world' or the noise of future conflict.

6. Dissonant static harmony as an anaphone of negative emotions

While dissonant static harmony in dance music may be heard to depict machine noise and non-human subjects, scholars such as Robert Fink, Karen Collins, and Philip Tagg have, by contrast, primarily associated dissonant static harmony with the expression of human emotions and subjectivity. The relationships between the individual pitches, in passages of 'tonal' Western art music, have traditionally been interpreted as expressive of human emotional states. Deryck Cooke has argued, for example, that Western art music is 'the supreme expression of universal emotions' and 'a language of the emotions, akin to speech' (Cooke, 1959, p. 33), and that the 'tensions' between notes 'constitute the whole apparatus of musical expression' (Cooke, 1959, p. 34).

Discussing Western art music in general terms, Cooke suggests that notes on flattened scale degrees within a passage of music are more likely to be expressive of painful emotions, anguish, and sorrow than their 'natural' scalar counterparts. Therefore. while the major third

is 'contentedly joyful' (Cooke, 1959, p. 64) the minor third is likely to be heard as 'depressed' and 'unnatural'. While the major sixth expresses a 'pleasurable feeling of being dissatisfied' the minor sixth expresses 'acutely painful dissatisfaction' (Cooke, 1959, p. 69) and while the major second is 'largely neutral' the minor second expresses 'hopeless anguish' (Cooke, 1959, p. 78). Film composer Lalo Schifrin also describes a 'relationship of music and emotions' when discussing the use of modal scales as a compositional choice. Schifrin suggests that the Ionian mode as appropriate for 'for positive moods, happiness, euphoria, exhilaration' while the Dorian and Aeolian modes are able to depict 'sadness, melancholy, loneliness'. (Schifrin, 2011, p. 2).

Cooke's descriptions of the expressive potential of scale degrees is primarily directed towards interpretation of discursive chord progressions and melodic development in Western art music. However, harmony in rock, which is also typically organised around chord progressions, has been interpreted in a similar fashion, as expressive of human emotions. In *On Aeolian Harmony in Contemporary Popular Music* (Björnberg, 1984), Alf Björnberg argues that the Aeolian mode has historically been associated in rock music with the expression of broadly negative emotions. He suggests that the lyrics of Aeolian rock songs typically deal with subject matters such as 'historical and mythic narratives, static states of suspense and premonition, alienation in life and in personal relationships and fear of, but also fascination by, the future and modern technology and civilization' (Björnberg, 1984, p. 5). An example of discursive, chordal, Aeolian harmony in rock, that might be interpreted in those terms, is the ♭VI-♭VII-i progression of the chorus of David Bowie's '1984' (1974).

Machinic dance music has also often been described as similarly emotionally expressive. Dan Sicko has argued that 'Detroit techno would become filled with longing voices and chords – sounds that must seem melancholy and even trite to European audiences' (Sicko, 2010, p. 38). Similarly, Detroit techno has been contrasted with Chicago house: 'the two styles were very different emotionally, in keeping with the cities that bred them: while house was about lustful churchy energy, techno dealt in lament and anxiety. Even today, in discussing what defines the style, Derrick [May] casually relies on the word 'melancholy' (Brewster & Broughton, 2006, p. 354). However, these quotes do not specifically argue that the emotional expressiveness of techno is due to the use of dissonant static harmony, which, as has been

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suggested in this chapter, may be heard as depicting the workings of machines rather than the emotions of human subjects.

As was noted in the previous chapter, jazz and soul derived chordal harmony is often employed in Detroit techno music, and so, when Simon Reynolds describes Derrick May's 'It Is What It Is' as 'elegantly elegiac (Reynolds, 1998, p. 11), this emotional expression may be attributed primarily to the use of conventional chordal harmony and melodic development in this track. In addition to the Locrian mode static riff discussed above 'It Is What It Is' features a v–ii–♭VI–♭III chord progression (in B) and a clearly defined 'lead' melodic part. These melodic and harmonic elements may be regarded as the most 'emotionally expressive' aspects of the track, and it seems probable then, then, that the interpretation of this track as melancholy or 'elegiac' might be due to the presence of these elements, rather than the underlying dissonant static harmony.

However, some research has argued specifically that dissonant static harmony in synth-pop and industrial music is, in itself, likely to be heard as emotionally expressive, and is often associated with the expression of sorrow or anxiety. Robert Fink has described the Phrygian melody of Kraftwerk's 'Trans-Europe Express' (1977) (and also Afrika Bambaataa and Soulsonic Force's 'Planet Rock' (1982)) in strongly emotional terms as a 'dark synthesizer tune, full of Germanic Weltschmerz'. Fink links this expressive effect to the melody's 'minor-key chromaticism' and also argues that 'the theme's specific habit of repeated leaps up to the lowered sixth degree of the minor scale will overwhelmingly be read as expressive of pain and sorrow' (Fink, 2005, p. 346). Fink suggests, describing the use of the melody in 'Planet Rock' (1982) that 'the appropriation of the Weltschmerz theme by Baker and Bambaataa transferred some of that anxiety and gloom into African-American music' (Fink, 2005, p. 349) suggesting that Phrygian melodies in the electro hip-hop style are equally likely to be heard as expressive of these painful emotions.

Fink's interpretation of 'Trans-Europe Express' (1977), then, differs considerably from that which was suggested in the previous chapter, where it was argued that the track may be heard primarily as depicting (potentially disturbing and unsettling) machine 'noise' rather than human emotions directly. It may be the case that this melody can be interpreted in both ways, particularly as the melody of 'Trans-Europe Express' is much longer and more developed than

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many of the examples of dissonant riffs discussed in this chapter. The melody develops over four bars and has a strong sense of finality when it concludes ♭9-8-♭7-8. It is possible that this melody may be heard as expressive of 'pain and sorrow' or other emotions, although, this interpretation is not supported by the paramusical text of 'Trans-Europe Express' or 'Planet Rock' neither of which contain any reference to emotional pain.

Similarly, Karen Collins has argued that the Phrygian-subset 'bass ostinato' of the industrial track 'Serene Image' (2001) by Flesh Field, is also likely to be heard as expressive of negative emotions such as 'anguish' and 'despair' (Collins, 2005, p. 175). This bassline, based on the note sequence 1-♭3-♭2-1 in C is a Phrygian-subset riff, and is similar to the bass riff of Kraftwerk's 'It's More Fun To Compute' (1981) and many bass riffs in machinic dance music. Collins suggests that this bass ostinato, containing a 'Phrygian inflection' is likely to be heard as ''dark', 'heavy', 'sombre' or 'gloomy'' (Collins, 2005, p. 175), and also suggests that Aeolian scale riffs might be heard to possess similarly negative qualities, due to the inclusion of the minor sixth scale degree, which she describes as 'emphasising the sadness in the lyrics' in an example of industrial music (Collins, 2005, p. 174). She also argues that 'the semiotic connotations of industrial music, particularly in its tonality, seem closely related to the moods and tones of cyberpunk - despair for the future, darkness, anxiety and uncertainty, urban decay, and violence' (Collins, 2005, p. 175).

Philip Tagg has also speculated that dissonant harmonies in dance music, containing a ♭2 scale degree, may be heard as expressive of pain, sorrow, or other negative emotions, again approaching this analysis of the expressive potential of 'tensions' in harmony, similar to Deryck Cooke. Tagg notes that, 'with the exception of a few rock songs from the early eighties which sported lyrics expressing alienation, hopelessness and a sense of doom, no internationally popular music of this century has shown such a leaning toward these modes with their downward pulling minor sixths and/or seconds' (Tagg, 1994, p. 9). Tagg, then, suggests that the ♭2 scale degree, specifically in the context of dance music, will be heard as expressive of negative emotions.

Dissonant static harmony in dance music may also be heard to express 'tension' and the human emotions associated with it, in a similar fashion to examples of film music that also

use passages of dissonant static harmony. The internally unstable qualities of dissonant static harmony have been historically exploited by film composers to create a sense of tension in film scores. Passages of dissonant static harmony, in the form of repeated ostinatos, are commonly used in film music to create tension, exploiting the internal instability and harshness of the harmony. For example, a sense of threat and tension is conveyed in the cue 'At The Bank' from John Powell's soundtrack to *The Bourne Identity* (2002), which repeats the one-bar phrase, 1-5-♭6-5-4-5-♭3-♭2-1, initially in C. This ostinato creates tension through the use of the ♭2 scale degree, heard in the same static harmony as the foundation note, and can be described as a Phrygian-subset harmony. It also increases tension through short-term repetition and harmonic stasis, and a refusal to resolve to immediately resolve to a more consonant harmony. Such dissonant ostinatos in film music are common and may be understood to represent or evoke human emotions, rather than depicting non-human subjects or the movements of machines. For example, Rebecca Eaton, considering the possibility that serialist music might be heard as a sign for machine-like 'rational thought of science and mathematics', suggests that this may be unlikely as 'atonal or dissonant musics are already culturally encoded in film as "scary" or "chaotic"' (Eaton, 2014, p. 12). It is possible that dissonant static harmony in dance music may be interpreted in a similar way by listeners and may be regarded as directly expressive of tension, excitement, anxiety or gloominess.

While this interpretation of dissonant static harmony in dance music as evocative of negative emotions is possible, it differs from the previously outlined interpretation of dissonant static harmony as expressive of an emotionless machine subject. An interpretation of dissonant static harmony as primarily depictive of machine noise, contradicts the interpretation of the same harmony as expressive of 'anguish' or 'despair'. However, while it is possible to disagree with Fink, Collins and Tagg's interpretation of the emotionally expressive qualities of dissonant static harmony, it is possible that the association between dissonant static harmony and machine noise may still be heard to suggest the 'alienation of dehumanisation' that Collins argues is part of a general 'dystopian' stylistic strategy of 'social critique' in industrial music (Collins, 2005, p. 166). The perceived emotional absence and 'coldness' of dissonant static harmony may provoke anxieties, on the part of the listener, about the loss of 'human' emotional expression. Simon Reynolds has similarly noted that some listeners may find the 'erasure of humanity' in machinic dance music as 'unnerving' (Reynolds, 2007, p. 314). So,

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when, Robert Walser suggests that the Phrygian mode is 'distinctive' as the 'second degree hangs precariously over the tonic, making the mode seem claustrophobic and unstable' (Walser, 1993, p. 47), in the context of static harmony in dance music this claustrophobic and unstable quality of the ♭2 scale degree may be understood to depict the disturbing and 'unstable' sound of machine noise and machine movement rather than any 'unstable' human emotions. In this context, dissonant harmony may be heard as unsettling and disturbing precisely because it is not heard to be expressive of human emotions.

7. Objections to Tagg's claim that Phrygian harmony in dance music functions as a genre-synecdoche for non-Western music

The idea that Phrygian harmony in machinic dance music is likely to be heard as genre synecdoche of 'non-Western' music is one that has been proposed by Philip Tagg, but which can be shown to be relatively unconvincing. This section argues that only macroharmonic collections containing an augmented second interval between scale degrees are likely to function as genre synecdoches in the way that Tagg suggests. None of the four types of dissonant harmony most common in machinic dance music typically contain this scalar interval, and so are unlikely to be heard as genre synecdoches of non-Western music.

In the article *From Refrain to Rave* Tagg suggests that "rave music's penchant for the Phrygian, a mode virtually unused previously in any form of internationally well-known music apart from what came out of Spain in the form of *malgueñas, farrucas, fandangos* and flamenco music" is "particularly remarkable" (Tagg, 1994, p. 9). Although Tagg does not give any specific examples of works that employ the Phrygian mode, he does speculate how the use of this mode might be interpreted by listeners of electronic dance music: "from a Eurocentric viewpoint, this is the mode of Spain, gypsies, Balkans, Turks and Arabs, possibly also of the *mezzogiorno*." In the course of his speculation as to why producers of electronic dance music might be using the mode, and what they might be hoping to communicate in using it, Tagg poses the question, "why Phrygian?" (Tagg, 1994, p. 9)

Tagg's argument implies that 'Phrygian' harmony in dance music will typically be heard as a genre synecdoche for non-Western music, due to the similarity between the Phrygian scale and the 'maqam' scales of traditional Arabic music. In *Everyday Tonality II* Tagg describes

numerous maqamat scales, which he suggests are 'common in music from the Arab world, the Eastern Mediterranean, the Balkans, Greece, Turkey and southern Spain' (Tagg, 2018, p. 113). He also suggests that Western listeners might hear these modes as ''exotic' or 'different''. Tagg notes that maqam scales are constructed from the combination of two tetrachords, or groups of four notes, with the lower tetrachord based on the tonic and the upper tetrachord based on the fifth note of the scale. The Hijaz tetrachord describes a sequence of four scale degrees, which when based on the tonic outlines the scale 1,♭2,3,4 and when based on the fifth, creates the scalar sequence 5,♭6,7,8. Distinctively, the Hijaz tetrachord contains an augmented-second interval between its second and third notes.

A huge range of maqam scales can be produced through combination of tetrachords, many of which are identical to familiar Western diatonic scales and modes, but Tagg suggests that 'Western musicians will typically zoom in on the differences between euroclassical tonality and that of the maqam world' (Tagg, 2018, p. 120) when using harmony to suggest 'non-Western' music. This means that the maqam scales that are unlike Western diatonic keys or modes are most likely to be employed as genre-synecdoches of non-Western music in the context of Western music. Tagg identifies 'modes containing ♭2 ('flat two') and/or ♯4 ('sharp four') and/or an augmented second (scale step of 1 ½ tones)' (Tagg, 2018, p. 113) as likely to be heard as genre-synecdoches of non-Western music.

Musicologist Derek. B. Scott agrees that the Phrygian mode (containing the ♭2 scale degree) is one of many 'orientalist devices' that appear in orchestral music as genre synecdoches of non-Western music, and which were employed to make a 'simple distinction between Western Self and Oriental Other'. (D. B. Scott, 1998, p. 309) Scott also lists the use of 'augmented seconds and fourths (especially with Lydian or Phrygian inflection)' (D. B. Scott, 1998, p. 327) as potentially being heard as genre synecdoches of non-Western music. Locke also identifies 'chromatically altered' scales including the 'lowering of the second scalar degree' (Locke, 2009, p. 51) as having non-Western connotations. Locke also suggests that the augmented second, when heard 'with a pounding rhythm and unchanging drone-based harmonies [...] becomes a crystal-clear announcement that we are now "in" the Middle-East' (Locke, 2009, p. 55).

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Scales containing a Hijaz tetrachord are frequently used in film and television music as genre synecdoches of non-Western music. One of the most famous examples of this type of signification in film music is Maurice Jarre's main theme to *Lawrence of Arabia* (1962) ('Main Title' (1982). The accompanying chord progression to the main melody is chromatic (I-iidim⁷-I-♭vii-I (in D), but the first phrase of the melody, 8-5, 3-4-♭6-7-8-5 (in D), outlines a Hijaz Kar scale, featuring an augmented second interval between the ♭6 and 7 scale degrees. Similarly, in Jack Nitzsche's score to the action-adventure film *Jewel of the Nile* (1985), a Hijaz tetrachord is associated with the Arab character Omar Khalifa, who is first introduced with a 1-♭2-3-4-3-♭2-1 (in G) motif played on a synthesiser.

Hijaz tetrachords have also been used in pop and rock music as genre synecdoches for non-Western music. Often these Hijaz melodies will also include rapid stepwise runs up and down a scale, which Scott has also identified as a possible signifier of non-Western music, in the context of Western art music (D. B. Scott, 1998, p. 327). Rapid scale passages are a feature of the melody of Dick Dale's 'Misirlou', beginning 1-♭2-3-4-5-♭6-7-♭6-5 (in E), in which the melody begins with a full ascent through the complete Hijaz Kar scale. Similarly, the figure that concludes each phrase of the main riff of 'Powerslave' (1984) by Iron Maiden, 4-3-4-5-4-3-♭2-1 (in A), is also characterised by rapid stepwise movement through a Hijaz tetrachord based on the tonic. The Hijaz tetrachord has also been used in funk and R&B music as a genre synecdoche. *Open Sesame* (1976) by Kool & The Gang begins with the melody 8-7-♭6-7-8-♭9-10-♭9-8-7-♭6-7-8 (in B), which is doubled with open fifth chords ('bare fifths' are another common genre synecdoche of non-Western music, according to Scott (D. B. Scott, 1998, p. 327)) and which contains augmented seconds between the ♭2 and 3 and ♭6 and 7 scale degrees.

The Hijaz tetrachord has also been used as a genre-synecdoche for non-Western music in styles of synth-pop and dance music that may otherwise be heard to possess a 'machinic' aesthetic. For example, the 1-♭2-3-4-5-♭6-5-4-3-4-3-♭2-1 (in E♭) melody of 'Halwa' by German synth-pop band Cluster (1976) is likely to be heard as a genre-synecdoche of non-Western music. This melody outlines a lower Hijaz tetrachord and emphasises the augmented second gap between ♭2 and 3 by ascending and descending across the scale.

Another use of a Hijaz tetrachord as a genre synecdoche of non-Western music in synth-pop can be identified in Giorgio Moroder's '(Theme From) Midnight Express' (1978). In this example, the Hijaz tetrachord is very likely to be interpreted as a genre synecdoche of 'Turkish music', as the track appeared in the soundtrack to the film *Midnight Express* (1978) about a young American man imprisoned in Turkey. The track features the chord progression i-v-i-v-♭VI-♭III-♭II-V$^{♭9}$-i (in G), with a Hijaz melody, 7-8-7-♭6-7-♭6-5-7-8-7-♭6-5 (in G), played over the ♭II-V$^{♭9}$ chords at the conclusion of the progression. Giorgio Moroder again included a Hijaz tetrachord melody in 'The Chase' (1978), a track that otherwise may be heard as a paradigmatic example of machinic dance music. The main part of the track employs a conventional minor pentatonic static harmony, with a foundation note of C. However, a bridge section, which begins at 03:38, with the chord progression ♭III-♭II-♭III-♭II-i-V$^{♭9}$-i-V$^{♭9}$-i (in C), features a melody emphasising a Hijaz tetrachord based on the fifth: 5-4-5-♭3-4-♭2-♭3-4-♭6-// 15-♭14-15-12-**♭13-11-9-7-5-8** (in C). The highlighted pitches are heard as chord tones of the V♭9 chord and outline a Hijaz tetrachord on the fifth (5,♭6,7,8).

The use of scales containing Hijaz tetrachords in dance music, may, then, function as a genre synecdoche for styles of 'non-Western' music. However, this claim is different to Tagg's assertion that Phrygian harmony will be heard to function as a genre synecdoche of non-Western music. Consideration of the many examples of Phrygian-subset static harmony discussed in this chapter, suggests that it is not the case that Phrygian harmony will typically be heard as a genre-synecdoche of non-Western music. For example, the Phrygian melody of Kraftwerk's 'Trans-Europe Express' (1977) has been discussed in academic writing by Robert Fink (2005) and Carsten Brocker (2010), but neither have suggested that it might be heard as a genre-synecdoche of non-Western music. Similarly, discussion of the track by Uwe Schütte (2020) and Pascal Bussy (2005) make no reference to the potential function of the melody as a genre synecdoche of non-Western music.

It seems likely, then, that dissonant static harmony in dance music that does not contain the augmented second interval of the Hijaz tetrachord, is not likely to function as a genre synecdoche of non-Western music. This distinction between the use of the Hijaz tetrachord, and other types of dissonant static harmony in machinic dance music, including Phrygian harmony, is supported by the results of the listening test, which is discussed in Chapter Six.

Out of the twelve responses which associated test music with the region of 'North Africa', eleven of these responses were elicited by one track; C.C.C.P's 'American Soviets' (1986). This was the only tested track that included a melody based on a Hijaz tetrachord and the only track containing an augmented second interval. Two of the other test tracks ('What Time Is Love?' (1988) by The KLF, and 'Illuminated Displays' (2002) by Arpanet) featured Phrygian-subset riffs, but these tracks were not heard as associated with North Africa. These results are consistent with the view that, while Hijaz tetrachords in dance music may be heard as genre synecdoches for non-Western music, it is unlikely that dissonant harmony that does not contain a Hijaz tetrachord will be interpreted in the same way. Tagg's speculation regarding the meaning of 'Phrygian' harmony in dance music, then, does not accurately describe how Phrygian-subset static harmony in machinic dance music is likely to be heard.

8. Dissonant static harmony as a style flag in machinic dance music

Instead of being heard as a genre-synecdoche of non-Western music, it is more likely that dissonant harmony in dance music may function as a genre synecdoche of earlier machine music in film and television, and as a style indicator for specific styles of machinic dance music. Many dance music listeners will be familiar with pieces of film and television machine music such as *The Twilight Zone* (1959) theme, the *Doctor Who* (1963) theme, and although less familiar with the soundtrack music of films such as *The Day The Earth Stood Still* (1951) and television programmes such as *Star Trek* (1966), may still recognise the use of dissonant static harmony as a genre synecdoche of a film and television 'machine music' style.

Many examples of dance music use dissonant static harmony as a genre synecdoche of a general style of film and television 'machine music'. In several dance tracks that refer to *The Twilight Zone* or *The Outer Limits* (1963), a number of different types of dissonant static harmony are employed, intended to be heard as genre synecdoches of this earlier style. For example, NWA's electro hip-hop track 'The Panic Zone' (1987) (a play on the title of *The Twilight Zone)* features an 8-8-♭7-8-8-♭9-♭7 Phrygian-subset bass riff that may be intended to be heard as a genre synecdoche for 'machine music' in general, supporting the paramusical allusions to both *The Twilight Zone* and *The Outer Limits* in the song's paramusical text (the lyrics of the track allude to the introduction of *The Outer Limits:* 'Do not attempt to adjust your radio, There is nothing wrong, The underworld is taking control, You're not only in

dimension of sight and sound but of mind. There's a signpost up ahead, and it reads, "The Panic Zone"'). Similarly, in the acid house track 'The Twilight Zone (Bambam club mix)' (1988), by Party Boy, a Phrygian-subset 8-♭9-8-5 riff (in B) is used as a genre synecdoche for film and television machine music rather than the *Twilight Zone* theme, specifically.

Many of the other examples of dissonant static harmony in machinic dance music may also be heard as genre synecdoches of film and television machine music. It has already been noted, for example, that The KLF's 'What Time Is Love? (Pure Trance)' (1988) is harmonically similar to the *Doctor Who* title theme, and its Phrygian-subset harmony may also be heard as a genre synecdoche for television machine music more genrally. Robert Hood's 'Minus' (1994) makes no explicit paramusical reference to science fiction texts, but its octatonic harmony may be heard as similar to the use of octatonic harmony in the *Star Trek* episode 'The Corbomite Maneuver' (1966), and so may also function as a genre synecdoche. It is therefore possible that many of the uses of dissonant static harmony in the dance music examples discussed in this chapter, are likely to be heard as genres synecdoches referring to earlier styles of 'film and television machine music'.

Alternatively, dissonant static harmony in machinic dance music may sometimes be heard as a genre synecdoche for horror film music. In the Chicago acid house track 'Your Only Friend' (1987) by Phuture, an eerie high-pitched wordless vocal, outlining the melody 5-6-♭6, is heard over a static pentatonic 8-♭10-♭7 bassline (in C). The resulting macroharmony, (1,♭3,♭5,♭6,6,♭7) contains both a diminished seventh chord and a chromatic pitch collection (♭6,6,♭7), so can be considered extremely dissonant. However, the wordless vocal melody may also be heard as an allusion to a similar vocal part in the track 'Main Title', by Charles Bernstein, from the film *A Nightmare On Elm Street* (1984). The vocal part in 'Main Title' similarly begins on the fifth note of the scale before creating dissonances with the underling harmony (5-♭6, 5-♭5 (in D)). 'Your Only Friend', which begins with the ominous dialogue, 'this is cocaine speaking, I can make you do anything for me', therefore uses this melodic allusion to horror film music to characterise drug addiction as akin to 'being in a horror film'. However, as Eshun has suggested, such seemingly horrific depictions of drug use are likely to intended to be heard with a certain level of ironic detachment by clubbers and dance music audiences.

Eshun suggests that, rather than straightforwardly moralistic, such acid tracks represent an 'the enticing threshold into its ahuman world' (Eshun, 1998, p. 097).

Dissonant riffs have also appeared prominently as style indicators in dance tracks that explicitly define themselves as belonging to a particular style of machinic dance music, for example 'Acid Tracks' (1987) by Phuture, 'Call it Techno'(1989) by Frankie Bones, 'Hardcore U Know The Score' (1991) by The Hypnotist and 'Electrotechno' (1996) by Aux 88. This suggests that dissonant riffs may often function as style indicators in these styles of machinic dance music. These uses of dissonant static harmony in dance music, as a genre synecdoche for film and television machine music, and as style indicator of machinic dance styles themselves, is quite different to Tagg's speculation that harmony in dance music will be primarily heard as a genre-synecdoche of non-Western music, and better captures their likely meaning in machinic dance music.

9. Conclusion

This chapter has suggested a set of criteria for defining dissonance within the context of static harmonies in dance music, suggesting that harmonies that are either based on diminished or augmented triads, are non-diatonic, or contain the ♭2 or ♭5 scale degrees are likely to be heard as dissonant. Such dissonant harmonies are often heard as harsh or unstable in comparison to consonant harmonies, and according to Temperley are often avoided in rock and pop music. Such harmonies may also produce an expectation of resolution to a consonant harmony, an expectation that is often denied in machinic dance music.

This chapter also outlined in detail four of the more common types of dissonant static riff employed in machinic dance music, these being riffs containing chromatic scale fragments, Phrygian-subset riffs, riffs based on diminished or augmented scales, and finally, riffs that are randomly generated. The chapter also evaluates several possible external meanings of dissonant static harmony in the context of machinic dance tracks. It argues that while dissonant static harmony function as an anaphone for machine noise, it has often been employed in contexts where it will be heard to specifically suggest the sounds of a futuristic 'computer world' or the sounds of technological warfare. Alternatively, dissonant static

harmony may be heard as anaphonically suggestive of negative emotional states, if this harmony is heard to contain 'painful' dissonances or 'depressed' flattened scale degrees.

This chapter also evaluates Philip Tagg's claim that harmony in 'techno-rave' music is likely to be heard as a genre synecdoche of non-western musical traditions. It is argued that this interpretation is, in fact, unlikely for much dissonant static harmony in dance music, as this harmony typically does not contain augmented second melodic intervals. Finally, it is argued that dissonant static harmony in dance music may also be heard as a genre synecdoche of film and television machine music, or as a style indicator for multiple styles of machinic dance music.

Chapter Four – Disjunctive Harmonic Shifts in Machinic Dance Music

In some machinic dance music tracks, static riffs or melodic patterns are abruptly transposed up and down the chromatic scale, a process which can be termed 'harmonic shifting', creating a kind of 'pseudo-discursive' organisation over longer stretches of musical time. This type of harmonic organisation can be described as pseudo-discursive as it lacks the 'hierarchically ordered discourse' which is characteristic of properly discursive passages of music (Middleton, 2002, p. 269) and retains the essentially static character of harmony in machinic dance music. Harmonic shifts in dance music do not typically follow a discursive chord progression and are not heard to accompany a single melodic phrase. Instead, these harmonic shifts are not harmonically prepared and are likely to be heard as possessing an unexpected or 'disjunctive' character. This chapter argues that disjunctive 'harmonic shifts' between sections or passages of static harmony in dance music are likely to function as composite anaphones (sonic and kinetic) for the workings of machines. This practice is defined as distinct from harmonic shifting in blues and R&B derived traditions of popular music.

1. Discursive harmonic shifts in R&B

The terminology of shifting between harmonic levels employed in this thesis is taken from Peter van Der Merwe's discussion of harmonic practice in folk and popular music (van Der Merwe, 1989, pp. 208-212). According to van Der Merwe, a 'harmonic shift' describes the transposition of a melodic pattern, resulting in the 'shifting' of that melodic pattern from one foundation note, or perceived tonal centre, to another foundation note. Harmonic shifts transposes melodic patterns up or down the chromatic scale, and exactly replicate the intervals of the initial pattern, rather than altering these intervals to fit a diatonic scale. Harmonic shifts therefore produce harmonic parallelism, as all notes in a chord or melodic sequence are raised or lowered by the same amount, as has been noted by Richard J. Ripani (2006, pp. 37-38).

In blues and R&B practice harmonic shifts typically follow discursive chord progressions supporting a single melodic line or phrase. Van Der Merwe, for example, describes the ubiquitous 'boogie woogie bass', notated as a 1-3-5-6-♭7-6-5-3 melodic pattern (van Der Merwe, 1989, p. 211), which is common in blues and jazz, and is typically transposed up and

down the chromatic scale according to the foundation notes of the twelve-bar blues chord progression. In these progressions the harmonic parallelism in the boogie woogie bass may suggest a series of distinct harmonic levels, but these levels are heard to follow a discursive twelve bar progression, supporting a single melodic line.

When an entire twelve-bar blues progression is considered, chromatic transposition of the initial boogie-woogie bass pattern to the I, IV and V chords produces an overall macroharmonic collection of 1,2,♭3,3,4,5,6,♭7,7, a scale with a chromatic third and seventh. However, as van Der Merwe notes, this chromaticism is only present at the level of the overall progression and is not present within any individual harmonic level. As van Der Merwe describes, 'the logic of the boogie-woogie sevenths lies in their relation to the current chord, not the following one' (van Der Merwe, 1989, p. 212). Notes may be added to the seventh chord framework (for example the sixth in the boogie woogie bass), occasionally creating a full diatonic or heptatonic scale over each chord. Each harmonic level is, then, based on a single chord, but may also outline a scale including seconds and sixths, which also heard to move in parallel with the foundation note. As van Der Merwe suggests, a harmonic level 'is more than a mere chord' (van Der Merwe, 1989, p. 209).

In Blues and R&B music, harmonic shifts are typically only applied to the bass and chordal layers of a song. Melodic riffs and vocal melodic parts typically remain static, often based on the minor pentatonic scale, while the bassline riff and chords 'shift' underneath them. Such progressions can therefore be regarded as genuinely discursive, as they support a single continuous melodic phrase that extends typically over twelve bars, while the chord progression supports that single phrase and can be related to a single tonal centre. For example, 'Papa's Got A Brand New Bag' (1965) by James Brown, as transcribed by Ripani (Ripani, 2006, p. 89), features a I-IV-I-V-IV-I-V progression (in E), over 12 bars. The 8-5-♭7 bassline that follows the I chord for bar 1-4 is transposed up by a fourth to the IV chord for bars 5-6. This transposition can be understood as an example of harmonic shift as it maintains the melodic shape of the original riff, simply transposing it in step with the chord changes. This progression supports James Brown's largely pentatonic and harmonically static vocal, based on the foundation noted of the first chord of the progression, which begins with a 11-

♭10-8, 8-♭7-8-6-5 descent, over the first four bars. This vocal melody is essentially static, based on the original foundation note and does not shift with the bass riff and chords.

In blues and R&B music, then, harmonic shifting is typically confined to the bass and harmonic layers, while the melodic layer remains static, and arpeggiates a chord progression that supports a single melodic phrase with a stable tonal centre. In this context, harmonic shifting is discursive and not static, as it is based on the arpeggiation of a discursive chord progression. However, harmonic shifting of the melody in combination with the chordal accompaniment, so that all parts are shifted simultaneously, is not typical in blues and R&B style as it would disrupt the sense that the melody is anchored to a single tonal centre. According to van Der Merwe, in blues and R&B, 'as a rule, the melody does not follow the outline of the bass. This is in keeping with that general independence of melody and accompaniment that is one of the strongest features of the blues style' (van Der Merwe, 1989, p. 211). In blues harmony, the melody is often fixed to the overall tonal centre, while the harmony moves to the IV and V chords. This independence of melody and accompaniment in blues and rock has been observed by David Temperley (2007), Allan Moore (1995, p. 189) Ripani (2006, p. 40) and has been referred to as the 'melodic/harmonic divorce'.

A distinctive characteristic of 'disjunctive' harmonic shifting in machinic dance styles is that harmonic shifts typically operate on all of the pitched layers of the texture, bass, harmonic filler layer and melody, simultaneously. This difference has several implications. Firstly, disjunctive harmonic shifts may be heard to interrupt and segment melodic phrases and so are no longer heard as arpeggiations of discursive chord progressions that accompany a single melodic phrase. Secondly, as the harmonic shifts typically occur between passages of otherwise static harmony, without chord progressions, these harmonic shifts are likely to be heard as unprepared, unanticipated, and abrupt.

Carsten Brocker's description of harmonic shifting in Kraftwerk's 'Europe Endless' (1977), which he describes as 'employing a harmonic shift', highlights the abruptness of these shifts: 'while the introduction, the main melody and the following song are all in G major, the second part of the song is in B major. There is here neither a transitional melodic or harmonic modulation nor an introductory drum break [between these passages]. The F-sharp major middle section, which follows the repeat of the two parts, is not musically introduced either.

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This juxtaposition of thematic elements reinforces the monotonous machine-like quality of the constantly repeated synthesizer sequence' (Brocker, 2010, p. 108). Brocker here explicitly links harmonic shifting between sections of harmonic stasis with the evocation of machines in Kraftwerk's music, indicating that the link between disjunctive harmonic shifts and machine aesthetics has already been made in the literature. However, Brocker's analysis is limited to Kraftwerk's music, and does not consider the wider application of this practice in machinic dance music.

2. Disjunctive shifts of scale

As has been noted, in the example of the 'boogie-woogie bass', harmonic shifts in popular music typically accompany the I-IV-I-V-IV-I blues progression. As van Der Merwe notes, 'The blues shifts are between the three primary triads' (van Der Merwe, 1989, p. 211) of the I, IV and V chords. Typically, parallel harmonies (often Mixolydian or Dorian) are built on these three major chords of the diatonic scale. The macroharmonies of these three harmonic levels, with foundation notes separated by an interval of a fourth, use scales that are closely related, in terms of the number of notes shared by these scales. Harmonic shifting in the context of a 12-bar blues progression is characterised by smooth shifts between scales, in which, usually, only one note of the scale is changed during each harmonic shift. If, for example, a 12 bar blues accompaniment used the following scales, E Mixolydian, A Mixolydian, E Mixolydian, B Mixolydian, A Mixolydian, E Mixolydian (the underlying harmonic levels of 'Papa Has A Brand New Bag'), all of these harmonic shifts involve the alteration of only one note of the scale, apart from the shift from B Mixolydian to A Mixolydian, which changes two scale degrees (this shift can be regarded as a shift from V-I-IV in which the intermediate I chord has been removed).

Shifting a harmonic level by any interval other than a perfect fourth or fifth, then, is likely to be heard as abrupt and disjunctive due to the increased number of scale degrees that are altered in moving from one macroharmony to the next. The below table indicates the number of scale degrees altered when shifting a harmonic level that outlines a diatonic scale, according to the interval of transposition. The table indicates that shifts by a tritone or minor second are likely be heard as the most disjunctive, due to the number of notes of the scale that are altered. Shifts by intervals other that by a perfect fourth, or possibly major second,

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may also be heard as distinctive in machinic dance music, simply because these shifts have not been commonly found in R&B chord progressions historically. In machinic dance music, then, the longer-length structures created by harmonic shifts frequently contain abrupt and extensive changes of scale between 'unrelated' harmonic levels.

Table 2: Disjunctive changes of scale produced by different intervals of transposition

Interval of transposition of diatonic scale	Number of alterations to scale
Minor Second	5
Major Second	2
Minor Third	3
Major Third	4
Perfect Fourth	1
Tritone	5

3. Internal meanings of disjunctive harmonic shifts

The use of harmonic shifts in dance music can often produce longer term structures that contain a departure from and return to an original harmonic level. For example, Model 500's 'No UFO's (Vocal)' (1985) features a harmonic shift from the foundation note of D in the verse, to a foundation note of E in the chorus section, before returning to the original foundation note of D in the subsequent verse. In the verse section of Donna Summer's 'I Feel Love' (1977), the verse begins on the foundation note of C before cycling through various foundation notes and returning to a foundation note of C in the chorus.

In such examples, the foundation note of the first harmonic level may be more likely to be heard as the 'long-term', or primary tonal centre than the foundation notes of the subsequent harmonic levels. The first foundation note may be heard as the most important because it is heard first, and often because it has a longer duration than other foundation notes in a section or over the course of a track. Harmonic shifts that imply a return to an original harmonic level, then, may also create some sense of harmonic resolution.

However, longer-term structures created by transposition of static riffs create no strong internal harmonic expectations that they will move to any other particular foundation note or return to an original foundation note. The E♭ Phrygian harmonic level of 'Trans-Europe

Express, for example, creates no expectation that it will 'resolve' to the C Phrygian harmonic level, or vice versa. Even in the case of the verse section of 'I Feel Love' there is little sense that the G Mixolydian harmonic level at the end of the verse should be considered a V^7 harmony in relation to the original foundation note of C. Each previous Mixolydian harmonic level in the verse is transposed up by a minor third or natural second, rather than down by a perfect fifth. There is no expectation in this progression that any of the Mixolydian harmonic levels will resolve like V^7 chords to a foundation note a perfect fifth below, or to any other foundation note. Each section is essentially harmonically static.

Harmonic shifts between passages of static harmony are therefore likely to be heard as abrupt, as they are not harmonically prepared or anticipated. The foundation note may be heard as suddenly shifted with the transposition of the melodic pattern, from one moment to the next. Equally the sense that any one foundation note is the tonal centre of a track, established by it being the first foundation note of a section, is very weak, and may be overridden quite easily. For example, Tangerine Dream's 'Vengeance' (1977) begins on a foundation note of C, which is established through non-tonal assertion. However, from 03:26 the track moves to the foundation note of F for a moderate amount of musical time. This new foundation note is quickly asserted through repetition, 'overriding' any sense that C is the long-term tonal centre. The track does then, finally, return to the foundation note of C, but this is also heard as unanticipated and disjunctive.

A similar disjunctive effect has been noted in the style of minimal music when changes to the harmony are unprepared and cannot be anticipated. Wim Mertens has noted that the use of modulation in Philip Glass's Music With Changing Patterns is 'a remarkable departure for Glass'. Mertens suggests that 'After some 40 minutes, a sudden transition is made […] without any preparation or solution in a passage where A sharps become natural' and suggests that 'this sudden modulation causes a psychological dis-orientation of the listener' (Mertens, 1988, p. 77). Mertens describes this change in harmony as disjunctive, as it is not anticipated or prepared. Similarly, harmonic shifts in machinic dance music, then, may be heard to possess a peculiarly disorientating, jarring and disjunctive quality as they are not anticipated harmonically.

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4. Discursive harmonic shifts in dance music

Within the R&B styles that immediately preceded disco, such as Philly soul, and in within the disco style itself, twelve bar blues patterns were very rarely employed, and as a result, harmonic shifts of any kind are very rare in these styles. In Ripani's analysis of the top twenty-five R&B singles of each decade, he notes only one use of twelve bar blues patterns in the seventy-five songs analysed from the 1970s-1990s (Ripani, 2006, pp. 122, 147. 167). This one example is Michael Jackson's 'Billie Jean' (1982) which features a harmonic shift by a perfect fourth in the bassline, as it moves with the I-IV progression in the verse. In most disco songs prior to the release of 'I Feel Love' in 1977, and in house and garage styles, harmonic shifts of any kind are relatively rare. Although static harmony, in the form of riff-based sections, is common in disco music during the 1970s, these riffs tend to be confined to use on the foundation note, and harmonic variety is created by alternating these sections with sections of chordal harmony, rather than by transposing or shifting the riff to another foundation note.

However, discursive harmonic shifts of the blues and R&B type can be identified in some later examples of house music. In Steve Hurley's 'Jack Your Body (Club Your Body) (1986), much of the track features a static bass riff on A♭, based on the bassline to First Choice's 'Let No Man Put Asunder' (1977). But at various points in the track this bassline is transposed to E♭, creating a I-V-I progression, and in the middle of the track (03:28) the bassline is transposed multiple times to create I-IV-I-V-IV-I twelve bar blues progression. Crucially, a one-bar static melodic riff based on the pattern 1-♭3-1-4 (in A♭) is repeated over this progression, so the transpositions of the bassline may be heard to outline a chord progression supporting a single melody and tonal centre. Such use of harmonic shifting in dance music, similar to harmonic practice in R&B songs such as 'Papa's Got A Brand New Bag' (1965), is therefore unlikely to be associated with the evocation of the machinic in dance music.

Another, unrelated use of transposition in popular music is what has been termed by Walter Everett as a "truck-driver's modulation," where verses or choruses may appear in successively higher keys, normally a half-step or whole-step apart' (Everett, 2004, p. 4). Such modulations may produce transpositions of riffs, but usually only occur once or twice during a song. For example, the R&B track 'Last Night Changed It All' (1976) by Esther Williams, begins in F Major

and modulates up by a whole-tone to G Major halfway through its length. Again, such practices are common in popular songwriting and are unlikely to be heard as related to the practice of disjunctive harmonic shifts in dance music discussed in this chapter.

5. Disjunctive harmonic shifts in dance music and film music

The practice of disjunctive harmonic shifting in dance music is closely linked to the use of pattern sequencing, or step-sequencing, technology used to control synthesisers, which became popular in disco music and synth-pop in the late 1970s, and were employed in tracks by Giorgio Moroder, Kraftwerk, and Tangerine Dream. Carsten Brocker notes that Kraftwerk first began using a 'Matten & Wiechers Synthanorma sequencer' on their 1977 *Trans-Europe Express* album (Brocker, 2010, p. 107) and that the use of this technology can be linked to the construction of harmonic shifts in that album. As a result, disjunctive harmonic shifting, in 1970s synth-pop and disco, is nearly always heard in combination with other machinic style elements, such as metronomic, unswung clock-like synthesiser patterns, and electronic timbres. Sequencing technology allows a synthesiser to be controlled directly by a sequencing module, whether internal to a synthesiser or drum machine or an external unit. Such sequencers can be programmed to play melodic patterns which are looped indefinitely. These patterns can also be transposed up or down by any number of semitones to a new foundation note, creating the harmonic shifts that are discussed in this chapter.

An early and influential example of a machinic dance song featuring prominent harmonic shifting is 'I Feel Love' (1977) by Donna Summer. The verse section of 'I Feel Love' is 24 bars in length, and moves from an initial foundation note of C, to E♭, to F and then to G. This series of harmonic shifts includes a particularly disjunct shift of scales between the harmonic level of C and the subsequent harmonic level of E♭ (3 notes of the scale are altered in moving from C Mixolydian to E♭ Mixolydian). The instrumental parts that outline these harmonic levels are a sequenced bassline pattern 8-5-♭7-8 that is transposed up to each subsequent 'foundation note'. In the final verse this bassline is joined by parallel major chords which move up in parallel with the bassline to each new foundation note.

In stark contrast to the harmonic shifts in 'Papa's Got A Brand New Bag' the vocal melody of the verse section of 'I Feel Love' is transposed in parallel with the bass riff, moving up by a

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minor third from the first to the second phrase of the verse. This transposition has the effect of dividing the verse into several distinct phrases, each based on a different foundation note. The vocal melody of the first phrase, which descends from the tonic to the major third of the scale is repeated in the second phrase but has been transposed up by a minor third to the new harmonic level. After this initial transposition of all melodic parts from the first to the second harmonic level of E♭, the bassline is transposed again from E♭ to F, however this harmonic shift is tied together by Donna Summer's vocal phrase, which crosses this shift. Finally, the verse contains another harmonic shift from F to G which coincides with the start of the final phrase of the verse.

Table 3: Vocal phrases and harmonic shifts in the first verse of 'I Feel Love' (1977)

Verse Phrase	Foundation note	Bass pattern	Vocal melody	Vocal melody (relative to foundation note)	Scale of harmonic level
Verse phrase 1 (8 bars)	C	8-5-♭7 (in C)	C-B♭-A-G-F-E-F-G	8-♭7-6-5-4-3-4-5 (in C)	C Mixolydian
Verse phrase 2 (8 bars)	E♭ (4 bars)	8-5-♭7 (in E♭)	E♭-D♭-C-B♭-A♭-G	8-♭7-6-5-4-3 (in E♭)	E♭ Mixolydian
	F (4 bars)	8-5-♭7 (in F)	A-B♭-C	3-4-5 (in F)	F Mixolydian
Verse phrase 3 (8 bars)	G	8-5-♭7 (in G)	D-C-B-A-G-F-G, D-B	12-11-10-9-8-♭7-8 (in G)	G Mixolydian

This verse section may, then, be heard as internally disjunctive as it contains three abrupt and unprepared changes of scale. There is also little sense that each new harmonic level is related to the first foundation note of C, or that the song will necessarily return to that foundation note. This centric uncertainty is created by the transposition of all melodic parts, including the vocal, away from the original foundation note, so that each subsequent foundation note in the verse has the potential to be heard as a new, independent tonal centre. In contrast, while the chorus section of 'I Feel Love', uses the same foundation notes as the verse, the chorus section does not feature any harmonic shifts and may be heard to establish C as a

stable tonal centre. The I-♭III-IV-V-I… (in C) progression of the chorus can be understood as a conventional chordal harmony supporting a single vocal melodic phrase centre on C.

In addition to 'I Feel Love', disjunctive harmonic shifts can be identified in several other late 1970s synth-pop and dance tracks. Tangerine Dream's 'Vengeance' (1977) begins with a Phrygian-subset 8-♭9-♭7 bass pattern (in C) played by a pattern sequencer. Over this pattern is layered with other synthesiser patterns, creating a Phrygian mode macroharmony. However, at various points in the track this bass pattern is abruptly transposed up by a major third from the foundation note of C to E, before being transposed back to the original foundation note of C. These abrupt and unprepared harmonic shifts are emphasised with the addition of minor triads on foundation notes. In the second half of the track there is a harmonic shift by a minor second from E to F, before the pattern is finally transposed back to C. This final F-C transposition can be regarded as an example of a shift between closely related scales, however the earlier shifts between C Phrygian and E Phrygian scales require the alteration of four notes of the scale and are likely to be heard as highly disjunctive. Crucially, none of these harmonic shifts suggest an arpeggiation of a chord progression accompanying a single melodic line, and each harmonic level may be heard as essentially unrelated to the others. There is no sense that any of the harmonic layers represents the definite tonal centre of the work, however the foundation note of C may be suggested as the overall tonal centre, as it is heard first.

A similar use harmonic shifting by thirds is found in Kraftwerk's 'Trans-Europe Express/Metal on Metal' (1977). In this track, over thirteen minutes long, the whole track is based on a series of oscillations between two harmonic levels a minor third apart. Like 'Vengeance' each harmonic level outlines a Phrygian macroharmony. A table showing the harmonic levels in the track is presented below. The verse and chorus sections of the song are differentiated by abrupt shifts between harmonic levels, with the verse level on E♭ and the chorus level on C. The verse level is associated with a 'verse motif' of rising fourths, while the chorus melody is the Phrygian melody discussed in Chapter Three.

Table 4: Harmonic Levels in 'Trans-Europe Express/Metal on Metal' (1977)

Section	Foundation Note and Scale	Time
Introduction (verse motif)	E♭ Phrygian	00:05
Chorus	C Phrygian	01:07
Verse	E♭ Phrygian	01:51
Chorus	C Phrygian	02:10
Verse	E♭ Phrygian	02:45
Chorus	C Phrygian	03:03
Verse motif	E♭ Phrygian	03:38
Drum break	n/a	03:47
Verse	E♭ Phrygian	04:23
Chorus	C Phrygian	04:41
Verse motif	E♭ Phrygian	05:17
Chorus melody	E♭ Phrygian	05:24
Drum break	N/a	06:38
Chorus melody/ Chorus	E♭ Phrygian	08:56
End		13:29

These harmonic shifts are applied to the single note bassline which is transposed up and down between E♭ and C, but can also be heard in shifts between the minor triads built on the foundation noes of E♭ and C. This harmonic shifting can be heard in the 'doppler effect' bending of the E♭m triad to a Cm triad at 01:07 at the first point of transition from the introduction section to the first chorus. It can also be heard at each shift from the verse into the chorus, such as, at 02:10, when an E♭m chord is shifted down to a Cm chord at the start of the chorus.

The most obvious instance of harmonic shifting is heard in the second half of the track, when the chorus melody, which in the first half of the track is only heard relative to a foundation note of C, is heard transposed up by a minor third to a new foundation note of E♭. Overall, the first half of the track gives the impression of shifting abruptly between two unrelated harmonic levels a minor third apart.

Kraftwerk, perhaps attempting to imitate the verse progression of Donna Summer's 'I Feel Love', later employed similar abrupt shifts between harmonic levels in the chorus to 'The

Robots' (1978). However, unlike 'I Feel Love', each harmonic level in the chorus of 'The Robots' is based on the minor pentatonic scale rather than the Mixolydian scale.

Table 5: Harmonic Levels in 'The Robots' (1978)

Phrase	Foundation note	Bass pattern	synth melody	Chords	vocal melody	Harmonic shift	Scale alterations
Intro and verse (28 bars)	D	1-♭7-1-♭3	1-♭3-1, ♭3-4-♭7-5	Dm-CM	1-♭7-1-♭7-1-♭7-♭3	n/a	n/a
Chorus phrase 1 (4 bars)	B♭	1-♭7-1-♭3	1-♭3-1, ♭3-4-♭7-5	B♭m	1-♭3-1	Down by major third	4
Chorus phrase 2 (4 bars)	G	1-♭7-1-♭3	1-♭3-1, ♭3-4-♭7-5	Gm	1-♭3-1	Down by minor third	3
Verse (8 bars)	D	1-♭7-1-♭3	1-♭3-1, ♭3-4-♭7-5	Dm-CM	1-♭7-1-♭7-1-♭7-♭3	Up by perfect fifth	1

The verse sections contain a layer of chordal harmony, with a i-♭VII-i non-functional chordal progression on the tonic of D (Dm-CM), but the chorus section is characterised by its use of static harmonic levels without chords. The chorus is itself split into two harmonic levels, based on the foundation notes of B♭m and Gm respectively (separated by an interval of a minor third). These levels can each be described as outlining a minor pentatonic scale.

Again, the melodic level moves in tandem with the harmonic level. In 'The Robots' the 1-♭3-1 vocodered vocal melody ('we are the robots') is transposed down by a minor third from B♭ to G and so, unlike in the 'melodic/harmonic divorce' in rock and blues music, there is no independence of the melodic and accompaniment layer, and the harmonic levels cannot be heard as an arpeggiated chord progression supporting a single melodic phrase. The chorus of 'The Robots' is likely to be heard as highly unusual in the context of popular music, featuring two consecutive disjunctive shifts in close succession within the same chorus section.

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Similarly, the instrumental synth-disco track 'Droid' (1978) by Italian band Automat, features a short bridge section featuring a chromatic sequence with a series of rapid harmonic shifts. This section is in stark contrast to the rest of the track which features conventional functional and non-functional chordal harmony. The brief bridge section at 02:52 transposes the melodic sequence 1-1-5-1-1-4-1-1-♭3-2-2-♭3-4 up repeatedly, by three successive intervals of a minor third, to the foundation notes of B♭, D♭, E and G. Again, this rapid succession of harmonic shifts is likely to be heard as disorientating and unusual.

Vangelis's 'End Titles From 'Blade Runner'' (appearing in the film in 1982 and first released in 1989), features similar harmonic shifts to those used in 'I Feel Love' and 'The Robots', but unlike those examples, Vangelis uses theses transpositions to create a chord progression that can be heard as accompanying a single, sixteen bar melodic phrase, 15-b14-b13-12, b14-13-12-11, b13-12-11-8, b7-b10-8 (in C). In 'End Titles From 'Blade Runner'', then, the harmonic shifts follow a discursive chord progression, supporting a single unified melodic line. However, each chord in the Cm^{Add9}-Gm^{Add9}-Dm^{Add9}-Fm^{Add9}-Cm^{Add9} progression can still be considered the basis of an Aeolian mode harmonic level, and there is clear harmonic parallelism in the 1-2-♭3 sequence bass pattern, which is transposed to each successive foundation note. The use of harmonic shifting in this context, then, is not genuinely disjunctive, as it is tied to a single tonal centre and accompanies a single melody, but each harmonic shift still involves some abrupt changing of scale that may be heard as possessing a mechanical quality.

Genuinely disjunctive harmonic shifts by minor seconds and tritones can be identified in the synth-pop and disco music of the late 1970s and early 1980s. The opening section of 'Mr. X' (1980) by British synth-pop band Ultravox features a harmonic shift by a minor second from the initial foundation note of A to a new foundation note of B♭, before returning to the original foundation note of A. The bassline pattern, 1-8-5-♭3-4, is transposed up by a minor second from A to B♭. The initial passage is accompanied with a melody, 9-8-5-8-9-8-9-8-♭10 (in A), while the B♭ passage is accompanied with a minor chord (B♭m). The opening section shifts repeatedly between the foundation notes of A and B♭ (A-B♭-A-B♭-A) in a way that is highly reminiscent of the oscillation of foundation notes in 'Trans-Europe Express', but all melodic parts are transposed by a minor second interval instead of a minor third. The scales of A and

B♭ natural minor only have 2 scale degrees in common, and such a harmonic shift can therefore be heard as highly disjunctive.

The track 'Unit' (1981) by Logic System (an alias of Japanese producer Hideki Matsutake) may be heard as a style pastiche of Kraftwerk. In the second part of the track, a passage of static harmony with a Dorian mode melody (1-8-♭7-6-5, 5-4-6-4-♭3-2-4, ♭3-2-1), is repeatedly transposed up by a minor second, from an original foundation note of A, to B♭, B and then C, before returning to A. The track 'Los Ninos Del Parque' (1981) by German synth-pop band Liaisons Dangereuses begins with a sequenced bass synthesiser loop (approximately 8-♭10-♭7-8, 8-♭10-11 in B♭) that repeats after every six beats. This sequence is occasionally transposed up by a tritone to a new foundation note of E. Such harmonic shifts by a minor second or tritone are likely to be heard as very disjunctive or abrupt, as five scale degrees are, theoretically, altered in shifting from one foundation note to another. In the case of 'Los Ninos Del Parque' the bass sequence only uses four scale degrees, none of which are retained when the sequence is transposed.

A similar series of disjunctive shifts are employed in a cue from Basil Poledouris' soundtrack to the film *Robocop* (1987). In the cue 'Van Chase' (1987) a synthesiser pattern, 1-5-♭6-5-8-5-♭6-5, is transposed to a series of foundation notes. From 0:16-0:27 the pattern is based on F, is transposed down to E♭ and then transposed back up to F. Then, after a brief interrupting section, from 0:49-1:16 the same pattern is transposed to the following foundation notes: C, E, E♭ and finally G. This rapid use of harmonic shifts, by intervals of a natural second, major third, and minor second may also be heard as reflecting the uncertain and dangerous situation of the car chase in which the character of Murphy/Robocop is involved.

Disjunctive harmonic shifts may also be identified in various later styles of machinic dance music. As was noted in the introduction, Model 500's 'No UFOs' features a harmonic shift between the 'verse' and 'chorus' sections of the track, where the 5-♭9-♭7-8-5 bass pattern is transposed from a foundation note of D to a foundation note of E, before returning to D. Channel One's 'Technicolor', also produced by Juan Atkins transposes a 1-3-1-♭3-1-♭3-♭10 bassline from C to G and back to C. Techno Music' (1988) by Juan (Juan Atkins) features an

oscillation between a complex two-bar bass sequence that is transposed by a harmonic shift up by a major second from the foundation note of D to E, before returning to D.

A notable example of harmonic shifting in house music is found in 'French Kiss' (1989) by Lil' Louis, in which a sequence based on an open fifth chord and a ♭7-5-4-♭5-5 chromatic riff is shifted from the foundation note of F down by a major second to E♭ before returning to the original foundation note of F. The Italian piano rave track '2√231' (1991) by Anticappella, features a section based around a dissonant 8-♭9-♭7-8-♭9-♭7-8-♭5-4 riff, that is transposed down by a major second from a C♯ foundation note to B, before returning to C♯. In the early trance track 'The Space Track' (1992) by Cosmic Baby, an 8-♭10-8-11-♭7 bassline and a 5-6-♭7-8-♭7-♭6-4-5-6-♭7-8-6 melodic pattern are shifted down by a major second from a C♯ to B foundation note before returning to C♯.

The 01:16-02:09 section of the techno track 'Rave New World' (1991) by X-101 (Detroit producers Mike Banks, Jeff Mills and Robert Hood) is particularly notable for its repeated use of harmonic shifts. This section features a ♭3-1 bassline that is transposed, along with a minor triad, to the following foundation notes: F-F♯-F-F♯-G-F. The track, as a whole, is characterised by frequent abrupt and unexpected harmonic shifts, undermining any sense of a stable foundation note or tonal centre. The Belgian new-beat track 'Ibiza (Loco Acid mix)' (1988) by Amnesia, begins with a neighbour bassline on the foundation note of B♭ (1-♭2-1-♭2-♭3-1). This bassline pattern and a minor triad on the foundation note are then transposed up by a minor third to D♭, before returning to B♭, then shifting to F and then returning again to B♭. 'Interplanetary Adventures (Space Mix)' (1989) by Dr Zarkhov features a bass sequence, 1-♭3-1-♭7, 1-♭3-1-5, that is transposed up by a minor third from the initial foundation note of C to E♭ before returning to C.

6. Disjunctive harmonic shifts as anaphones for mechanical movement

The disjunctive harmonic shifts considered in this chapter may be heard to anaphonically suggest a seemingly mechanical process, similar to the metaphor of the 'truck-driver's modulation' mentioned earlier in this chapter. Walter Everett's description of truck-driver's modulation is intended to capture the mechanical character of unanticipated changes of

foundation note, which may be likened to a gear change in a truck or car. However, unlike the truck-driver's modulation, which is typically employed only a few times during a song, and between sections, disjunctive harmonic shifts in dance music are often applied multiple times within sections and may transpose material up or down the chromatic scale, undermining any sense of a stable foundation note or scale within a section.

The changes of foundation note brought about by harmonic shifts may also be heard as inherently arbitrary and brutal, insensitive to the harmonic expectations that are associated with a style. This sense of arbitrariness is identified by James Buhler as key to the sense that the harmony used by John Williams to depict the villainous forces of the 'Darkside' in the original Star Wars trilogy of films, possesses a technological or unnatural quality. Contrasting the harmonic organisation of 'The Imperial March' and the theme for 'The Emperor', with themes associated with the powers of 'The Force', Buhler notes that these heroic themes commonly use functional harmony involving the dominant chord, while the Darkside themes use a form of harmony that avoids the use of the functional dominant chord. Buhler suggests that 'this association with the dominant gives insight into the Force: the Darkside is an arbitrary power, a force that is wholly willed without respect to the inner nature of the thing, whereas the good side of the Force, like the dominant, is an unforced force, a force that takes account of the natural state of things; that is, where they want to go. The good side channels, as it were rather than forces' (Buhler, 2000, p. 48).

The norms of functional harmony are therefore understood by Buhler to create 'natural' expectations of how a chord progression might progress. Practices such as harmonic shifting, however, may be heard as distorting these harmonic expectations in a seemingly arbitrary fashion, forcing harmonic structures into unnatural and artificial relationships. According to Buhler, this kind of harmonic arbitrariness is associated both with the expression of the technological and unnatural nature of the Darkside, which is described as 'arbitrary and artificial, a kind of technology' (Buhler, 2000, p. 48), but also its 'grotesque' and 'rigid' qualities; 'the social order of the Empire appears a distortion, its technology ruthless and grotesque. These conceptions are brought over into the music, where all compositional force is brought to bear on the making the themes associated with the Rebels seem natural or at

worst fantastic, while those of the Empire sound rigid, ponderous and above all unnatural' (Buhler, 2000, p. 48).

This quality of an unnatural arbitrariness, then, may also be heard in machinic dance music that uses harmonic shifts. A paradigmatic example of the creation of a mechanical feel in dance music through the use of foundation note shifts is X-101's 'Rave New World' (1991), in which the bass pattern and a minor triad are repeatedly transposed up and down the chromatic scale in a seemingly arbitrary fashion. In contrast to functional harmony, there is no sense of any 'natural' harmonic expectations being followed in this track.

As a result, such progressions seem highly appropriate to depict robots and technology in popular music and in film music, such as the music from *Blade Runner* and *Robocop* considered in this chapter. Robots, in fiction, are also depicted as having no 'natural' inclinations and instead rigidly following commands that are imposed on them 'from outside', in the form of their programming or instructions. According to Kraftwerk's 'The Robots' (1978); 'We are programmed just to do, Anything you want us to.' The behaviour of the robot is therefore portrayed as resulting from control imposed from the outside against of the natural inclinations of the individual towards 'natural' and 'human' self-expression.

7. Disjunctive harmonic shifts as style flag for machinic synth-pop and disco

The use of harmonic shifting in more recent dance music may also be heard as a style flag, referring to the distinctive style of Donna Summer's 'I Feel Love' (1977), Kraftwerk's 'The Robots' (1978) and 1970s synthesiser music in general. Several cover versions or remixes of earlier synth-pop tracks including harmonic shifts were released in the early 1990s, including Kraftwerk's remixed versions of 'The Robots' ('Robotronik' (1991)) and a trance version of Vangelis' music for *Blade Runner*, ('Blade Runner' (1992) by Remake). A cover-version of the *Blade Runner* theme in the electro style had been released by Italian producers Hipnosis as 'End Title (Blade Runner)' (1983).

Similar harmonic shifts also appear in more recent dance music, in which they may be heard as genre synecdoches referring back to the 1970s machinic synth-pop style. 'Visions' (2009) by Gatekeeper (included in the listening test discussed in Chapter Six) transposes the melodic

sequence 5-4-♭3-2-♭3-1, as well as a minor triad, to the successive foundation notes C,E♭,C,E♭,A,F♯,A,F♯, or the chord tones of a Cdim7 chord. The diminished relationship of the foundation notes means that the resulting progression has a similar octatonic feeling to Automat's 'Droid' discussed above. Miss Kittin & The Hacker's 'Flexibility' (1999), similarly features a sequenced 8-♭7-8-♭10-8-♭7-8 bassline that is transposed, with a minor triad, from the foundation note of C♯ to D♯ and then to B before returning to the tonic of C♯. This progression includes a shift down by a major third from D♯ to B similar to 'The Robots'. 'Descendance' (2011), by Turzi Electronique Experience, features a ♭3-1-♭3-1-2-5-1 sequence that is transposed, as well as a minor triad, to the foundation notes of F,D♭,B♭,F. This sequence of foundation notes, shifting down by a major third, then shifting down again by a minor third before being shifting up by a perfect fifth is identical to the D,B♭,G,D foundation note sequence found in 'The Robots', although beginning on F rather than D. As a result, 'Descendance' recorded in 2011, is likely to be heard as harmonically similar to 'The Robots' which was recorded more than thirty years earlier and the use of harmonic shifting may be heard as a 'genre synecdoche' for 1970s synth-pop.

8. The association of harmonic shifting with machinic aesthetics in dance music

The original version of Donna Summer's 'I Feel Love' (1977), first appearing in the context of the concept album *I Remember Yesterday* (1977), was intended to be heard as broadly evocative of a technologically advanced future. The track, first appearing on the concept album *I Remember Yesterday* (1977), in which each song was a pastiche of popular music from a particular decade, was specifically intended to be heard as music from a future period (Thompson, p. 100). The original version's extensive use of harmonic shifts, then, combined with other 'machinic' signs, such as the use of electronic instrumentation and clocklike metronomic rhythms, are likely to be heard as anaphonically expressive of the functioning of machines and contribute to the perception that 'I Feel Love' has a futuristic, machinic aesthetic.

The importance of disjunctive harmonic shifts to the construction of the machinic aesthetic in 'I Feel Love' can be illustrated by considering a remixed version of the song that was released in the mid-1990s. This version, 'I Feel Love (12" Masters At Work Mix)' (1995),

remixed by house production team Masters At Work (Louie Vega and Kenny Gonzalez), systematically replaces the machine aesthetic of the original version with a 'classic' disco sound that evokes the style conventions of 1970s disco artists such as The Salsoul Orchestra and Loleatta Holloway, as well as the garage-house style conventions of Masters at Work's own productions.

The Masters At Work remix replaces the explicitly machinic rhythmic and timbral elements of the original version with structural elements familiar from 1970s disco and soul and 1990s garage-house. The synthesised instrumentation of the original version is replaced with instrumentation characteristic of 1970s R&B and disco, such as bass guitar, Rhodes organ, and acoustic percussion. Similarly, a less machinic rhythmic feel is created, with syncopations and swing, in contrast to the metronomic rhythms of the original version.

Importantly, the harmonic organisation of the original version, based around the use of passages of static harmony interrupted by disjunctive harmonic shifts, is replaced with conventional, functional jazz-influenced chordal harmony in the remixed version. Part of the process of removing the machine aesthetic of the original version, then, involved removing the mechanical sounding, disjunctive harmonic shifts of the original version, and replacing them with a more conventional functional chordal harmony, likely to be heard as a genre synecdoche for 1970s and 1980s disco and soul.

Table 6: Chord progressions in the first verse and chorus of 'I Feel Love (12" Masters At Work Mix)' (1995)

	Original static harmony	New chord progression in first verse	Function of chord progression
Verse phrase 1 (8 bars)	C Mixolydian (I)	Am^9-Gm^9-$EM^{7\sharp9}$-Am^9 -DM^7	i-♭vii-V-i in A (♭II of F)
Verse phrase 2 (8 bars)	E♭ Mixolydian (♭III) – F Mixolydian (IV)	$C\sharp^{Maj9}$-$CM^{♭9}$-$G♭M^{7add9}$-F^{Maj9} –DM^7	♭VI-V-♭II-I in F (V of G)
Verse phrase 3 (8 bars)	G Mixolydian (V)	$F\sharp m/B$-EM^7-Am^9-FM^9-Em^9 -GM/A	V-I, iv-♭II-i in E (V of C)
Chorus	C Major (I-♭III-IV-V)	$A♭M/B♭$-$B♭M/C$-F^{Maj9}-$EM^{7\sharp9}$- GM/A	♭VII-I-IV-III-V

This sophisticated, jazzy, functional chordal harmony of the remixed version may be heard as a genre synecdoche for 1970s and 1980s R&B and disco. M7♯9 chords, in particular, have previously been used in the chorus of 'The Only Way Is Up' (1980) by Otis Clay (CM-EM$^{7♯9}$-F^{Maj7}-FM/G (I-III-IV-V in C)), the introduction progression to 'Love Sensation' by Loleatta Holloway (1980) (Am-GM-Am-EM$^{7♯9}$-EM$^{7♭9}$-Am (i-♭VII-i-V-i in A), the verse section of 'Love Me Like This' (1983) by Reel To Reel, which ends A♭m^7-D♭M^9-EM/G♭-E♭M$^{7♯9}$ (i-IV-♭VII-V in A♭) and the verse section of 'Another Star' (1976) by Stevie Wonder (F♯m^7-EM^7-D^{Maj7}-C♯m^7-Bm7-C♯$^{7♯9}$-F♯m^7 (i-♭VII-♭VI-v-iv-V-i in F♯)). In each of these examples the M7♯9 chord is used as a V chord in a minor key, or in the case of 'The Only Way Is Up', as the V chord of the relative minor key.

The verse section of the remixed version of 'I Feel Love', unlike the original version, can also be described as genuinely discursive, as each phrase has a target chord, which is reached by a V-I dominant-tonic progression (E.g., EM$^{7♯9}$-Am^9), or by a ♭II-I progression (where the ♭II is a substitution for the V). This new verse section can now be understood to modulate between the keys of A minor, F Major, and E minor before modulating to C Major in the chorus. The transitions between these key areas is also smoothed by the use of pivot chords. The D^7 at the end of phrase 2 is the V chord of the next tonal centre of G, and the GM/A chord at the end of phrase 3 is the V chord of the key of C major in the chorus. As was suggested in Buhler's analysis of music in the *Star Wars* films, this functional harmony might be heard as creating a more 'natural' harmonic progression than is found in the original version, as each new tonal centre is prepared by a dominant chord and therefore appears to be naturally resolved to, rather than artificially 'forced'.

It can be seen in this example that the replacement of the static, disjunctively shifting harmony of the original version with a functional chordal tonal system drastically changes the overall character of the song and is part of a process of removing the machine aesthetic of the original version. This smoothly re-harmonised version of 'I Feel Love' is likely to be heard as using a much more familiar chordal harmony harmonic system, unlikely to be associated with the evocation of machines.

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9. Conclusion

This chapter has described a practice employed in some examples of machinic dance music which can be termed 'disjunctive harmonic shifting'. This practice, which involves the simultaneous transposition of all layers of a passage of music (melodic, chordal and bass parts) can be contrasted with harmonic shifts in earlier R&B and blues music, in which the bass and chordal layers are transposed, but the melodic layer is not.

As a result, such shifts in machinic dance music may be heard as possessing an unexpected or disorientating quality and may be heard as anaphonically suggestive of machines and technology if such shifts are heard as harmonically 'unnatural', 'forced' or 'artificial'. The use of similar transpositions in the scores of the films *Blade Runner* (1982) and *Robocop* (1987) suggest that transpositions of melodic patterns may typically be heard as anaphonically suggestive of the robotic or technological. Subsuquently, due to the use of disjunctive harmonic shifts in 1970s, 1980s and 1990s machinic dance music, this harmonic practice has been employed in later dance music as a style flag, heard to refer earlier styles of machinic dance music.

Finally, the harmony of a remixed version of Donna Summer's 'I Feel Love' was considered in detail, as an example of how harmony plays an important role in the construction of machine aesthetics in dance music. It was noted that the use of disjunctive harmonic shifts, in the original version of the song, accompanied other timbral and rhythmic signifiers of machines and technology in order to construct a machine aesthetic. However, in the later remix, 'I Feel Love (12" Masters At Work Mix)' (1995), disjunctive harmonic shifts were replaced with more conventional chordal harmony, as part of an attempt to construct a 1970s or 1980s disco or R&B aesthetic.

Chapter Five – Transpositional Chord Progressions in Machinic Dance Music

This chapter identifies and describes two related practices, both common in machinic dance music, that involve the use of sampled or otherwise 'fixed' chord voicings. The first of these practices involves the doubling of static melodic riffs with parallel chords, adding dissonant chromatic pitches to the macroharmonies of riffs that may otherwise be consonant. The second of these practices involves the production of non-functional and often highly chromatic progressions through the transposition of fixed chords. Such progressions use chords of a single quality, move entirely in parallel and often produce a sense of scalar ambiguity. This chapter argues that doubled riffs and transpositional chord progressions are likely to be heard as evocative of both the mechanical and the fantastic while also being recognised as style flags for machinic dance music and science fiction and horror film music.

1. Chordal transposition in dance music

British acid-house producer Baby Ford has noted that his productions often use sampled chords, and that this practice often creates unusual harmonic results: '"A lot of the sounds I use are sampled chords and they go out of tune when you play chords in a different key over the top. It's not a deliberate thing, it's a question of trying it out and if it works, all well and good. There aren't too many rules' (Bradwell, 1988, p. 119). The acid-house group 808 State have also described the use of this practice, with band-member Graham Massey noting that, 'another technique we use quite often is a sampling a chord into the FZ1 and playing it back from single notes […] We got the idea from Derrick May. There's something about a whole chord being shifted like that which is very techno' (Trask & Ward, 1989, 1993, p. 127).

Simon Trask and Phil Ward have identified the use of this practice in 808 State's music, noting that 'it's this technique [the use of sampled chords] which was used to produce the parallel major seventh chords of 'Pacific State' (from a chord on the D50 sampled into the FZ1)' (Trask & Ward, 1989, 1993, p. 127). Kodwo Eshun has likewise identified the use of sampled chords in the music of Derrick May: 'By sampling a chord and playing it back as a single note, the original chord expands into a keyboard. Unlocatable intermediate tones emerge, which May then exaggerates by jumping between octaves of the expanded chords spectrum so that the sound shockcuts as treacherously as spring-loaded stalactites' (Eshun, 1998, p. 108).

These authors describe a practice that was common in late 1980s and early 1990s dance styles such as Detroit techno, hip-house, and UK hardcore, where sampled chords, usually in the form of synth-string pads or 'stabs', were used to create sequences of parallel chords. This practice relied on a feature of most hardware samplers of the period, allowing sampled sounds to be assigned to a particular note of a keyboard. This allowed individual sampled pitches to then be played with a keyboard, with the original sample being transposed up or down the chromatic scale by the sampler. However, when a sample of a chord sound, rather than an individual pitch, was loaded into a sampler, the chord sound would be treated as a single pitched sound and would also be transposed up and down the chromatic scale in line with the keys pressed, creating a sequence of transposed chords with identical voicings, that appear to always move in parallel.

For example, if a sampled Cm chord was assigned to middle C on the keyboard, playing the series of notes c-e♭-b♭-d♭ (8-♭10-♭7-♭9 in C) would produce the chord progression Cm-E♭m-B♭m-D♭m. Similar progressions of parallel, identical chords could also be produced through use of the 'chord memory' function of a synthesiser or keyboard. Dennis DeSantis has noted that, 'a number of classic polyphonic synths from the 80s had a feature called "chord memory," which was essentially an automatic parallel harmony generator. To use chord memory, the user would hold down a chord and press the chord memory button. After this, playing a single note on the keyboard would play the memorized chord, transposed as necessary' (DeSantis, n.d.). Additionally, it is possible that some of the examples of parallel harmony discussed in this chapter were realised without use of samplers or chord memory functions and were simply played in parallel chord voicings by a keyboardist. However, as was argued in the introduction, such progressions, if indistinguishable at the point of audition from those realised through these music technologies, are likely to be heard and interpreted in the same way.

The distinctively parallel progressions produced through use of sampled chords and chord memory functions, can be described as entirely transpositional in nature. At all times the original voicing of the first chord is retained, while all chord voices are transposed up and down the chromatic scale in parallel with the successive chord roots. Progressions produced in this way can be understood as produced by a series of chromatic transpositions of the first

chord of the progression, indicating the melodic interval by which the initial chord is transposed to create each subsequent chord in the progression. For example, the notation Cm–T^3–E♭m–T^{-5}–B♭m–T^3–D♭m indicates that the second chord of the progression is produced by transposing the first chord up the chromatic scale by three semitones, the third is produced by transposing the second chord down by five semitones and the final chord is produced by a transposition upwards by three semitones. Transpositional progressions have similar parallel qualities to the progressions created by harmonic shifting, as both are produced by chromatic scale transpositions, but, crucially, in transpositional chord progressions only the chord is transposed, leaving any bass or melodic layer unaltered.

Such parallel chord progressions can also be regarded as a form of 'melodic doubling' as the chord progression exactly mirrors or 'doubles' a single melodic pattern, typically at an interval of a third or fifth. For example, the hypothetical Cm-E♭m-B♭m-D♭m progression described above is produced by doubling an 8-♭10-♭7-♭9 melodic pattern (played as a single melodic line on the keyboard), with a parallel melodic pattern a minor third above (♭3-♭5-♭2-3) and another parallel melodic pattern a fifth above (5-♭7-4-♭6). Each of these parallel melodic layers progresses by exactly the same series of melodic intervals as the original melodic pattern.

2. Chordal doubling of static riffs in machinic dance music

The technology of sampling and chord memory has been used in dance music in two related, but distinct practices. Firstly, short duration chord samples, often in the form of short attack 'stab' sounds, have often been used to 'double' short, repeating, musematically repetitive melodic riff patterns. This doubling retains the melodic and rhythmic properties of the underlying riff, which can still be regarded as based on a single static harmony but adds additional pitches to the macroharmony of a particular passage.

The sampled chord sounds used to double riffs in dance music are typically short duration, with equally short attack, meaning they maintain the rhythmic and melodic properties of a riff instead of a chordal accompaniment. The most popular 'stab' sounds in late 1980s and early 1990s dance music include the minor triad heard at the conclusion of Nitro Deluxe's 'Let's Get Brutal' (1986), used in Inner City's 'Big Fun' (1988), the minor triad chord sound

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from Marshall Jefferson's 'Move Your Body' (1986) used in Royal House's 'Party People' (1987) and a minor triad sound from Landlord's 'I Like It (Blow Out Dub) (1989) sampled in countless early 1990s dance tracks such as 'DJ's Take Control' by SL2 (1991), 'Evapor-8' (1992) by Altern-8 and 'Inception' by DJ Trace (1991).

These sequences of parallel chords may occasionally double static melodic riffs that are present in the bass or melodic layers. For example, the bassline of Inner City's 'Big Fun' (1988), 8-4-8-♭7-5 (in E♭), is doubled by a progression of sampled minor triads, creating the series of chords E♭m–T^{-7}–A♭m–T^7–E♭m–T^{-2}–D♭m–T^{-3}–B♭m. In other cases, these riffs may not double another part, but may be heard as riffs in their own right, such as the 8-♭10-♭6-♭9-8 riff doubled with minor triad stabs in Modular Expansion's 'Cubes' (1990). The doubling of melodic riffs in dance music can be understood as analogous to the doubling of riffs in rock, which Walter Everett has noted is common in hard rock and heavy metal styles (Everett, 2004, p. 7). However, as well as harmonic similarities, there are clear timbral differences between practice in rock and dance music, and the doubling of riffs with chord types other than a major triad or power-chord, such as a minor triad, is very rare in rock.

The doubling of static riffs can be understood to add pitches to the macroharmony within a passage of static harmony that are not present in the original riff. So, for example, while the doubled riff for the rave track 'Playing With Knives' (1991) by Bizarre Inc, may be based on the three-note melodic line 1-2-5-2, when doubled with minor triads, these chords produce a larger macroharmonic collection, 1,2,♭3,4,5,6,♭7, or the complete diatonic Dorian scale.

In many cases doubling of riffs can be understood to add dissonant pitches to an original melodic riff, irrespective of whether the original riff is consonant or dissonant. For example, while the original minor-pentatonic pentatonic riff of 'Big Fun' can be described as consonant, the macroharmony produced by doubling the riff with minor triads, creating a series of chords i-iv-i-♭vii-v, can be considered dissonant for two reasons. Doubling of the ♭7 scale degree with a minor triad introduces a ♭2 scale degree in the harmony, which may be heard as a non-supermodal dissonance. Additionally, the resulting macroharmony contains the 1,♭2,2,♭3 chromatic pitch collection, which may also be heard as dissonant when heard in the context of a single, static harmony.

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The one-bar, Phrygian-subset 8-♭10-♭6-♭9-8 riff of 'Cubes' may already be heard as dissonant as it contains the ♭2/♭9 scale degree. However, the macroharmony produced by doubling this riff, 1,♭2,♭3,3,4,♭5,5,♭6,♭7,7 introduces a second dimension of dissonance, as it produces a chromatic pitch collection of six notes, ♭3,3,4,♭5,5,♭6. The doubling of static riffs, then, can often be heard to increase the perceived dissonance of static riffs by introducing either the ♭2 or ♭5 scale degrees, or by producing chromatic pitch collections (similar to those discussed in Chapter Three, section 4a. Dissonant static harmony with chromatic pitch collections). Although the melodic shape of the original riff can still be discerned, the doubling of riffs may be heard to increase the sense that these riffs are 'noisy' or dissonant. In 'Big Fun' and 'Cubes' minor triads are used to double the riff, and this is perhaps most common type of riff doubling in machinic dance music, but other chord qualities may be used to double static riffs. For example, in the introduction to SL2's 'Way In My Brain' (1991) a major triad is used to double an 8-6-♭7-♭9 (in D) riff, creating the series of chords DM-BM-CM-E♭M. This doubling creates the dissonant macroharmony 1,♭2,2,3,4,5,♭6,6,♭7, containing the chromatic pitch collections 1,♭2,2 and 5,♭6,6.

There are a small number of possible doublings of static riffs that are fully diatonic and do not produce dissonant macroharmonies. Some doubled riffs can be identified in dance music that do stay within a diatonic scale by using only three chords. The main 1-4-5 bass riff of 'Move Your Body' (1986) by Marshall Jefferson, for example, is doubled with minor triads, creating the series of chords Em-Am-Bm (or i-iv-v in E), outlining a consonant Aeolian mode macroharmony. This doubled riff has been sampled numerous times and appears in 'I'll House You' (1988) by The Jungle Brothers and 'Party People' (1987) by Royal House (Todd Terry).

Bizarre Inc.'s 'Playing With Knives' (1991) features an Em-F♯m-Bm-F♯m-Em series of chords, doubling a 1-2-5-2-1 bass pattern in E, that can be considered an example a diatonic Dorian macroharmony. The same progression is used in the chorus of '(Can You) Feel The Passion (Zen Mix)' (1991) by Blue Pearl, developed from a remix of 'Playing With Knives'. Similarly, the deep-house track 'Can't Get Over It (Kaos 6:23 mix)' (1992) by Dee Dee Brave features a 9-12-5-8-9 pattern of minor triads, Em-Am-Am-Dm-Em, or ii-v-v-i-ii, a diatonic Dorian macroharmony. Another example of consonant doubling of a static riff in dance music is

'Kinetic (Orbital Mix)' (1992) by Golden Girls, in which a 2-5-1 riff is doubled with major chords, creating a diatonic Lydian macroharmony.

3. Transpositional chord progressions in machinic dance music

The same music technologies used to create doubled static riffs have also been used in machinic dance music to produce chord progressions, through the repeated transposing of a single chord sample or voicing. These chord progressions can be distinguished from doubled riffs due to their different role within the texture of a dance track. Rather than retaining the short-term musematic rhythmic and melodic properties of a riff, these progressions typically have a slower rate of chordal change and hold chords for longer periods of musical time. Due to their slower rate of change, these progressions lack the clear melodic and rhythmic properties of riffs. These slower-moving progressions are also often heard in combination with the more short-term musematic riffs and can be heard to occupy the 'harmonic filler level' rather than the melodic level of the overall texture. Although occupying a more traditional position within the texture of the track, chord progressions produced entirely by transposition are relatively unusual within popular music and can be contrasted with the more common types of progression that allow some independence of chord voices.

Transpositional progressions in dance music are also typically based on the pitches of an underlying static harmony and are layered over static bass riffs, contextualising them with regard to a fixed and stable tonal centre. For example, the chord progression of 808 State's 'Pacific State' (1989), ♭III^{Maj7}-IV^{Maj7}-♭VII^{Maj7}-I^{Maj7} (in D), is based on the following roots, ♭10-11-♭7-8 (in D). This 1,♭3,4,♭7 collection is derived from the underlying D pentatonic static harmony of the track, over which the chord progression is layered.

Within the context of doubled static riffs, it has been argued that non-diatonicism is likely to be heard as producing chromatic pitch collections that add dissonance to a single static harmony. However, in the context of transpositional chord progressions, non-diatonicism may be heard, instead, to introduce a quality of chromaticism to a progression of consonant chordal harmonies, that is not heard as dissonant. Walter Everett has noted that interesting chromatic effects may sometimes be produced by transpositional chord progressions in rock. Discussing the CM-AM-GM-FM-DM progression that opens Creedence Clearwater Revival's

'Proud Mary' (1969), Everett notes that 'Although the triads are generated from parallel doublings of the scale steps, their ultimate voicings lead to stark pairings in two relative-parallel progressions, in neo-Riemannian terms, from C to A and from F to D' (Everett, 2004, p. 6). Chord progressions in dance music produced by transposition, then, may also be described as 'chromatic'. For example, the ♭iii-v-i progression in the intro to DJ Crystl's 'King Of The Beats' (1994) (E♭m-Gm-Cm)), may be heard as chromatic, with a flexible third scale degree, and may be heard to produce a sense of 'scalar ambiguity', which will be discussed below.

Chromatic chord progressions produced by transpositions, can also be regarded as 'pantriadic' rather than 'pan diatonic'. Pantriadic harmony, according to Richard Cohn, is a harmony that uses 'triads without diatonic scales' (Cohn, 2012, p. xiv). For Frank Lehman, 'pantriadic chromaticism' describes a harmonic practice based on the use of 'consonant (major and minor) triads, while diatonic functional norms are not in operation' (Lehman, 2018, p. 66). Pantriadic harmony, then, describes chord progressions that use consonant triads, but which often dispense with the 'tonal norms of centricity, diatonicity and functionality' (Lehman, 2018, p. 10). This term can be used to describe progressions produced by transposition in dance music, as these progressions also do not typically fit within a single diatonic scale and can also be described as a succession of consonant chords (although many of the examples discussed here use seventh or ninth chords rather than triads).

While passages of pantriadic harmony in orchestral and film music may often be 'non-centric', similar pantriadic progressions in dance music are far more likely to be heard in the context of a clearly established tonal centre. The resulting harmony can be described as a form of 'tethered chromaticism', a term which Lehman uses to describe 'music with a strong sense of tonicity but without the predictable routines of functional syntax or the limitations of a single diatonic collection' (Lehman, 2018, p. 207). This description seems to describe chromatic harmonic practice in dance music relatively well, as Lehman notes that 'if a tonic chord clearly emerges, but is found to be surrounded by nondiatonic triads (e.g. ♭ii, ♭iii, ♯IV etc), tethered chromaticism is in operation' (Lehman, 2018, p. 207). Transpositional progressions in dance music using a minor triad often feature such non-diatonic chords.

Progressions featuring 'non-diatonic chords' in dance music are also likely to be heard as unusual and unexpected when judged by the expectations of diatonic tonality. Richard Cohn has argued that the use of chords from outside of a diatonic collection often produce a momentary sense of 'scalar ambiguity' (Cohn, 2012, pp. 21-24), describing a perceived ambiguity as to whether the internal intervals of the new chord are consonant or dissonant. This creates a phenomenon whereby a chord which would normally be considered consonant, such as a minor triad, may momentarily be heard to contain dissonant intervals due to the chromatic context in which the chord appears. For example, a minor triad can typically be considered consonant as it contains only consonant, diatonic, intervals: the interval of a minor third from the chord root to its third, the interval of a major third its third to the chordal fifth, and the interval of a perfect fifth from the chord root to the fifth. However, Cohn suggests that scalar ambiguity occurs when one of those consonant intervals is simultaneously perceived as a dissonant interval, such as an augmented second.

Cohn has described how chromatic progressions may produce a scalar ambiguity when considered 'against the expectations of classical diatonic tonality' (Cohn, 2012, p. 22). Cohn notes that, for example, if a G♯m chord (voiced g♯,b,d♯) were transformed to an Em chord, by lowering the g♯ by a semitone and raising the d♯ by a semitone (producing the chord g,b,e), the resulting chord may be heard to contain a scalar ambiguity and therefore heard simultaneously as both consonant and dissonant. In the initial G♯m chord, the distance between the g♯ and d♯ outer voices is heard as a perfect fifth, and if it were taken as a hypothetical tonic chord, it could be described as based on the scale degrees 1,♭3,5. As both voices are heard to move outward, the second chord could therefore be described as based on the scale degrees 7,♭3,♭6, with the lowest voice moving down from 8-7 and the upper voice having moved upwards from 5-♭6 . However, such a designation would fail to describe the resulting chord as a minor triad, as it implies the outer voices of this new chord are a non-diatonic diminished seventh interval apart rather than a diatonic major sixth interval. The scale degrees 7,♭3,♭6 cannot be regarded as a minor triad, because, if ♭6 is considered the root of the new triad, it contains the scale degrees ♭6,7,♭3. This chord appears to contain a root note and a chordal fifth, but an augmented second chord tone instead of a minor third. Most listeners, however, will hear the chord simultaneously as a familiar minor triad, leading

to the sense that the chord simultaneously both consonant and dissonant. As Cohn suggests, 'in the attempt to reconcile these interpretations, the ear is caught in a liminal space, where the binary distinction between consonance and dissonance is eroded' (Cohn, 2012, p. 22). It might be generalised then, that such ambiguous chromatic effects are heard when a consonant intervals and dissonant intervals (such as an augmented second, diminished fourth, augmented fourth or diminished fifth) are both momentarily heard as applicable to the same internal intervals within a chord.

Such an ambiguity between perceived consonance and dissonance occurs in the transpositional chord progression heard at the beginning of 'Ambient Rubb-A-Dubb' (1991) by Shake Inc., Em-Gm-Dm, or i-♭iii-♭vii (in E). This progression produces a sense of scalar ambiguity as it moves between each chord. In moving from the Em chord to Gm, the Gm chord may be heard as made up of the scale degrees of ♭3,♯4,♭7 relative to the tonal centre of E. However, this perception of the chord, in relation to the underlying scale, implies that the chord is not consonant. Instead, the chord could be understood to contain a dissonant augmented second interval between the ♭3 and ♯4 scale degrees. This dissonant 'possibility' co-exists with the consonant 'possibility' that the b♭ in the Gm chord is a ♭5 scale degree, implying a consonant minor third interval between the ♭3 and ♭5. with a consonant major third between ♭7 and 2.

4. **Internal meanings of transposition in machinic dance music**

Doubled riffs and transpositional chord progressions both produce sequences of chordal harmonies that move only in parallel. Continual transposition of chords, both in doubled riffs and transpositional chord progressions may produce a sense that the voice leading linking chords is rough and disjunct instead of smooth. Smoothness and roughness in voice-leading between chords can be measured by the amount of voice-leading work that is required to transform one chord into an another in a chord progression. In conventionally 'smooth' voice leading, a chord 'transformation' from Cm to Em, for example, can be achieved by two units of voice leading work (the note of c moves down by one semitone to b and the note of e♭ movies up by one semitone to e). The same chord progression produced by transposition, however, transposing the whole Cm chord up by four semitones, requires 12 units of voice-

leading work (c-e, e♭-g, g-b). Chord sequences produced by transposition, by definition, can never include any common-tone relationships between successive chords, as all chord tones are always shifted in moving from one chord to the next. As a result, such sequences are likely to be heard as jerky and disjunctive, with chords occasionally transposed across large intervallic distances. For example, the synth-string chord progression of 'Pioneers Of The Warped Groove' (1991) by The Hypnotist, can be described as Em–T^7–Bm–T^{-11}–Cm–T^4–Em. This progression contains a transposition of a chord down by eleven semitones, creating a transformation requiring a massive thirty-three units of voice-leading work.

The distinction between transposition and smooth voice-leading has been noted by Frank Lehman. When discussing the progression to Ennio Morricone's theme for the crime film *Citta Violenta* (1970), an example of transpositional harmony, Lehman notes that, 'On a chord to chord level, the behaviour of Morricone's theme is wholly transpositional in nature […] Morricone progresses from one triad to the next not by exploiting common-tone relationships or emphasizing smooth voice leading, but by picking up each chord in its entirety and placing it down elsewhere' (Lehman, 2018, p. 212). Exclusively transpositional voice leading may create a sense that the progression is disjointed, with chord voices continually moving more frequently and further than is necessary or natural.

A contrary sense that a chord progression is built up from more than one voice, rather than the parallel doubling of a single melodic line, can be created in dance music by layering additional voices over a transposed chord. This practice lessens the sense that a progression is transpositional and creates a sense that the progression uses more conventional voice-leading. Galaxy 2 Galaxy's 'Jupiter Jazz' (1992), for example, begins with a series of transposed open-fourth chords, in the sequence 8-6-♭10-9, but this is immediately overlayed with a Gm^7-Am^7/E-Fm^7/B♭-Em^7/A piano progression with independently moving voices, which overrides any sense that the progression is created exclusively by transposition transformations. In Blue Pearl's 'Can You Feel The Passion (Zen Mix)' (1991) the chorus progression of 1-2-5-2 (in E), doubled with minor triads, is accompanied by an independent 1-2-5-4 bassline, again creating independence of chordal voices, and suggesting a F♯m/A chordal inversion.

Another notable feature of chord sequences produced entirely by the transpositions of chords, is that, by definition, they contain chords of only a single chord quality. Differences in chord quality may result in significant differences in the perceived 'valence' of the chord progression. Recent research has been carried out on the perception of the valence of individual chords in a non-musical context, with 'valence' defined as the 'intrinsic attractiveness or aversiveness' of the chord (Lahdelma & Eerola, 2016a, p. 4). Research by Lahdelma and Eerola has suggested that 'perceived consonance does not automatically result in more perceived valence and preference in single chord perception' (Lahdelma & Eerola, 2016a, p. 7), so while a chord may be considered consonant, it may not necessarily be heard as positively valent.

Research by Lahdelma and Eerola has collected empirical data regarding the perceived valence of twelve chord types (2016a). All of the chords tested were consonant (containing only diatonic internal intervals), apart from two chords, the C7$^{\sharp 11}$ chord, and the 'Neapolitan hexatonic' chord. The C7$^{\sharp 11}$ chord contains a non-diatonic augmented fifth interval between the b♭ and f♯ (♭7 and ♯11) chord tones. The Neapolitan pentatonic chord contains a non-diatonic augmented second between the d♭ and e chord tones (♭2 and 3). These two dissonant chords were ranked as two of the lowest three valence chords tested, which suggests that dissonant chords are often likely to be heard as negatively valenced. However, the consonant minor triad was ranked between these two dissonant chords and was heard as one of the most negatively valenced chord qualities.

This perception that the minor triad is consonant but negatively valenced may be explained by another property of the minor triad. The minor triad was the only chord in the test that cannot be rewritten as an inversion of a major chord (for example, the 'minor seventh' chord can be rewritten as an inverted 'major sixth' chord). The minor triad, then, the only tested consonant chord that did not 'contain' the notes of a major triad, was also perceived as the least positive of all of the tested consonant chords, lower ranked than all eight other consonant chords that contained the notes of a major triad.

Lahdelma and Eerola's research seems to support the musicological instincts of Deryck Cooke, who has argued that the 'major third has established itself naturally as an expression of

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pleasure or happiness' (Cooke, 1959, p. 55). The test results appear to suggest that any consonant chord containing the notes of the major triad will be heard as more positively valenced than any consonant chord that does not. Frank Lehman has also argued, discussing sequences of purely minor triad progressions in film music, 'when nearly every chord in a progression is minor, a tremendous magnification of the negative emotional valence of individual triads takes place. The effect of *intensified minor chromaticism* is to engulf an entire passage in the dark associations usually pegged to a singular harmonic object, multiplying the expressive power of the ever sullen minor triad' (Lehman, 2018, p. 82). Although Lehman here is not specifying whether the minor progressions in question are generated through melodic doubling or by smooth voice-leading, Lehman does imply that progressions in which every chord is a minor triad may be heard to possess a strong negatively-valenced quality. Lahdelma and Eerola's study, therefore, seems to indicate that the perceived valence of consonant chords can be divided into two categories: those that contain the notes of a major triad and those that do not, with those chords that do not contain the notes of a major triad heard as negatively valenced compared to those that do.

This distinction between 'major' and 'non-major' categories of chords may be expected to be carried over into the perception of transpositional chord progressions in dance music, with chord progressions based on the transposition of 'major' chords heard as more 'positive' than those based on non-major chords. This distinction can be illustrated by considering two progressions that are harmonically similar, both produced by doubling the notes of a minor pentatonic scale, but which use chords of different quality. The opening progression to 808 State's 'Pacific State' (1989) doubles a minor pentatonic pattern (♭10-11-♭7-8) with a series of major seventh chords, creating the following four-bar progression: ♭III^{Maj7}-IV^{Maj7}-♭VII^{Maj7}-I^{Maj7} (in D). This progression is heard over a pentatonic bass pattern (with chromatic ♭5), 1-♭3-1-4-1-♭3, 8-1-♭5-4-♭3 (in D) and various other static pentatonic riffs, which are all based on D. Meanwhile, in DV8's 'Thoughts of Tomorrow' (1990), a 1-♭3 melodic motion is doubled with minor triads, producing the progression Am-Cm (i-♭iii in A), heard over pentatonic bass and melodic riffs based on A.

Whilst the 'Pacific State' progression is thoroughly 'major', the 'Thoughts of Tomorrow' progression is thoroughly 'non-major', as it only contains minor triad harmonies. It may be

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expected, then, that these two progressions, despite both being based on minor pentatonic static melodic lines and both using consonant chords, will be quite different in terms of their perceived valence, with the 'Pacific State' progression heard as significantly more positive than the 'Thoughts of Tomorrow' progression.

The perceived valence of a chord progression, then, may influence how any scalar ambiguities in that progression are interpreted. As was noted above, Walter Everett has suggested that chord progressions created by doubling a minor pentatonic scale, and containing the chord pairs ♭III-V, ♭iii-v, V-♭VII and v-vii, can be regarded as chromatic, due to the 'third-relations' that exist between these chord pairs. These pairs of chords do not fit within a single diatonic scale, and so may create a sense of scalar ambiguity which may be momentarily heard as strange or uncanny. Both major and minor triad progressions based on a minor pentatonic scale, therefore, may produce scalar ambiguities, as neither fit within a single diatonic scale.

However, perception of this 'uncanny' scalar ambiguity may vary according to the perceived valence of the chord progression in which it appears. A scalar ambiguity in the context of a series of high valence 'major' chords may be heard as a 'playful' breaking of diatonic expectations within a positively-valenced context. Scalar ambiguity in a 'non-major' context, however, is more likely to be heard as disorientating and unsettling, as it suggests a potential breakdown of diatonic expectations within a context that is already heard as broadly negative.

Considering again the examples of 'Pacific State' and 'Thoughts Of Tomorrow', both progressions, based on doubling of pentatonic roots, contain scalar ambiguity, but this scalar ambiguity may be interpreted differently depending on the chordal valence of these progressions. For example, the ♭III^{Maj7}-IV^{Maj7}-♭VII^{Maj7}-I^{Maj7} progression of 'Pacific State' contains a scalar ambiguity between the I^{Maj7} chord and the ♭III^{Maj7} chord. However, as the major seventh chords making up the progression are heard as generally positive, this internal scalar ambiguity may be heard as a pleasing and 'jazzy', adding chromatic interest to the progression.

However, in the context of a 'non-major' progression, such as the i-♭iii progression of 'Thoughts of Tomorrow', this scalar ambiguity may be heard as something more unsettling or even threatening. 'Thoughts of Tomorrow' creates a scalar ambiguity when it moves from the

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first chord of Am to Cm (♭iii in C). The Cm chord contains a chord tone of E♭, that may be understood either as a ♯4 or ♭5, either an augmented second or a minor third above the chord root of C. This scalar ambiguity may be heard to introduce a sense of disorientation or destabilisation to a progression that is already heard as having a broadly negative character. The chordal context of scalar ambiguity, therefore, may play a significant role in how these progressions are interpreted.

So far, in this chapter, transpositional chord progressions and doubled riffs have been considered only in isolation. However, they are often employed in combination with other static melodic riffs, whether in the bass or melodic layers. Some chord progressions and doubled riffs may, then, be heard to 'clash' with these other static riffs depending on the pitches which they contain. The principle of harmonic clashing is taken from Dmitri Tymoczko's analysis of jazz improvisation. Tymoczko, has noted that, in jazz, performers can create a sense of tension by moving in and out of 'synchrony' with an underlying harmony, often by playing complete chordal harmonies that are heard as semitonal 'shift' of this underlying harmony. Tymoczko describes this process as an 'oscillation between states of being in the same key and states of being apart', described as 'home' and 'away' harmonic states. Tymoczko has noted that 'away' harmonies may often be produced by semitonal transposition of chords from the home key, creating what he refers to as 'sidestepping' in works by Frédéric Chopin (Tymoczko, 2011, p. 375). Tymoczko notes that in such passages, the music 'briefly and dramatically shifts to a distant and colourful key, before settling back to its proper home' (Tymoczko, 2011, p. 375). Such moves away from and back to the 'home' harmony can create a sense of tension and resolution, even with the context of a broadly static tonal system.

Clashes between chordal and melodic layers can be identified in dance music using transpositional chord progressions, for example LFO's 'LFO (The Leeds Warehouse Mix)' (1990). This track features a bassline (1-♭3) and a bleepy melodic riff (♭7-8-♭7-8-♭7-♭9) that outline a static Phrygian-subset 1,♭2,♭3,♭7 macroharmonic collection (in C). However, the accompanying chord progression, Dm-Am-Fm-Cm, Cm-Gm-E♭m-B♭m (ii-vi-iv-i, i-v-♭iii-♭vii) creates numerous clashes with this underlying static harmony. The first two chords, ii-vi, for example, feature a natural 2 and major 3 scale degree, clashing with the ♭2 and ♭3 scale

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degrees present in the bassline and riff. The next two chords, iv and i, however, may be heard to blend with the underlying static harmony creating the sense that the progression moves in and out of 'synchrony' with the rest of the track. A similar clashing effect can be heard in Model 500's 'No UFO's in which an Aeolian i-v-iv progression is heard over a Phrygian-subset bassline, creating a clash between the ♭2 and 2 scale degrees in the bass and progression.

Clashes between textural layers may be heard to create temporary dissonances, often in the form of chromatic pitch collections. For example, the ii-vi chord progression of 'LFO', combined with the underlying riffs, creates a 1,♭2,2,♭3,3,4 chromatic collection. Harmonic clashes, then, may produce temporary states of tension which are 'resolved' when the progression moves back into scalar synchrony with the underlying harmony.

5. Doubled melodic patterns in machinic film music and machinic dance music

Melodic patterns doubled with parallel chords can be identified in both machine music in film and in machinic dance music. The doubling of melodic patterns or riffs with parallel chords, creating dissonance and 'noise', may be heard as another harmonic practice that has been associated with depiction of machines and technology. For example, while mostly featuring conventionally voiced, smooth chordal chromaticism, the section of Gottfried Huppertz's score which accompanies the famous scene in Fritz Lang's *Metropolis* (1927) when the robot 'maschinemensch' is first brought to 'life' ('I. Auftakt: Der Maschinemensch' (2018)), also features sequences in which short melodic patterns are doubled with minor triads. In one repeated sequence, the melodic pattern 8-5-b6-8 (in A) is doubled with minor triads, producing the sequence Am–T^{-5}–Em–T^{1}–Fm–T^{4}–Am. While the underlying 8-5-♭6-8 melodic pattern is diatonic, doubling this pattern with minor triads produces the chromatic pitch collection ♭7,7,8. The 'Rebel Fanfare' in John Williams' score for *Star Wars* (1977) (appearing in the track 'Imperial Attack' (1977)), doubles a ♭3-1-♭3-1-♭5-4-♭5-4-♭3-1 (in G) melodic line with major triads creating the sequence of chords ♭III-I-♭III-I-♭V-IV-♭V-IV-♭III-I (in G) (Lehman, 2023). Again, the doubling of this motif with fixed chords creates a 1,♭2,♭3,3,4,♭5,5,6,♭7 collection containing the chromatic pitch collection ♭3,3,4,♭5,5.

Similar doublings of riffs, producing dissonant macroharmonies, can be identified in machinic dance music, for example, the chorus progression to Altern-8's E-Vapor-8 (1992) (beginning

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01:19), doubles a 5-♭6-♭7-8 bass riff with minor triads, creating the progression Em-Bm-Cm-Dm-Em or i-v-♭vi-♭vii-i (in E). Doubling the diatonic bass riff therefore creates a dissonant ♭7,7,8,♭9,9,♭10 chromatic pitch collection. SL2's 'DJs Take Control' (1991) features a section in which a melodic doubling of a diatonic 4-5-♭6 line with minor triads is layered over a one-bar 1-8-5-♭6-5-♭6-♭3 bassline, creating the two-bar sequence iv-v-♭vi (in F) (beginning 02:36). Again, this doubling creates a dissonant ♭7,7,8 chromatic pitch collection in the static harmony. The chord progression of 'Hold It Down' (1991) by 2 Bad Mice, doubles a diatonic 1-3-2-4-5 riff with a minor triad, Bm–T^4–E♭m–T^{-2}–D♭m-T^3–Em–T^2–F♯m–T^{-7}–Bm, or i-iii-ii-iv-v, producing a five-note chromatic pitch collection, 5,♭6,6,♭7,7, again adding dissonant 'noise' to the underlying consonant diatonic riff.

Other riffs, which are already melodically dissonant, may also be heard to having additional harmonic 'noise' added to them through doubling. For example, the opening riff to 'Darkrider' (1992) by Rufige Cru (an alias of Goldie), is produced by the doubling of an octatonic 1-♭3-5-♭5-5-3 pattern (in C), with minor chords (Cm-E♭m-Gm-F♯m-Gm-Em, or i-♭iii-i-♭v-v-iii). The resulting macroharmonic collection, 1,♭2,2,♭3,♭5,5,6,♭7,7, produced by doubling, is not octatonic, and contains the seven-note chromatic collection, 6,♭7,7,8,♭9,9,♭10. 'Inception' (1991) by DJ Trace, features a section which is based on the doubling of a 1-4-♭5-1 melody (in C), creating the progression Cm-Fm-G♭m-Fm (i-iv-♭v-i). This doubled-riff contains the notes 1,♭2,♭3,4,♭5,5,♭6,6 and therefore contains the six-note chromatic collection ♭3,4,♭5,5,♭6,6. Frank De Wulf's 'Moribund' (1990) features the progression Cm–T^5–Fm–T^{-7}–B♭m–T^3–D♭m–T^{-2}–Bm–T^{-5}–G♭m–T^6–Cm, or i-iv-♭vii-♭ii-vii-♭v, concluding with tritone motion from ♭v-i. This doubled riff contains every note of the chromatic scale. X-101's 'Sonic Destroyer' (1991) begins with a series of sampled stabs, E♭m$^{7♭5}$-Dm$^{7♭5}$-Bm$^{7♭5}$-Dm$^{7♭5}$-Am$^{7♭5}$ (i-vii-♭vi-vii-♭v). This doubling creates a macroharmonic collection of ten of the twelve notes of the chromatic scale. The doubling of short riffs with chords, then, often adds extensive chromatic 'noise' to the original melodic patterns which may be heard as consonant or dissonant in a static context.

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6. Doubled riffs as anaphonically expressive of mechanical brutality

As Graham Massey, a member of the band 808 State, has noted, in a quotation cited above, 'there's something about a whole chord being shifted […] which is very techno' (Trask & Ward, 1989, 1993, p. 127). This statement could be interpreted as suggesting that doubling of riffs with sampled chords practice is likely to be heard as a style flag for 'techno', but it can also be taken to mean that this practice may be heard as anaphonically suggestive of the machinic or technological.

Doubled riffs in dance music are created by repeated transpositions of a single chord sample. As was argued in the discussion of harmonic shifts in Chapter Four, repeated chromatic transpositions may be heard as anaphonically suggestive of mechanical or 'forced' harmonic motion, as they appear to apply an arbitrary process to harmonic material without any sensitivity to harmonic expectations or conventions within a style. For example, in minor key tonality, or in modal harmony in rock, a minor foundation chord may be expected to progress to another chord within the minor key or a minor mode. The shift from i-♭iii in Rufige Cru's 'Darkrider' (1992), then, may be heard as a harmonically arbitrary motion, in the sense that the foundation chord may be heard to be 'picked up' and placed elsewhere (to use Lehman's metaphor), in a manner which entirely ignores harmonic expectations, placing it in a position that is 'outside' of the expected minor key or modal harmonic region.

Doubled riffs may also be heard as mechanically 'repetitious' as each chord in the sequence is voiced identically (and in the case of sampled chords, is timbrally identical). 'Excessive repetition' (Wente, 2018, p. 3) was identified by Allison Wente as a central characteristic of machinic music, and so doubled riffs in dance music may be heard as 'mechanical' in the sense that they are heard to continually repeat the same chord voicing without any variation. The thoroughly parallel harmony produced by this practice may also be heard as harmonically 'limited' and mechanical in the sense that a chord is treated as an indivisible musical unit, rather than the individual tones of the chord. The resulting chord progressions may be heard as lacking the variety and complexity of chord voicings that are typically found in popular music. As these progressions are produced by transposing groups of tones rather than individual tones, they may be heard as machinic in the sense that they are lack the nuance and subtlety of 'human' performance. Dissonant doubled riffs, like the dissonant harmonies

discussed in Chapter Three, may also be heard as sonic anaphones for machine noise, with the dissonance of the doubled chords heard to evoke the noise of machines. Doubled progressions, then, can be regarded as composite anaphones, as they refer to the functioning of machines in multiple ways.

The doubling of riffs with fixed chords can also create voice leading that is unnatural or even impossible, in terms of realisation by human performers. It often creates voice leading between rapid sequences of chords that human performers might find difficult to play, such as the T^{-11} transposition in The Hypnotist's 'Pioneers Of The Warped Groove' (1991), described above. Simon Reynolds has highlighted the 'machinic' property of riffs that are composed 'one note at a time on a sequencer (sometimes resulting in note-patterns that would be unplayable by human hands)' (Reynolds, 2007, p. 314). The doubling of these riffs with chords may, then, add to the perception that these riffs are 'unplayable by human hands' and 'machinic'. This mechanical quality of chordal doubling has been exploited in film music. For example, the use of transpositional harmony in Gottfried Huppertz' score to *Metropolis* (1927), discussed above, may be interpreted as a kinetic anaphone, representing the jerky, mechanical movement of the maschinemensch, suggesting that this machine has a ponderous, stiff, and mechanical movement rather than the fluid and smooth movement of a biological being.

Chordal doubling may also be heard to possess a 'brutal' quality, as each chord is mechanically doubled without consideration of whether the resulting voice-leading is humanly playable, whether the resulting macroharmony is consonant or dissonant, or whether it conforms with or contravenes stylistic expectations. As a result, doubled riffs may be heard as appropriate for the depiction of militarism and war, and a doubled melody is notably used in Holst's 'Mars, the Bringer of War' (1990) from *The Planets* (1916) to suggest the brutality of war. In bars 43-45 of 'Mars, the Bringer of War', tubas play a series of parallel chords over a C pedal ostinato, doubling a melodic line which begins ♭9-8-7-8-♭9-♭10-11-12-♭13-12 (in C) with the chords D♭M-CM-BM-CM-D♭M-E♭M-FM-GM-A♭M-GM. It is possible that this 'mechanical' doubling of a melodic line may be heard as brutal or violent. Musicologist Richard Greene has described 'Mars' as representative of the lowest aspects of human psychology. Greene also notes that

the movement has often been interpreted by audiences as embodying 'the horrors of modern warfare' (Greene, 1995, p. 43).

The association of melodic doubling with war or aggression may explain its use in film music. In the BBC science-fiction television series *The Quatermass Experiment* (1953) a part of 'Mars, the Bringer of War' was used as the main title theme. The plot of the series involves a deadly alien lifeform infecting an astronaut, which has the potential to kill all life on earth. When the television series was adapted into a film version in *Quatermass Xperiment* (1955) the composer James Bernard composed an original theme to replace 'Mars, the Bringer of War'. The replacement piece begins by doubling a 1-♭2-1, 1-♭2-1, 1-♭2-1-♭2-2-♭2-1-♭2-1 (in C) line with open fifth chords. This new theme to *The Quatermass Xperiment*, then, also uses melodic doubling to evoke the unthinking 'brutality' of the alien virus.

The common qualities of all these examples is a perceived analogy between melodic doubling and rough, brutal, and mechanical movement or intelligence. Similar progressions in dance music, then, may be understood to possess the same associations. The mechanical and brutal character of such progressions, then, may contribute to the perception that certain styles of dance music, possess an uncompromising or militant aesthetic. Kodwo Eshun, for example, describing the militaristic aesthetic of the Detroit based techno record label Underground Resistance, argues that, 'by installing themselves inside the military, UR becomes a WarMachine advancing decades ahead of American music' (Eshun, 1998, p. 117). In the context of this militant, militaristic aesthetic the mechanical brutality of melodic doubling maybe heard as appropriate.

The highly chromatic, and brutally 'stabbing' progression of X-101's 'Sonic Destroyer' (1991) has already been noted in this chapter. Eshun describes the X-101 album, *X-101* (1991) as an example of 'sonic brutalism' and suggests that in this album 'Techno becomes punishing, a barbed-wire warzone of voltage endured and inflicted' (Eshun, 1998, p. 118). It is therefore possible that the use of melodic doubling in this track contributes to the sense that this music is brutal and mechanical. Similar progressions can be found elsewhere in tracks produced by Mike Banks as Underground Resistance, for example, the Fm-G♭m (i-♭ii in F) progression at the start of Ingator II's 'Skyscratch (Mano Mano) (Underground Resistance Tresor Mix)'

(1992). It can also be identified in other tracks released on the Underground Resistance label, such as The Suburban Knight's 'Nocturbulous' (1993). This track doubles a two-bar ♭9-♭6, 8-5, 9-6, ♭10-b7 riff (in B), with minor triads creating the doubled sequence ♭ii-♭vi, i-v, ii-vi, ♭iii-♭vii (in B). Similar progressions have also used by Drexciya, such as the track 'Lake Haze' which doubles a 1-♭7-8-1-♭9-8 (in F) riff with minor triads, creating the sequence of chords i-♭vii-i-♭ii-i (in F).

As noted in Chapter One, Reynolds has noted the 'militancy' of early 1990s UK hardcore music and has suggested that this style suggests 'violence given focus and discipline' (Reynolds, 2009a). Again, the brutal and mechanical quality of doubled riffs may play a role in constructing that reported sense of 'violence' (Reynolds, 2009a). For example, the track 'Street Violence' (1991) by Trak 1 features a passage in which a minor pentatonic riff 8-5-8-5-8-5-♭7, 8-5-8-5-♭10-5-♭7-5 (in C♯), is doubled with minor triads, creating the sequence i-v-i-v-i-v-♭vii-i, i-v-i-v-♭iii-v-♭vii (in C♯) (from 01:49). This melodic doubling may be heard as sufficiently rough and brutal in character to be included in a track that repeats the dialogue sample, 'street violence is at an all-time high'. A more science-fictional and camp type of violence is evoked in the hardcore track 'Exterminate (Day Of The Hardcore)' (1991) by D-M-S featuring, samples of Dalek dialogue from *Doctor Who*, and beginning with an 8-7-♭7 descending pattern doubled to create the sequence i-vii-♭vii in C♯. 'Hardcore U Know The Score' (1991) by The Hypnotist also establishes its 'hardcore' character through use of doubling, featuring an 8-♭10-♭7-♭9 (in G) riff that is doubled with minor triads to create the sequence i-♭iii-♭vii-♭ii (in G). Such associations of melodic doubling have also been exploited in later drum & bass tracks, such as DJ TeeBee's 'Future War' (2000), which features a iv-iii-♭iii-ii-iv-iii sequence of doubled chords in A♭. Similarly, Trace & Optical's 'Mercury Switch' (2000) features a i-vii doubled riff (in E).

The perception of the 'brutality' of a riff may be linked to its perceived level of dissonance. The first half of Orbital's 'Impact (The Earth Is Burning)' (1993) features a 8-♭7-4-♭3 (in A) riff, which is doubled with major triads producing the sequence of chords I-♭VII-IV-♭III. This harmony is technically dissonant, in the sense that it produces a non-diatonic 1,2,♭3,3,4,5,6,♭7 pitch collection. However, this pitch collection, is relatively common in pop and rock music,

and may be regarded as relatively consonant, if it is regarded as containing a 'flexible' third scale degree. But from 07:08 this riff is replaced with a second riff, b5-1-1-1-b5-1-b5 (in A), that is also doubled with major triads, creating the macroharmonic collection, 1,♭2,3,♭5,5,♭7. This riff, containing the ♭5 scale degree, and doubled to contain a ♭2 scale degree, can be considered clearly more dissonant than the first riff, and creates a structural division in the track, between the relative consonant feel of the first section of the track, and the more dissonant feel of the second section.

7. Transpositional chord progressions in dance music

Chord progressions created by transposition of a single chord voicing in dance music can be separated into two types: those using chords that include the notes of a major triad, and those that do not. Transpositional chord progressions which feature chords containing the notes of the major triad may be heard as positively-valenced and emotionally 'warm', when compared to minor triad harmonies, and also more likely to be heard as similar to harmonic practice in earlier Afro-Diasporic styles such as jazz, R&B, and soul.

Many chromatic transpositional progressions in machinic dance music are produced by doubling minor pentatonic static melodic lines with either major triads, major seventh chords, or minor seventh or ninth chords (which contain the notes of a major triad). Such progressions, although containing scalar ambiguities, are likely to be heard as broadly positive due to the use of high-valenced 'major' chords. Although often doubling static riffs based on the minor pentatonic scale, such progressions may also double riffs that are based on modes of the pentatonic scale. As Tagg notes, in *Everyday Tonality II*, there are five modes of the 'minor' pentatonic scale, the La-pentatonic (1,♭3,4,5,♭7, the common minor pentatonic scale), the Doh-pentatonic (1,2,3,5,6, the major pentatonic scale), the Re-pentatonic (1,2,4,5,♭7), Mi-pentatonic (1,♭3,4,♭6,♭7) and the Sol-pentatonic (1,2,4,5,♭6) (Tagg, 2018, p. 154).

For example, the early drum & bass track 'Find A Way (1993)' by Internal Affairs features a four-bar 'Mi-pentatonic' progression (moving up by a perfect fourth each time and fitting within the Mi-pentatonic scale) doubling an 8-11-♭7-♭9-♭6 line with Maj9 chords to create the

progression I-IV-♭VII-♭II-♭VI (in E). The piano progression from Blame's UK hardcore track '2 Bad Mice Take You' (1992), ♭III^{Maj7}-IV^{Maj7}-I^{Maj7}-♭VI^{Maj7} (in C), is also based on the doubling of a 'mi-pentatonic' static harmony. The UK hardcore track, 'Different Strokes' by Isotonik (1991), meanwhile. uses a sample of the Maj7 chord from 'Pacific State' to double a 1-2-4-5 major Doh-pentatonic line, creating the progression I^{Maj7}-II^{Maj7}-IV^{Maj7}-V^{Maj7} (in D). Similar progressions may be found in more recent dance music, such as 'Broken Heart (Martyn's DCM Remix)' (2008) by TRG, in which a minor pentatonic melodic line is doubled with minor seventh chords, creating the progression i^7-v^7-♭iii^7-iv^7 (in F).

These 'major' chord progressions in dance music, based on underlying consonant pentatonic melodic lines, are likely to be heard as relatively positively-valenced, and may be heard as evocative of harmonic conventions in other styles of popular music. For example, the main chorus progression of Roy Ayers' jazz-funk song 'Everybody Loves The Sunshine' (1976), F♯m^{11}-C♯m^{11}-Am^{11}-Bm^{11} (or i^{11}-v^{11}-♭iii^{11}-iv^{11} in F♯), is produced by forming a series of minor eleventh chords on the scale degrees of the F♯ minor pentatonic scale. Although the chord progression contains numerous scalar ambiguities (the first two chords outline the F♯ Dorian scale, into which the Am11 chord does not fit), this ambiguity may be heard as chromatic interest added to an unambiguously 'positive' song. Dance tracks using this major harmony are also likely to be heard as largely positive and using a type of harmony that has similarities to harmonic practice in other styles of popular music.

While transpositional progressions of major triads built on pentatonic roots are likely to be heard as using a broadly conventional harmonic system, transpositional progressions of major triads based on dissonant static riffs may be heard as more unusual and may be more likely to be associated with depictions of the fantastic. Pairs of parallel major triads a tritone apart, for example, may be considered highly ambiguous with regards to scale. A major chord based on a scale degree a tritone above the foundation note may be heard as based on the scale degree ♯4 or ♭5, with its third either a ♯6 or a ♭7, and the fifth either a ♯1 or a ♭2. This chord can therefore be described with eight different combinations of scale degrees, six of which are internally dissonant (♯4-♯6-♭2, ♯4-♭7-♯1, ♯4-♭7-♭2, ♭5-♯6-♯1, ♭5-♯6-♭2, ♭5-♭7-♯1) and only two of which are internally consonant (♯4-♯6-♯1, ♭5-♭7-♭2). As a result of this scalar ambiguity

(which offers more dissonant interpretations than consonant interpretations), pairs of major triads a tritone apart have often been used in film music to suggest a narrative event is wondrous, mysterious, or unknowable.

The I-♭V progression has been classed as a 'major tritone progression' or 'MTTP', by film music scholar Scott Murphy, who notes that such progressions have often been associated, in Hollywood cinema, with 'settings of, or objects from, outer space' (Murphy, 2006, p. 1). Murphy notes the use of such progressions in the scores of *Star Wars* (1977), *Star Trek II: The Wrath of Khan* (1982), *Dune* (1984) (Murphy, 2006, pp. 2-4), among others, as well as in more recent films such as *Treasure Planet* (2002) (Murphy, 2006, p. 7). Such progressions, as well as often connected with space travel, may also be generally heard as evocative of the fantastic or supernatural. Murphy notes that,

> the MTTP is often heard to accompany the extraordinary, and that which is beyond normal human experience. For example, the progression recurs throughout Alan Silvestri's scores to the *Back to the Future* (1985, 1989, 1990) films as a signifier of the mysteries and wonders of time travel, it highlights the moment when Daryl Hannah's character sees the true nature of the titular character in Shirley Walker's score for *Memoirs of an Invisible Man* (1992), and it accompanies the first occasion when the titular character's ability to understand animals leads to a healing (of an owl, in this case) in Richard Gibbs's score for *Doctor Doolittle* (1998) (Murphy, 2006, p. 11).

The MTTP might also be heard to suggest a fantastical quality in machines or technology. The second section of Bernard Hermann's 'Prelude' (2016) from *The Day the Earth Stood Still* (1951), for example, is based on an oscillation between two major chords a tritone apart, D-A♭ or I-♭V (in D). This progression may be understood to suggest the strangeness of unknown reaches of space from which Klaatu and Gort have travelled to Earth, and the miraculous quality of their alien technology. Stu Phillips' title music to the TV series *Knight Rider* also suggests that the robot car KITT is a piece of 'miraculous' technology when it incorporates an MTTP, a CM-F#M progression (♭V-I in F#) (at 0:43).

Although these film and television music progressions are not voiced with parallel chords, parallel major tritone progressions in machinic dance music may also be heard as creating a strong sense of scalar ambiguity and may also be associated with evocations of space, or the fantastical. For example, a I-♭V-♭II synth-string progression, produced by the transposition of a major triad, appears in the track 'Hyperspeed (G-Force Part 2)' by The Prodigy (1992) (first

heard at 01:10). This four-bar progression outlines the chords BM-FM-CM (I-♭V-♭II in B), with the majority of the phrase resting on either the BM or FM chords. The roots of the BM and FM chords are separated by an interval of a tritone and create the strong sense of scalar ambiguity described above.

Equally, 'major' chord progressions based on a melodic lines including the ♭2 scale degree may be heard as strongly ambiguous. Model 500's 'Milky Way' (1995), for example, begins with a doubling of an ascending 1-♭2-2 line with minor ninth chords, resulting in an E♭m9-Em9-Fm9 progression (i^9-♭ii^9-ii^9 in E♭). The second chord of Em9 does not fit within either an E♭ Aeolian or E♭ Dorian scale and may be heard to create a strong sense of scalar ambiguity.

Compared to progressions of parallel 'major' chords, progressions in film music constructed from parallel minor triads may be heard as lacking 'warmth', and appropriate to score compassionless or emotionally cold characters. For example, John Williams' theme for 'The Emperor' (1983), from *Star Wars Episode VI: Return Of The Jedi* (1983) is constructed from only minor triads. The theme begins by transposing the foundation chord of Gm up by a minor third to create a B♭m chord (Buhler, 2000, p. 47). After being transposed back down by a minor third to Gm, the subsequent chord is a C♯m, although this is not reached by a parallel transformation. The full progression of the theme is therefore Gm–T^3–B♭m–T^{-3}–Gm–RPRP-C♯m (or i-♭iii-i-♭v), in which the foundation chord alternates with the chromatically related chords of ♭iii and ♭v. The sense that the Emperor theme is both 'ambiguous', in terms of scale, and lacking the emotional warmth of 'major' chords is appropriate for scoring this evil and uncanny figure.

Chord progressions similar to the Emperor theme, where a minor foundation chord is transposed up or a down by a minor third, creating the progressions i-♭iii or i-vi, are also common in machinic dance music. The UK techno track 'LFO (The Leeds Warehouse Mix)' (1990) by LFO, features a progression of parallel minor triads, Dm–T^7–Am–T^{-4}–Fm–T^7–Cm–T^{-12}–Cm–T^7–Gm–T^{-4}–E♭m–T^7–B♭m, or ii-vi-iv-i, i-v-♭iii-♭vii (in C). This progression does not feature any upward transpositions by a minor third, but instead features transpositions up by a perfect fifth followed by a transposition down by a major third, creating the progression i-

v-♭iii. The ♭iii chord is also found in various early 1990s techno tracks that evoked the chromatic chordal harmony of LFO, such as 'Thoughts Of Tomorrow (club mix)' (1990) by DV8 (Roger Sanchez), which features an Am-T^3-Cm-T^{-3}-Am progression (i-♭iii-i in A). 'Ambient Rubb-A-Dubb' (1991) by Shake Inc., another track that recalls 'LFO', features the progression Em-Gm-Dm-Em (i-♭iii-♭vii-i in E) also contains a i-♭iii transposition. The UK hardcore track 'Let's Go (Cold Remix)' (1992) by Nasty Habits begins with a similar progression: Cm–T^{-9}–E♭m–T^7–B♭m–T^2–Cm–T^{-9}–E♭m or i-♭iii-♭vii-i-♭iii in C, although this progression begins with a transposition downwards by a major sixth, instead of upwards by a minor third. Similarly, the four-bar progression of Ed Rush's 'darkcore' drum and bass track 'Bludclot Artattack (Dark Mix)' (1993) is produced by doubling the melodic line 8-♭10-5-♭9-8 with minor triads creating the following progression: B♭m-D♭m-G♭m-Bm-B♭m, or i-♭iii-♭vi-♭ii-i (in B♭). DJ Crystl's 'King Of The Beats' (1994) begins with an E♭m–T^4–Gm–T^{-7}–Cm–T^3–E♭m progression, that can be considered a ♭iii-v-i progression, or a reversal of the i-v-♭iii progression found in 'LFO'. Such progressions in dance music, featuring the ♭iii chord, may be heard as strongly negatively-valenced, as they contain no 'major' chordal harmonies and may be heard to produce numerous scalar ambiguities.

Transposition of triads by a tritone is another practice commonly used in film music to create a strong sense of scalar ambiguity, as was noted above in relation to the MTTP. Tritonal transpositions of a minor triad can be identified in John Williams's 'Ark Theme' from the score to *Raiders of The Lost Ark* (1981). The theme, as heard in the cue 'The Map Room: Dawn', begins with the following sequence of chords: Cm-F♯m-T^{-6}-Cm, Cm-F♯m-T^{-6}-Cm (according to Lehman's transcription, with only the transpositional transformations marked (Lehman, 2012, p. 185)). This progression is made up entirely of minor triads which are mostly connected with chromatic, smooth voice leading. However, there are some instances where the chords are transformed by transposition. The F♯m-Cm progression in the first bar, and repeated in the second bar, for example, are examples of a T^{-6} transposition, or a transposition down by a tritone. The seventh bar also contains the successive transpositions Fm–T^3–A♭m–T^{-1}–Gm–T^{-4}–E♭m. The use of transpositions of a minor triad by a tritone creates a strong sense of scalar ambiguity, due to the numerous scalar interpretations that can be made of the second chord. The ♭v F♯m chord may be heard as based on a ♯4 scale degree, and containing the notes

♯4,6,♭9 (a diminished fourth between 6 and ♭9) or ♯4,♭7,♭9 (a diminished fourth between ♯4 and ♭7). The only internally 'consonant' interpretation would be ♭5,♭7,♭9. Again, like in the previous examples, this scalar ambiguity may be heard as appropriate for representing the mysterious 'Ark of the Covenant', which is presented in the film narrative as possessing strange and frightening supernatural power. Similar progressions with tritonal transpositions may also be identified in machinic dance music. Rufige Cru's 'Darkrider' (1992), features (in addition to the doubled riff that was discussed earlier in this chapter) a i-♭v-iii-♭v progression in C (that begins at 0:27), made up of short 'orchestral' string chord samples. This progression contains transpositions up and down by an interval of a tritone and so may be heard to refer to the harmonic conventions of film music such as John Williams' 'Ark Theme'.

Film composers may transpose a minor triad by an interval of a minor second to create scalar ambiguity. A series of semitonal transpositions can be found in Jerry Goldsmiths cue 'The Cloud' (1979) from *Star Trek: The Motion Picture* (1979), in which, according to Lehman's transcription, a passage of the cue (from 0:18) oscillates between two minor triads a semitone apart F♯m–T^1–Gm–T^{-1}–F♯m–T^1–Gm (Lehman, 2018, p. 79). This music creates a sense of internal scalar ambiguity appropriate to depict a mysterious and threatening space cloud.

Similar progressions, in which a foundation chord is transposed up or down by a minor second, can also be identified in machinic dance music. Model 500's 'Mind Changes' (1992), for example, features the progression Cm–T^1–D♭m–T^{-3}-B♭m–T^2–Cm (i-♭ii-♭vii-i in C), which begins with a transposition from the i chord to the ♭ii chord. The main chord progression in Sven Vath's electro track 'Contact' (2000), B♭m–T^{-1}–Am–T^2–Bm–T^{-3}–A♭m–T^2–B♭m or ♭ii-i-ii-vii (in A) includes both a ♭ii chord and vii chord relative to the foundation chord of Am, and begins with a transposition downwards by a minor second from B♭m to Am.

It has been argued in this chapter, that chords that do not contain the notes of a major triad may be perceived as relatively negatively-valenced or emotionally 'flat', compared to chords that do contain the notes of a major triad. Some seventh and extended chords built on the minor triad, then, notably the mAdd9, mMaj7, and m6 or m7♭5 chords, may also be heard as negatively-valenced, as they similarly do not contain the notes of the major triad. These

chords may be distinguished from the minor seventh chord (m7) which is an inversion of a major sixth chord.

These chords have been used in both film and dance music as substitutes for the minor triad, which retain the emotionally 'cold' qualities of the minor triad. The opening progression of Bernard Herrmann's 'Prelude', from *The Day The Earth Stood Still* (1951), for example, shifts between a mAdd9 chord and a m6 chord a half-step above it, creating the progression Dm^{add9}-$E\flat m^{6}$ or i^{add9}-$\flat ii^{6}$. Herrmann uses these chord types as a way of extending the underlying minor triads while avoiding the 'major' sound of m7 or m9 chords. Rebecca Leydon's transcription of this main theme indicates that this progression is partly based on a parallel movement of minor triads between the i and $\flat$ii chords (Leydon, 2004, p. 33). Some instruments are arranged to move in parallel, such as the trombones, which outline a $Dm–T^{1}$–$E\flat m–T^{-1}$–Dm progression, similar to the parallel progressions so common in machinic dance music.

The opening passage of 'Prelude' features many of the harmonic properties that are also characteristic of minor transpositional progressions in dance music. Firstly, it includes the dissonant $\flat 2$ scale degree, relative to the tonal centre of D. This is noted by Anthony Bushard, who suggests that 'throughout the score, Herrmann exploited the semitonal tension between the tonic D-natural and flatted-second E-flat' (Bushard, 2009/2010, p. 325). Bushard's comments suggest that, even in a chromatic chordal context, the presence of dissonant scale degrees may still be heard to create tension and instability within that progression.

Additionally, for Bushard, Herrmann's chromatic harmony, 'frustrates our harmonic expectations of the tonic-dominant symbiosis, upsets diatonic melodic convention by weakening the expected whole tone between scale degrees 1 and 2' (Bushard, 2009/2010, p. 325). This observation can be understood to describe the progression's scalar ambiguity, as the chord progression cannot fit into a diatonic scale and 'upsets diatonic melodic convention' (this simple progression contains many scalar ambiguities, and the second chord ($E\flat m^{6}$) may be heard as containing a non-diatonic augmented second interval between the notes of e$\flat$ and g$\flat$). Elsewhere in his analysis of Herrmann's score, Bushard notes that the use of

chromaticism may be heard to produce 'intervallic ambiguity', which is heard to 'comment upon dramatic uncertainty' (Bushard, 2009/2010, p. 316)

The mAdd9 and m6/m7♭5 chords used in this progression may also be heard as negatively valenced or lacking emotion, because they do not contain the notes of the major triad. The use of these chords may be heard to amplify the strange and unsettling nature of this progression, by deliberately avoiding introducing any sense of harmonic 'warmth'. Taken in combination, these harmonic features, may be heard as appropriate to elicit the 'feelings of fear, alienation, and paranoia inherent in the drama' (Bushard, 2009/2010, p. 325).

Similar properties may be identified in transpositional produced progressions in machinic dance music. Patrice Scott's 'Tones & Things' (2012) features an Em^{Add9}-Bm^{Add9}-Gm^{Add9}-Fm^{Add9} (i-v-♭iii-♭ii in E) progression, which is repeated throughout its duration. This progression, like the opening progression of *The Day The Earth Stood Still* (1951), contains dissonant scale degrees relative to the tonal centre (♭2 and ♭5), also contains pronounced chromaticism, which may be heard to produce scalar ambiguity (it includes the non-diatonic chords ♭ii and ♭iii) and avoids the warmth of major harmony by using mAdd9 harmonies throughout.

By featuring many of the same harmonic properties as passages of film music such as Herrmann's 'Prelude', it might be expected that transpositional progressions of minor harmonies in machinic dance music, such as 'Tones & Things' (and many of the other examples given above), will be heard to possess similar expressive qualities to these film cues. These pantriadic minor progressions may also be heard as unsettling and instable, ambiguous, strange, and lacking emotion.

8. Minor triad transpositional progressions in dance music

It has been argued in this chapter that chordal harmonies containing the notes of a major triad may have different qualities to those that do not. Crucially, in Lahdelma and Eerola's research, chords containing the notes of a major triad are heard as more positively-valenced than those that did not, such as the minor triad (Lahdelma & Eerola, 2016a). However, the minor triad was also the lowest ranked chord in terms of perceived 'energy. The minor triad, consequently, may be heard as a relatively 'flat' chordal harmony, mostly defined by its

absence of affect, lacking both the energy and instability of dissonant chords or the perceived 'warmth' of major harmonies. Such a harmony, then, may be heard as appropriate for depicting the non-human emotional 'absence' of machines and technology.

The use of fixed chord voicings also ensures that transpositional chord progressions will contain only chordal harmonies of a single quality, quite different to the mix of major and minor chordal harmonies that are typically found in major and minor key harmony and modal harmony. Common minor mode chord progressions in rock and R&B include ♭VI-♭VII-i or i-IV, and these progressions feature 'warm' major chord harmonies in addition to minor foundation chords. Passages of entirely minor chords, then, may be heard to 'intensify' the quality of emotional absence represented by the minor triad by excluding all major chord harmonies.

The choice to use exclusively minor triad progressions in film music to depict villains and threatening situations may be due to the lack of emotional warmth in minor triad progressions appropriate for the depiction of intelligence that is entirely without emotion and compassion. William Rosar has made a similar argument with respect to quartal chords, which he argues, in the film music of Leith Stevens, may be heard as depicting the 'coldness' and 'emptiness' of various subjects. Crucially, quartal chords (such as 1,4,♭7 or 1,4,5), built from a series of fourths, are another type of chordal harmony that do not contain the notes of a major triad. According to Rosar,

> From the outset, in *Destination Moon*, Stevens associated quartal harmony with the ethereal coldness and emptiness of outer space, with mechanical computation in *When Worlds Collide*, and in corporeal form, the cold-hearted brutal Martians in *War of the Worlds*. These different musicodramatic uses of quartal harmony are linked by a common perceptual quality, specifically, a physiognomic quality that is shared or partly shared by each film context, whether it be described in terms of ambience, expression, or character (Rosar, 2006, p. 428).

Discussing the use of quartal harmony in The War of The Worlds, Rosar similarly argues that:

> the "coolness" of the quartal harmony alone in association with the Martians and their machines corresponds well to H.G. Wells' characterization of the invaders from the red planet as "intellects vast and cool and unsympathetic." Once again, as in the "D.A." music in When Worlds Collide we see a kinship or association in Stevens' mind between machine music and quartal harmony (Rosar, 2006, p. 420).

The use of exclusively 'non-major' harmonies in many of the examples of film music discussed in this chapter, such as John Williams' 'Emperor' theme from *Return of The Jedi* (1983), the 'Ark theme', from *Raiders of The Lost Ark* (1981), and the opening passage of Bernard Herrmann's main title theme from *The Day The Earth Stood Still (1951)*, may be heard as producing a similar effect, and depicting non-human intelligence entirely without human emotional warmth.

The use of similar passages of minor harmony in dance music may also be heard as lacking in emotional warmth, and therefore depictive of a machinic, coldly rational intelligence. For example, LFO's 'LFO' (1990), features the entirely minor chord progression ii-vi-iv-i, i-v-♭iii-♭vii. Such a progression, based on the chord roots 2-6-4-8-1-5-♭3-♭7, could, hypothetically, be reharmonised as a Dorian modal progression, as ii-vidim-IV-i, i-v-♭III-♭VII, with a mix of major and minor chord qualities. Such a progression would radically change the overall character of the progression, introducing an emotional warmth in the major harmonies that is absent in the entirely minor version. Entirely minor progressions in dance music may, then, be heard to lack the warmth of major chords and therefore be appropriate for depicting an emotionally cold, machine intelligence.

9. Chromatic transpositional progressions and evocation of the fantastic

Recent academic scholarship by Richard Cohn and Frank Lehman has argued that the harmonic practice of 'pantriadicism' can be linked to the expression of concepts such as wonder, awe, and the supernatural and uncanny, in both nineteenth century orchestral music and modern film music. A notable difference between pantriadic and diatonic harmony is that pantriadicism often produces unusual, chromatic shifts between chords. The terminology for describing such chromatic chord shifts has been provided by 'Neo-Riemannian theory', which describes these chord shifts in terms of a number of 'operations' that would be required to 'transform' one chord into another.

A fundamental property of non-diatonic chord transformations, which emerges from Neo-Riemannian analysis, is that they can typically be understood as familiar diatonic chord transformations which have been altered by the use of a 'parallel' ('P') operation. The 'P' operation describes the transformation of a major triad to a minor triad (or vice versa) by

altering its third by one semitone. This 'parallel' transformation is regarded as central to the practice of chordal chromaticism, as it allows unexpected non-diatonic chord progressions to be produced by moving to the closely-related parallel chord based on the same chordal root. A Cm chord may therefore be transformed to a CM chord by raising its minor third by one semitone to a major third, a transformation which is always non-diatonic or 'chromatic'. Similarly, a diatonic Cm-E♭M progression may be chromatically altered by replacing the E♭M chord with its parallel minor triad, creating the chromatic Cm-E♭m progression (a 'relative parallel' or RP transformation). A diatonic Cm-A♭M progression may be altered to the chromatic Cm-A♭m progression (a 'leading tone exchange parallel' transformation, or LP transformation).

More distant chromatic chordal relationships can also be understood as produced by exchanging triads for their parallel versions. Lehman, for example, has noted 'the sheer weirdness' of a Gm to G♭M shift in Hans Zimmer's score to *Inception,* in a passage in which the Gm chord is heard as the tonic chord (Lehman, 2018, p. 6). This shift might be understood as a 'PLRLP' transformation containing two parallel transformations (it can be understood as a chromatic alteration of a diatonic GM-G♭m shift in which both chords have been replaced by their parallel chords). As was noted earlier in this chapter, Cohn has suggested that the sense of 'weirdness' produced by such chromatic progressions may result from the experience of scalar ambiguity, the result of simultaneous scalar interpretations of chordal harmonies as both dissonant and consonant. Cohn argues that the perceived sense that a harmony is both consonant and dissonant may be heard as an anaphone for 'breakdowns in the division between otherwise securely demarcated categories, prototypically the boundary between reality and illusion, or life and death' and are 'a mark of the psychological uncanny' (Cohn, 2012, p. 22). Cohn specifically argues that, as a result of their scalar ambiguity, LP or PL progressions may be heard as a 'icons rather than symbols of altered or destabilized mental states' (Cohn, 2012, p. 22). Cohn elsewhere argues that chromatic harmony, which 'confounded' the expectations of functional harmony, was generally associated in nineteenth century music with 'altered or heightened realities' and heard as ''capable of evoking the strange, magical and inscrutable' (Cohn, 2012, p. x). Frank Lehman elsewhere describes the 'otherworldliness' (Cohn, 2012, p. 85) of the 'hexatonic pole progression (a CM-A♭m

transition or PLP transformation). Lehman claims that 'Pantriadic harmony is a potent style topic, used throughout film history to represent and sometimes elicit the affect of wonderment' (Lehman, 2018, p. 10) Lehman elsewhere argues that chromatic pantriadicism is used by film composers to fulfil four aesthetic needs: 'intensification, fantasy, atypical psychology and sublimity ' (Lehman, 2018, p. 70).

Such 'LPR' chromatic harmony has also been employed in dance music, and it might be expected that such chromatic harmony will also be heard as anaphonically expressive of the fantastical in this context. Tethered LPR chromaticism has been employed in machinic dance music and may be heard as evoking the fantastic and sublime, particularly in relation to science-fictional concepts such as the future and space travel. For example, the introduction section of Donna Summer's 'I Feel Love' (1977) features a chromatic parallel transformation (CM-Cm-CM), that may be heard as a reference to the similar CM-Cm progression at the start of Richard Strauss's 'Also Sprach Zarathustra' (1968) (a work that came to be popularly associated with the future and space travel due to its use in Stanley Kubrick's *2001: A Space Odyssey* (1968)). A similar CM-Cm-CM-Cm progression is found at the 07:17 point of Cerrone's 'Supernature' (1977), released in the same year as 'I Feel Love' and another disco song with a futuristic, science-fictional theme. These progressions can be heard as paradigmatic chromatic progressions as the highlight transformations between parallel major and minor triads.

Chromatic harmony of this type also been employed in later dance music with futuristic, science-fictional aesthetics. The UK hardcore track 'Out of Space' (1992) by the Prodigy, begins with a synth-string progression that can be described as EM-C♯M-D♯M-C♯m-D♯M-EM or I-VI-VII-vi-VII (in E). This progression is not exclusively produced by transposition and includes a chromatic change of chord quality from C♯M to the parallel C♯m chord. This progression can be described as featuring the following transformations, EM-RP-C♯M-T^{-2}-D♯M-PT^{-2}-C♯m-PT_2-D♯M-T^1-EM, and so combines both transpositions and LPR chromaticism. The progression begins with a chromatic RP transformation, or a shift from the chord of EM to its relative minor chord of C♯m, with the C♯m chord replaced by its major parallel chord of C♯M. Such chromatic transformations then, such as P, RP and LP may be heard as

anaphonically evocative of the fantastic, and appropriate to appear in a dance track with a theme of 'outer space'.

Crucially, chromatic chord progressions produced only by transposition, may be distinguished from the smooth voice leading and common-tone retention of the 'LRP' chromaticism described above. Entirely transpositional chord progressions can never contain genuine 'P' transformations in which the third note of a chord is changed while the remaining chord-voices are unaltered. This is because transpositions, by definition, move chords in their entirety rather than operating on individual chord voices. Transpositions do not allow for individual chord voices to be altered relative to the rest of the chord, and so do not allow for the kind of transformations described by Cohn and Lehman as characteristic of 'LRP' chromatic harmony.

So, although exclusively transpositional pantriadic progressions can be regarded as highly chromatic and may be shown to 'confound' diatonic expectations, Lehman has explicitly argued that transpositional progressions are unlikely to evoke the strange and uncanny in the same way as 'LRP' chromaticism with smooth voice leading. Lehman is keen to differentiate between the expressive properties of progressions produced by transpositions and LRP progressions, suggesting that these different types of voice-leading practice are likely to possess different associations. Lehman suggests that transpositional harmony is likely to be associated primarily with 'Debussyian Impressionist harmony' rather than with 'Wagnerian romanticism' and notes that transpositional harmony is prevalent in historical epic films such as *Quo Vadis* (1951) and *Ben Hur* (1959) (both scored by Miklos Rozsa), and may be heard in that context to 'connote antiquity' (Lehman, 2018, p. 82) rather than the fantastic. Lehman notes that such transpositional progressions can easily 'slip into pantriadic territory' but argues that 'parallel voice leading is not the driving force behind most forms of pantriadic chromaticism' (Lehman, 2018, p. 82). Exclusively transpositional harmony, therefore, is, for Lehman, primarily evocative of ancient music or 'antiquity' rather than the fantastic.

However, the potential for transpositional progressions to be heard as evoking the strange, fantastic, and uncanny is evident when considering the use of this practice in the film music discussed in this chapter. In John Williams' 'Emperor theme', Herrmann's 'Prelude' from *The Day The Earth Stood Still* (1951) and Goldsmith's 'The Cloud', chromatic transpositional

transformations have been used to score scenes and characters that can be considered strange or supernatural. Consideration of the examples of film music and machinic dance music discussed in this chapter suggest that a clear distinction between the expressive associations of chromatic 'LRP' harmony and transpositional harmony may not always be clear, and it may be possible that transpositional progressions can also be heard as evocative of the fantastic. For example, a i-T^3-♭iii progression, in which a minor triad is transposed up by a minor third, and which begins both John Williams' 'Emperor theme', and machinic dance tracks such as DV8's 'Thoughts of Tomorrow' (1990) and Rufige Cru's 'Darkrider' (1992), may be understood to produce the same scalar ambiguity that Cohn has argued is crucial to the anaphonic expression of the fantastic in romantic music. In such progressions, the third of the ♭iii chord may be heard as a ♭5 scale degree relative to the tonal centre of the passage but may also be heard as ♯4 scale degree relative to the 5 scale degree established in the previous i chord. Transpositional progressions as well as 'LPR' progressions, then, may also produce scalar ambiguities, and may also be heard as evocative of the uncanny or the fantastic.

Williams' 'Emperor theme' has been described as possessing fantastical qualities, despite beginning with a transpositional transformation. Buhler specifically mentions the parallel quality of this progression and suggests that such transpositional harmony may be heard as contributing to the sense of the supernatural, or uncanny. Buhler suggests that Williams' Emperor theme has 'an elemental, other-worldly quality. It is as if these triads were being moved in sonorous blocks against their tonal will. The music gives the impression that only a very powerful sorcerer, perhaps only a god, could animate these chords thus, could make progress so against their tonal nature' (Buhler, 2000, p. 47). Here Buhler is associating transposition with technology and the machinic, but also with ancient mythological, magical forces, such as sorcerers and gods, suggesting that this theme may be heard as a combination of these two qualities.

It seems plausible, then, that chromatic transpositional harmony in dance music may be likely to be heard as evocative of 'heightened realities' or 'wonder' in a similar way to these examples of film music. As was noted in Chapter Two, Ben Williams has suggested that a style of astral techno can be defined by its sense of 'cosmic rapture' and evocation of a 'technological sublime' (B. Williams, 2001, p. 166) and these tracks may use transpositional

chromaticism to suggest sublimity and the transcendence of everyday reality. For example, 'Lost Transmission From Earth' (1992) by The Martian, begins with a chromatic transpositional progression, E♭m-B♭m-D♭m-B♭m (or i-v-♭vii-v in E♭) and 'Eye Of The Storm' (1990) by Underground Resistance begins with the transpositional progression BM^6-F♯M^6-DM^6-EM^6 (I-V-♭III-IV in B), doubling a melodic line 8-5-3-4 (in B). Other Detroit techno tracks already mentioned in this chapter, such as Model 500's 'Milky Way' (1995), can also be understood to use chromatic transpositional harmony to evoke the sense of the 'cosmic' that is characteristic of astral techno.

Similarly, 'cosmic' transpositional progressions may be identified in other styles of machinic dance music. The I-♭V-♭II progression of The Prodigy's 'Hyperspeed (G-Force Part 2)' (1992) may still be heard as an anaphone for 'the vastness of outer space' in a similar fashion to MTTPs in film music, even though it is produced by transposition. Murphy argues that the 'distant' harmonic relationship of the two chords separated by a tritone 'invoke the concepts of great distance, ambiguity, and unfamiliarity' and so are 'appropriate accompaniment' (Murphy, 2006, p. 1) for scenes depicting outer space. Such a transpositional progression may even be heard as even more 'distant' as the voice leading distance between the chords may be greater than in LPR chromaticism.

The 'fantastical' qualities of this chord progression may therefore play a crucial role in how 'outer space' is evoked by the track. The track is likely to be interpreted as evocative of space, due to its paramusical framing. The track's name 'Hyperspeed (G-Force Part 2)' suggests futuristic space travel, such as 'hyperspace' travel in the *Star Wars* franchise of science-fiction films. The track also begins with an excerpt of dialogue from the landing from a 1981 NASA space mission ('Columbia now at 9 times the speed of sound. Roger that, and I got a solid TACAN lock on preplanned trajectory') and features a space-travel themed vocal sample taken from the 1983 electro hip-hop track The Return of Captain Rock' by Captain Rock ('Let's jet out, we'll cruise at hyperspeed, I got the beat to move your feet and that's all we need, Check it out!'). This paramusical text suggests a 'space' interpretation of the track, and this interpretation is supported non-harmonic structural elements, most notably the use of synthesised instrumentation and 'synth strings' sounds, which may be heard as evocative of technology or science fiction film music.

However, this evocation of space is also supported and amplified by the use of the transpositional MTTP progression. The use of the MTTP may be heard as evoking the 'vast distances' involved in space travel and the 'foreign and inhospitable' nature of outer space. The MTTP may also be heard, as Murphy suggests, more generally, as a signifier for the extraordinary, and that which is beyond normal human experience' (Murphy, 2006, p. 11). The tonal organisation of the track therefore helps clarify and amplify the 'space' theme of the track established by its paramusical elements, but also adds new meanings, such as the potentially fantastical or 'extraordinary' qualities of space travel at 'hyperspeed'. At a more metaphorical level, the 'hyperspeed' theme of the track may be interpreted as metaphor for dancing to rave music, metaphorically 'travelling through outer space', possibly under the influence of drugs such as ecstasy. In this case the use of the MTTP progression, suggests an analogue between the listening or dancing experience and travelling through a strange and distant setting which might be regarded by those dancers as 'beyond normal human experience' (Murphy, 2006, p. 11). Such harmony, in combination with other machinic signs in the track, may be understood to suggest that machines and modern technology can be fantastic or 'wondrous' and may afford new, 'extraordinary' experiences.

Many other dance tracks using transpositional progressions may also be heard to evoke the strange and fantastic, as their non-diatonic harmonies create scalar ambiguities that break with diatonic expectations. 'Planet Mystery' (1992) by Jessie Deep!, for example, features a Gm-F♯m progression over a D pedal bassline (iv-iii in D). The F♯m chord can be heard as creating a D^{Maj7} chord in combination with the bass, so that the progression may be rewritten as iv-I^{Maj7}. This progression therefore contains an interval between the B♭ in the first chord, and F♯ in the second chord that may be heard as either a diminished fourth or major third. This scalar ambiguity may be heard as evoking the 'mystery' of the title, and again appropriate for depicting space as a mysterious and fantastic setting.

Many of the examples already discussed in this chapter are highly chromatically ambiguous and may be heard as evoking the fantastic. The synth-string progression of Hypnotist's 'Pioneers Of The Warped Groove' (1991) for example, i-v-♭vi-i (in E), creates an ambiguity as to whether the D♯/E♭ in the ♭vi (Cm) chord should be heard as an augmented second or minor third above its chordal root of C. As a result, it may be suggested, contrary to the rule

proposed by Lehman, that many of the examples of chromatic transpositional progressions discussed in this chapter will be heard as having a fantastical quality. Heard in combination with the other signifiers of machine music discussed in previous chapters, the use of this harmony in dance music may suggest fantastical or supernatural technology, a technology that is paradoxically, both human-constructed but allows scenarios, such as space travel, that are beyond normal human experience. As was noted above, this may be commonly understood as a metaphor for the experience of listening to or dancing to machinic dance music itself, a music that often advertises its technological construction whilst simultaneously offering a profound and elusive experience that seems to transcend that material origin. This musical experience is often described as analogous to a trip into the future, outer space, or other dimension, or analogous to possessing or being affected by a magical power. The track 'Wrinkles in Time' (1995) from 4 Hero's *Parallel Universe* for example, begins with a transpositional progression, A♭m-Fm-B♭m-Am or i-vi-ii-♭ii in A♭, full of all the chromatic ambiguity discussed in this chapter, used to suggest moving outside of our current position in space and time.

The primarily minor quality of much transpositional harmony in dance music may also be understood as suggesting a 'cold' feeling to these progressions, lacking in human warmth. As Lehman suggests, such entirely minor progressions may be heard as expressive of supernatural 'evil', or the 'Darkside' of the fantastical. Such associations, if heard in the context of machinic dance music, may be heard as suggesting machines possess a dangerous power that is 'beyond human understanding' but may still offer transcendent experiences.

10. Chord quality as style flag

As was noted earlier in this chapter, changing the quality of the transposed chord in transpositional harmony may significantly the change the perceived valence of that progression. However, different qualities of chords may also be heard as associated with different styles of music, and so may function as style flags.

Tagg has argued that particular chord types may be associated with particular musical styles. For example, he suggests that the m7♭5 chord may be associated with romantic music and jazz standards, minor seventh and minor ninth chords with 'jazz standards and 1960s-1970s

pop, minor eleventh chords with 'post-bop', major seventh chords with jazz standards (Tagg, 2018, pp. 226-229). Tagg's overview of chord types suggests that seventh, ninth or eleventh chords, whether major or minor, are likely to be heard as associated with jazz and R&B styles. Chord progressions in these styles may also sometimes contain parallel movement between these chords. For example, Tagg, transcribing the opening bars of Miles Davis's 'So What?' (1959), suggests that the end of each phrase is marked by the parallel downward movement of chords minor eleven chords, creating a parallel Em^{11}-Dm^{11} progression.

As a result, some of the examples given in this chapter of dance music with seventh or ninth chords, such as 808 State's 'Pacific State' (1989) (transposing a Maj7 chord to notes of the minor pentatonic scale) or the $A\flat^{Maj7}$-E^{Maj7}-B^{Maj7}-$F\sharp^{Maj7}$-$C\sharp^{Maj7}$ (I-♭VI-♭III-♭VII-IV (in A♭)) mi-pentatonic progression of 'Universal Love' (1995) by 4 Hero, may be heard as style flags for 'jazz' or 'Jazz-funk'. Both of these tracks emphasise this association of the chord quality by featuring saxophone solos, strengthening the association with jazz practice. Progressions produced by doubling seventh or ninth chords may sound similar to that of Roy Ayers' Jazz-funk track 'Everybody Loves The Sunshine' (1976) which, discussed earlier in this chapter, which features a progression of m11 chords, with roots based on the notes of the pentatonic scale. A recent guide to composing 'jazz chords' in electronic music, illustrates its article with a progression that begins with parallel minor ninth chords (Clews, 2021, p. 73) . As a result, the practice of doubling static riffs with seventh and extended chords is likely to be heard as a style flag for jazz, soul, and R&B styles.

As was noted earlier in this chapter, Walter Everett has described the common practice of doubling static pentatonic melodic riffs with open-fifth 'power chords' or major triads in rock. According to Everett, 'Type 5 [melodic doubling in a static harmonic context] is new with rock music. Here, each member of the minor-pentatonic scale is treated as the root of a major triad, in effect doubling the scale in major thirds and fifths as well as octaves' (Everett, 2004, p. 5). Examples of such doubling include the chorus to The Kinks' 'All Day And All of The Night' (1964) (I-♭III-♭VII-I) and Deep Purple's 'Smoke On The Water' (1972) (I-♭III-IV, I-♭III-♭V-IV). The use of transposed major triads or open-fifth power chords in dance music, may be heard as a genre synecdoche referring to rock or heavy metal styles in a dance music context. Such references to rock style can be identified in early 90s styles of European trance and techno.

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These tracks might be regarded by some dance music audiences as having a 'novelty' character, due to the absence of 'heavy rock' signifiers in most machinic dance music. For example, the 1-8-♭9-♭7-5 riff of 'Acid Rock' (1989) by Rhythm Device, is doubled with a sample of a guitar power-chord, creating the progression I5-♭II5-♭VII5-V5, and can be heard as a genre synecdoche of 'heavy rock' style. The similar 8-♭10-♭7-11, 8-♭10-♭7-5-♭7 riff, from the beginning of '2√231' (1991) by Anticappella, is also doubled with power-chords and is equally likely to be heard as referring to rock style.

The use of transposed minor triads, however, may be heard as a style indicator for machinic dance music itself, rather than as a genre synecdoche for the styles of R&B, jazz, and rock. In the late 1980s minor triad transposition was employed in a number of machinic dance songs, such as Inner City's 'Big Fun' (1988), 'Don't Make Me Jack (The Technordik Reconstruction)' (1989) by Paris Grey, 'There's A Party Going On (Extended Party Mix)' (1989) by Yvonne and Underground Resistance w/ Yolanda's 'Your Time Is Up (Mix 1)' (1990) and quickly established an association between minor triad transposition and styles such as hip-house, techno and UK hardcore.

The use of sampled or otherwise 'fixed' minor triads to double riffs or create transpositional progressions in modern dance music is, then, likely to be heard as a reference to late 1980s and early 1990s techno and hardcore styles. A recent guide to producing 'Detroit techno-style fixed interval chords', describes the use of 'chord memory' to produce progressions of minor triads that will sound like classic 1980s and 1990s Detroit techno (Clews, 2021, p. 75). The recent techno track 'The 4th Dimension' (2019) by Taelue, features the progression i-♭iii-i-vi (in B), likely to be heard as a style indicator of 1980s and 1990s Detroit techno. The use of minor triad transposition in machinic dance music may therefore be primarily heard as a style indicator for 1980s and 1990s Detroit techno, UK hardcore and other styles.

Crucially, the non-diatonic macroharmony that easily results from using sampled chords or chord memory may be heard as a style flag for early 1990s hardcore just as much as the timbral qualities of the chord samples themselves. For example, the track 'Crystal Caverns 1991' (2012) by Lone specifically references early 1990s hardcore in its title and uses the familiar 'Landlord stab' chord sample, but the evocation of early 1990s UK hardcore is also

achieved through the creation of a highly chromatic doubled riff. The harmonic qualities of fixed triads, then, may be meaningful to listeners in addition to their timbral qualities.

11. Chromatic transpositional harmony as style flag for science fiction film music

As this chapter argues, some chromatic progressions produced by transposition in dance music may be heard as similar to passages of chromatic harmony from film and television music, often in the science fiction genre. The use of the MTTP in The Prodigy's 'Hyperspeed (G-Force Part 2)' (1992) for example, in addition to functioning as an anaphone of the vastness of space, is likely to be heard as a genre synecdoche for 'cinematic space music', due to the prevalence of similar progressions in science fiction film scores, as Scott Murphy has described. The use of highly chromatic pantriadic harmony in combination with synth-string timbres, more generally, may also be heard as a genre synecdoche for 'space music', such as Goldsmith's 'The Cloud' discussed above. For example, the highly chromatic synth-string progression heard from 02:25, in Jeff Mills' 'Masterlight' (2001), G♭m-Em-A♭m-Em, or ♭iii-♭ii-iv-♭ii in E♭, may be heard as a genre synecdoche for science fiction or 'space music' due to its use of synth-strings and highly ambiguous chromatic harmony. The minor triad chromatic transpositional progressions of many machinic dance tracks may similarly heard as genre synecdoches for 'sinister cinematic space music' due to their harmonic similarity to film music such as John Williams' 'Emperor Theme'. Such 'cinematic' associations are strengthened by the use in many of these progressions of 'synth-string' instrumentation, further evoking the orchestral sound of film music.

The style of 'darkside' UK hardcore makes this connection explicit and clear. Rufige Cru's 'Darkrider' (1992) combines a minor triad chromatic progression with samples of The Emperor's dialogue taken from *Return of The Jedi* (1983). The progression can also be heard as attempting to emulate the harmonic organisation of John Williams' theme. Similar chromatic harmony can also be found in another track from the same period, 'Sinister (The Influence Remix)' (1993) by Grooverider, which begins with an Fm–T^{-5}–Cm–T^{3}–E♭m–T^{-1}–Dm–T^{-1}–D♭m–T^{3}–Fm progression, of a sampled chord moving in parallel (while a sampled voice repeats the words 'so sinister'). The Cm-E♭m upwards transposition by a minor third may similarly be heard as evoking the 'sinister' associations of The Emperor theme.

12. Chromatic transpositional harmony as style flag for horror film music

Some machinic dance tracks may use chromatic transpositional harmony as a genre synecdoche for horror film music. This is most notable in early 1990s UK hardcore and in styles such as 'darkside' or 'darkcore' drum & bass. In this context chromatic transpositional progressions may be heard as style flags for horror film music, rather than science fiction film music. As was noted earlier in this chapter, Lehman has suggested that chord progressions entirely using minor triads, or 'intensified minor chromaticism' may be associated with 'threats and evils beyond human understanding' and that 'the gothic flavour of this trope makes it a prized trope in horror scoring, particularly from the 1980s onwards' (Lehman, 2018, p. 82). For example, the cue 'Sleep Clinic' from Charles Bernstein's soundtrack for *A Nightmare on Elm Street (*1984), from (01:13) onwards, is based entirely on a succession of minor triads, with an implied tonal centre of D: Dm-B♭m-Dm-Fm-C♯m-Dm-Gm-Dm-Fm-Dm, or i-♭vi-i-♭iii-vii-i-iv-i-♭iii-i in D. This passage includes a i-♭iii-i progression similar to the John Williams's Emperor Theme. Similarly, the cue 'Resurrection', from Christopher Young's soundtrack to *Hellraiser* (1987), contains a passage of minor triads from 01:32, each a minor second above or below the last: B♭m-Am-B♭m-Cm-D♭m-Dm.

The use of chromatic minor transposition progressions in dance music may therefore be heard as a genre synecdoche for horror film soundtrack music. The liner notes to the CD compilation *The Dark Side (Hardcore Drum & Bass Style)* (1993) notes that 'all the tracks on this album have some of the elements; ruff cut up beats, severe bass lines, uplifting vocals, piano breaks, dark sounds (sometimes samples from horror films).' Simon Reynolds has noted the use of 'horror movie soundtrack dissonance' in 1990s 'darkcore' tracks (Reynolds, 1996). Horror soundtracks may be referenced without using chromatic transpositional harmony, for example, the track Mega City 2 'Darker Side Of Evil' (1993) (compiled on *The Dark Side (Hardcore Drum & Bass Style)* directly samples a passage of Christopher Young's score to *Hellraiser* which does not use transpositional harmony. However, the track 'String Of Darkness' (1993) by Darkman (taken from the same compilation) features a minor triad transposition progression (from 02:02), Fm-Cm-A♭m-Em or i-v-♭iii-vii. This progression may also be heard as a genre synecdoche of horror film music as it evokes the harmony of horror

music more generally and employed in film music cues such as Bernstein's 'Sleep Clinic' (both contain a ♭iii-vii-i progression).

Similarly, Ed Rush's 'Bludclot Artattack' (1993) features dialogue samples from the film *Hellraiser II* ('you got a ticket to hell?') as well as a sample of Queen's 'Ming's Theme (In The Court Of Ming The Merciless)' from *Flash Gordon* (1980) and combines these samples with a doubled riff that may be heard as a genre synecdoche horror soundtrack music. In the track 'Rob's Nightmare' (2019) by LFO, recorded in 1990, F♯m–T^3–Am–T^{-3}–F♯m–T^{-9}–Am–T^9–F♯m, the progression may similarly be heard as a style flag for 'cinematic horror music'.

13. Conclusion

This chapter has described two types of harmonic practice that were popular in 1980s and 1990s machinic dance music, both of which were produced through the use of sampled chords or 'chord memory' functions. The first of these harmonic practices, the doubling of static melodic riffs with chords, can be understood to add additional dissonance to riffs, often through the creation of chromatic pitch collections. As a result, doubled riffs can be regarded as typically producing another form of dissonant static harmony, with meanings similar to those suggested in Chapter Three. Doubled riffs may produce dissonance that is understood as an anaphone of 'machine noise', but may also have a 'brutal' quality, as they suggest an apparent disregard for diatonic or modal harmonic expectations.

Fixed chords have also been used to create a second type of harmonic practice in dance music, which can be termed 'chromatic transpositional chordal harmony'. Progressions produced in this way may be regarded as genuine progressions of discrete chordal harmonies rather doublings of a single static riff. These progressions are often highly chromatic and, as a result, may be heard as anaphonically evocative of the strange and fantastical. It is argued in this chapter that, although such progressions feature a series of entirely parallel chord voicings, that, due to their chromaticism, they may still be heard as anaphonically evocative of the fantastic and uncanny. These progressions may be heard to possess different expressive qualities to purely static harmony and may be heard to suggest that machines and technology possess fantastical or uncanny qualities. Combined with the 'noise' of dissonant static harmony, this chromatic harmony may be understood to suggest that new technologies, in

addition to disrupting existing social harmony, may substantially alter everyday experience, creating a 'fantastical' futuristic world that affords 'extraordinary' experiences.

Finally, this chapter argued that the choice of different quality chords, in the context of both chordal doubling and in transpositional progressions, has consequences for how such harmonic practices are likely to be interpreted. This chapter argues that chord types that contain the notes of a major triad are likely to be heard as 'warmer' or otherwise more positively valenced than those chords that do not. It is argued, therefore, that chromatic sequences of minor triads and diminished chords may be likely to be heard as expressive of emotional 'coldness' and some chromatic minor triad progressions may be heard as style flags for horror or science fiction film music. Finally some chord types may function as style flags, indexically associated with particular styles of popular music. For example, the minor seventh or minor ninth chords may be heard as style flags associated with jazz, R&B or disco styles, and so transpositional chord progressions using these chord types may be heard to possess a 'jazzy' quality.

Chapter Six – Testing Listener Responses to 'Machinic' Harmonic Practices

This chapter discusses the results of a listening test that was carried to test the central hypotheses of this thesis: that dissonant harmony, disjunctive harmonic shifts, and chordal doubling of static riffs in dance music may be heard to evoke the workings of machines and technology and that chromatic transpositional chord progressions may be heard to evoke a technology that is also fantastic or supernatural. This chapter argues that the results of the listening test are broadly consistent with these hypotheses, but that, due to the design of the test, the data cannot be used to conclusively confirm these hypotheses.

1. Rationale for conducting listening test

This thesis has argued that harmonic practices in dance music are likely to function as musical signs and has hypothesised how these signs might be meaningful to dance music listeners. It was felt that a listening test experiment, collecting listener responses to existing recordings of dance music tracks that employed these harmonic structural elements, could collect data that would support or challenge these hypotheses. It could be argued that the most appropriate method for collecting empirical data, regarding signification in dance music, would be one based on Philip Tagg and Bob Clarida's listening tests, as described in *Ten Little Title Tunes: Towards A Musicology Of The Mass Media* (2003). The method developed by Tagg and Clarida, is one that combines a 'free association' listening test, collecting responses to existing recordings of popular music, with a theoretical method intended to link the collected responses to particular structural elements present within the test music. It could be expected that a listening test that collected 'free association' responses would accurately capture listener responses to dance music, as it would not limit the range of these responses, or guide listener responses in any particular direction. As Tagg and Clarida argue in *Ten Little Title Tunes,* using multiple choice questionnaires to collect listener responses risks unconsciously guiding or leading the participants' responses towards preconceived meanings.

Similarly, it was felt that the use of existing recordings of dance music tracks as test music would ensure the relevance of the collected data to the discussion of harmonic practices in this thesis. Using simplified musical stimuli in a listening test might create an artificial listening experience unlike that produced by listening to real recordings of dance music. A listening

test using existing electronic dance music recordings might be expected to provide more relevant data regarding the potential meaning of harmony in dance styles. A further advantage of Tagg and Clarida's listening test method, is that it is designed to collect data describing aesthesic responses to the musical stimuli. Rather than requiring listeners to identify or describe any poietic practices that are audible in the test music, it instead invites listeners to describe any thoughts or images that are formed in response to listening to the test music, without considering how those responses might be 'elicited' by the internal structure of the test music itself. Such a test therefore specially aims to capture the non-musical concepts which might be produced in response to particular musical structural elements but does not require the listeners to have any musical training or knowledge.

The disadvantages of this test method include the generation of large amounts of data, much of it irrelevant to the specific questions of signification focused on in this thesis. The processing of the test data so that basic conclusions could be drawn from it, also proved to be highly time-consuming. A second disadvantage of this test method relates to the difficulty in linking listener responses to the presence of specific structural elements in the test music. This significant theoretical issue is discussed in more detail below. However, it was felt, before carrying out the test, that the advantages of collecting unguided listener responses would outweigh the disadvantages. For these reasons it was felt that a free association test, similar to that used in *Ten Little Tunes*, would be the most appropriate for gathering data regarding the potential meaning of the harmonic practices discussed in this thesis.

The listening tests conducted in Philip Tagg and Bob Clarida's *Ten Little Tunes* were not intended to test any hypotheses regarding how individual structural elements might function as musical signs. The only 'pre-test hypotheses' made by Tagg and Clarida were that the tested music might,

> elicit responses showing some degree of intersubjective consistency for each individual tune' and 'that it should be possible to document interobjective differences between the various pieces of music and to link such differences to intersubjectively verifiable differences of response (Tagg & Clarida, 2003, p. 111).

As a result, Tagg and Clarida's research offers plausible post-hoc semiotic explanations of why particular responses were 'elicited by' (Tagg & Clarida, 2003, p. 112) pieces of test music rather than testing any prior hypotheses regarding the potential meanings of the test music.

In this regard the aims of *Ten Little Tunes* were quite different to those of the listening test conducted for this research project.

The listening test responses in *Ten Little Tunes* were collected by inviting participants to respond to several short television theme tunes by imagining a scene that the music might accompany in a film or television show and then describing that scene in words. These responses were then discretised into individual VVAs, or 'Verbal Visual Associations'. The overall set of VVAs for a particular piece of music is termed by Tagg and Clarida as its 'PMFC' (its para-musical field of connotation). Tagg and Clarida then seek to link the process of semiosis, by which the music 'elicits' VVAs in the listeners, to the presence of specific musical signs in the test music, through a method that they term *Inter-Objective Comparison*. This method is intended to deconstruct the process of semiosis, by drawing comparisons between the structure of the test music (or Analysis Object or AO) and other examples of structurally similar music known as Inter-Objective Comparison Material (or IOCM). Tagg and Clarida argue that pieces of music that are similarly structured (the IOCM and the AO) are likely to elicit similar responses in listeners, and so are likely to possess similar PMFC. According to Tagg and Clarida, then, identifying the PMFC of the IOCM material, in 'lyrics, title, concomitant action, visuals, functions, audience, etc.' (Tagg & Clarida, 2003, p. 96), allows a hypothesis to be formed of how the structurally similar AO will be interpreted in the listening test.

The structural similarities, between the AO and IOCM, may be quite extensive (the IOCM is intended to be as structurally similar to the AO as possible). As a result, any similarity in PMFC between the AO and IOCM, cannot be linked to the presence of any individual musical structural element. Tagg and Clarida note that,

> Once IOCM is found, its structural elements (pitch, timbre, contour, volume, tempo, syntactic position, harmonic context, tonal idiom, etc.) are compared with those of the AO (analysis object). These elements of structural similarity can be hypothesised as *items of musical code (IMC)*. Since there is never total similarity between the IMCs of an AO and those of its IOCM (otherwise it would be exactly the same music), the structural elements of the IOCM which do resemble those of the AO are identified and noted (Tagg & Clarida, 2003, p. 96).

In some cases, then, the musical structural elements present in both the AO and IOCM may be numerous, and it is not possible to suggest that the consistency of PMFC between AO and IOMC is due to the presence of any single structural element.

As both Tagg and Robert Hatten have suggested, theoretically, it should be possible to relate the differences in expression between passages of music to individual structural differences between those passages of music. Great difficulty arises, however, in conceiving of a listening test using recordings of popular music that would be able to isolate the expressive meaning of individual structural elements. Such a test would need to collect listener responses to two pieces of test music that were structurally identical apart from one single, isolatable element. Any differences in PMFC between these two hypothetical AO could therefore be attributed to change of an isolated structural parameter. To effectively isolate the expressive meanings of individual musical structural elements in tests would require vast numbers of music to be tested, each similar to each other apart from the one structural variable in consideration. In *Ten Little Tunes*, each piece of test music was significantly stylistically dissimilar from the others and very few structural elements were identifiable across multiple pieces of test music. In Tagg and Clarida's test it is impossible to isolate and test the expressive results of changing a single structural element.

Tagg and Clarida, however, during analysis of the test results in *Ten Little Tunes*, do make claims and hypotheses regarding the meaning of individual structural elements. These claims are often supported by a process of comparing the tested AO to 'hypothetical' examples which are identical to the AO apart from one altered structural element. In this process of 'hypothetical substitution', the expressive changes that result from the alteration isolated structural elements may be hypothesised. Tagg and Clarida note that,

> In order to find out if a semiotic observation is valid, it is sometimes necessary to determine more precisely which elements in a museme stack or string are operative in producing the effects observed in reception test responses, or through interobjective comparison. Recomposing that part of the music by substituting one element for another allows the analyst to test whether it is the volume, register, pitch contour, harmony, tempo, orchestration, timbre, articulation, metre, or any aspect of any other parameter of musical expression that is essential to the production of the connotations observed […] In our analysis of *The Virginian* (Tune 2), for example, hypothetical substitution is used to distinguish between those aspects of the accompanying parts which communicated a sense of the pastoral and those which did not (Tagg & Clarida, 2003, pp. 98-99).

However, Tagg and Clarida's analysis can be criticised for not adequately distinguishing between those music-structural comparisons which are empirically tested and those which are purely 'hypothetical'. The specificity of Tagg and Clarida' analysis, attributing specific meanings to individual structural elements, is not supported by the empirical listening test data, which only identifies differences in PMFC between complete recordings, themselves

highly structurally dissimilar to each other. The significance of individual structural elements, in Tagg and Clarida's method, can only be isolated through comparison of a real recording with a hypothetical one, which does not 'exist' as a real recording and is not included in the listening test. The distinction between empirically recorded differences in PMFC between test music, and 'hypothetical' differences in PMFC between 'hypothetical' examples could be more clearly made by Tagg and Clarida.

Other criticisms of Tagg and Clarida's method have appeared in the musicological literature. John Richardson, in his review of Tagg and Clarida's *Ten Little Tunes,* suggests that it is 'unreasonable to expect future researchers to emulate every aspect of such a complex, multifaceted study' (Richardson, 2003). It is clear that Tagg and Clarida's method collects large quantities of data and requires a great deal of statistical work to be done before the data is useable, due to the 'free-association' nature of the test and the wide variety of responses that are offered.

Other criticisms, written before the publication of *Ten Little Tunes,* have been offered in response to Philip Tagg's earlier work, specifically his long-form analyses of the title music from *Kojak* (Tagg, 2000b) and Abba's *Fernando* (Tagg, 2000a). These criticisms are worth addressing here as the semiotic method described in *Ten Little Tunes* was developed from this earlier work. Richard Middleton has argued that Tagg's semiotic method is 'fruitful' but presents 'one or two problems' to researchers planning to employ them (Middleton, 2002). Middleton's first criticism is that he feels that Tagg's 'method is heavily dependent on orientations provided by accompanying extramusical aspects of the message – on '"reconstitutions" of intentions discovered in lyrics, programmatic elements (such as titles) and visual images.' (Middleton, 2002, p. 233) Middleton goes on to argue that this method is perhaps only likely to generate results when there is a large amount of 'extramusical' orientations present to create connotations for listeners. In Middleton's view, without suggestive paramusical texts, semiotic theory will face difficulty hypothesising the meaning or connotations of individual musical structures.

Tagg's incorporation of empirical data into his semiotic method in *Ten Little Tunes* goes some way to addressing the problems that Middleton identifies here. As the test music is presented without any 'extramusical orientations' it cannot be claimed that the attribution of meaning

to a piece of music is still 'heavily dependent' on such orientations. In both Tagg and Clarida's listening test and this study, extensive responses were given to all pieces of test music, suggesting that popular music tends to be highly significant and expressive without any kind of accompanying paramusical cues.

Middleton's second criticism is that Tagg's analysis of meaning in popular music is weakened by segmentation of the music into small units that are analysed outside of the larger structural context of a work. This is a legitimate criticism of the semiotic method as presented in Tagg's work, although it should be noted that, again, this criticism does not refer to the listening test in *Ten Little Tunes*. The listening test responses captured in that listen test were given in response to 'entire' pieces of music, rather than to individual aspects of it.

In the listening test carried out for this research project, the clips were chosen to be musically meaningful in the 'extended present', rather than necessarily relying on the development of longer discursive structures. All of the test clips contained a complete verse section, containing a complete discursive chordal progression, or a complete section of static harmony and so could be heard and interpreted without reference to longer song structures. This research project, therefore, does not directly address Middleton's concerns, but it could be argued that the test music used in this listening test are likely to be meaningful within the extended present.

A general criticism of listening tests that collect responses from non-specialist listeners has been made by Robert Hatten. Hatten has argued that contemporary, non-expert test participants are likely to lack the aesthesic competence to understand and interpret the music of Beethoven in the same way as a trained musicologist. Hatten notes that

> There are three good reasons why an exclusively experimental approach to the cognition of Beethoven's style, for example, might still fail to capture the kinds of expressive meaning I have put forward in this more speculative study; the music is historical; it is artistic; and its style must be learned. Artistic works are creative, and thus even more unpredictable. And a style must be learned in its full reconstruction. If my interpretations are any indication, we have yet to fully reconstruct the expressive competencies involved. One cannot assume that present-day listeners either have a fully internalised competency in a historical style or that they are not going to be influenced by later stylistic competencies in their interpretation. Thus, psychological testing would probably reveal more about the capacities of listeners than about potential stylistic interpretations of a work (Hatten, 2004, p. 272).

Such concerns may also be relevant to experimental testing of the meaning of popular music recordings. Randomly selected contemporary test participants may lack any prior knowledge of the styles of music that are included in the listening test and may also lack the 'aesthesic competency' necessary to interpret the music 'appropriately'. By contrast, dedicated dance music fans, who may have acquired extensive knowledge of the style by attending live performances and club nights, seeking out specific recordings and reading magazine reviews, interviews, articles, and books, may interpret the same recordings quite differently to 'non-fans'. Younger contemporary participants might also lack aesthesic competence specifically relating to historical styles of popular music. It could be argued, then, that contemporary listeners are unlikely to interpret the test music 'appropriately', and their responses may provide little insight into how particular musical structures were interpreted within a particular generic or historical context.

However, as Tagg and Clarida argue, popular music is 'conceived for mass distribution to large and often socioculturally heterogenous groups of listeners' (Tagg & Clarida, 2003, p. 70). Although specific popular music styles may be popular only within a narrow historical timeframe, and artists may often produce music for 'knowledgeable' audiences, the interpretation of popular music styles can still be understood to rely on a more general, and widely held mass media informed aesthesic competency. For musical communication to take place in the context of mass distribution, producers and listeners of popular music must both be reasonably competent in the same musical codes, suggesting a general level of aesthesic competence is possessed by most listeners to popular music, due to widespread exposure to the mass media in Western societies.

Karen Collins' reception tests appear to support this theory. Her tests, which were conducted with two groups, an industrial music fan group, and non-fan group, found 'a lack of real distinction between fans and non-fans in terms of their interpretation of the music' (Collins, 2012). This one case appears to suggest that more specialised codal competence, related to a specific style of music, may be built upon more generalised mass media codal competence possessed by most listeners. If this is the case, then the results of listening tests, conducted with non-fan participants, can be understood to collect relevant data for understanding the meaning of electronic dance music. It can be assumed that specialised codal competence

relating to electronic dance music, possessed by fans, critics, academics, and musicians, is more of a refinement and clarification of general mass media codal competence, rather than a direct contradiction of those codes. This being so, data collected from non-fan participants could be useful in clarifying the conventional meanings of the musical structures commonly employed in electronic dance music.

It can also be argued that a generalised mass media competency is unlikely to have changed dramatically between the 1980s and 2020s. Contemporary listeners are still exposed to the music and cinema of the 1980s and 1990s in the mass media, and contemporary popular music genres continue to refer to the style conventions of that period. It therefore seems more reasonable to assume that contemporary listeners possess the aesthesic competence to interpret styles of popular music of the 1980s and 1990s in a manner somewhat analogous to listeners in those time periods.

The gathering of empirical experimental data therefore allows for claims regarding the meaning of musical structures in dance music to tested, although it may not be possible to isolate the expressive properties of individual structural elements. As a result, despite the numerous criticisms of Tagg and Clarida's methods discussed in this chapter, such as the time-consuming nature of processing the test data, and the extent to which conclusions can be made regarding the interpretation of individual structural elements, it was felt that data collected from listening tests would usefully test the claims made elsewhere in this thesis regarding signification in dance music.

2. Test methodology

The test music for the listening test was chosen to contain a range of harmonic systems, and the majority of tracks chosen possessed a 'machine aesthetic'. The eleven excerpts of dance music that were chosen as test music use the following harmonic systems in various combinations:

- Functional chordal harmony
- Non-functional chordal harmony (with/without Hijaz-scale melody)
- 'LPR' chromatic chordal harmony
- Transpositional chromatic chordal harmony

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- Consonant static harmony (with/without disjunctive harmonic shifts)
- Dissonant static harmony (with/without minor triad doubling)

As a result, all five of the most common harmonic systems in dance music, discussed in the introduction of this thesis, are represented within the test music, with chromatic chordal harmony split into two types. The below table lists the eleven recordings that were chosen to be test music, as well as giving an overview of the harmonic systems employed in each excerpt.

Table 7: List of excerpts used in listening test

Excerpt	Harmonic systems
Groove Committee – I Want You To Know (1991)	Consonant static harmony Non-functional chordal harmony
The KLF – What Time Is Love? (1988)	Dissonant static harmony (Phrygian-subset)
Paperclip People – Clear & Present (1995)	Consonant static harmony Non-functional chordal harmony
Polar – Bipolar Suns (2001)	Chromatic chordal harmony (LRP) Dissonant static harmony
Sebastien Tellier – Sexual Sportswear (2007)	Functional chordal harmony
C.C.C.P. – American Soviets (1986)	Non-functional chordal harmony with Hijaz scale melody
Gatekeeper – Visions (2009)	Consonant static harmony with disjunctive harmonic shifts
Arpanet – Illuminated Displays (2002)	Dissonant static harmony (Phrygian) Non-functional chordal harmony
Liz Torres Featuring Kenny "Jammin" Jason – What You Make Me Feel (Fierce Mix) (1986)	Dissonant static harmony
Model 500 – Mind Changes (1992)	Dissonant static harmony (Phrygian-subset) Transpositional chromatic chordal harmony
Ed Rush – Bludclot Artattack (Dark Mix) (1993)	Dissonant static harmony (Phrygian-subset) with minor triad doubling

The listening test excerpts were chosen, before the test, with the aim of capturing a contrast between 'machinic' and 'non-machinic' dance music styles, but also, within the examples of machinic dance music, a contrast between different types of harmonic organisation. It was hoped that the non-harmonic stylistic parameters of the machinic test music could be kept as similar as possible allowing the expressive potential of their different harmonic systems to be isolated.

It was hoped that using test music in which the instrumentation was limited to drum machines and synthesisers, and which used only unswung rhythms, would allow the differences in harmonic organisation within this corpus of test music to be isolated. The majority of the pieces of test music use only synthesiser and drum machine instrumentation with no use of recognisable acoustic instrumental timbres. The exceptions to this rule are Groove Committee's 'I Want You To Know', which prominently features a synthesised piano sound, 'What You Make Me Feel (Fierce Mix)' which features recognisable acoustic percussion sounds, and 'Bludclot Artattack (Dark Mix)', which uses sampled breakbeats and a sampled chord sound. It was hoped that these differences in instrumentation type, between 'electronic' sonorities and 'acoustic' sonorities would create a meaningful contrast between machinic and non-machinic styles of dance music.

The tempo of the test music was mostly within the range of 119bpm to 133bpm, the exceptions to this rule being the 110bpm 'Visions' and the 160bpm tempo of 'Bludclot Artattack'. All of the test music featured 'straight' unswung and metronomically precise rhythms apart from 'I Want You To Know', 'What You Make Me Feel (Fierce Mix)' and 'Bludclot Artattack', all of which feature some element of swing or imprecision in the rhythmic organisation. Again, it was hoped that the distinction between swung and straight rhythms would be meaningful to listeners.

It was hoped, then, that by selecting several examples of machinic dance music that only used synthesiser and drum machine instrumentation and straight 'clock-like' rhythms, that these examples would be heard as stylistically similar, allowing any harmonic changes to be isolated in the test results. However, many non-harmonic structural differences are also identifiable between the 'machinic' test music excerpts, and this structural diversity likely played a role in the reception of these clips, independently of their harmonic organisation. For example, although 'Sexual Sportswear' and 'What Time Is Love?' both use only synthesiser and drum machine instrumentation, and both have straight, unswung rhythms, they are clearly examples of different styles of dance music, with different rhythmic patterns, tempo, timbral palette, mixing and mastering. The fact that the non-harmonic structural elements of the machinic dance examples could not be strictly controlled has implications regarding the conclusions that can be drawn from the data.

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None of the clips included any kind of speech or vocal performance. In two cases ('What You Make Me Feel' and 'Bludclot Artattack') a suitable test clip was produced by editing the original recording so that any vocal performance was removed. Song lyrics can be regarded as a form of paramusical expression, and as such were eliminated from the presentation of the music. The music was presented to the participants without titles, artwork, or any other kind of paramusical cues. It was also hoped that the music chosen would be unknown to the test participants, as it was felt that familiarity might influence the responses. The clip most likely to be recognised was *What Time Is Love?* (a UK hit single in 1990 in remixed form (The KLF Featuring The Children Of The Revolution - 'What Time Is Love? (Live At Trancentral)' (1990)), but it was expected that this original version of the track would be relatively unknown to contemporary listeners. None of the other recordings had been particularly commercially successful in the UK and could be expected to be unknown to the participants.

The chosen music was edited to create excerpts between 30 seconds in length and two minutes and eight seconds in length. The average length of each clip was approximately one minute. The excerpts can be understood to feature either static harmony, or repeated 'verse' sections and so are unlikely to be heard as excerpted from longer discursive or narrative structures. As such, they represented appropriate material to be tested in the form of short extracts in a listening test. The longest of the excerpts, 'Bipolar Suns'*,* although based on a combination of dissonant static harmony and a repeated chromatic chord progression, features a transition from a beatless introduction section to a 'half-time' section before transitioning again to a faster tempo section. This clip was therefore possibly more likely to be heard as divided into sections than the other clips.

The majority of test participants were recruited to take part in the listening test through the website *Survey Monkey* ("Survey Monkey," 2023) and all of the test participants were based in the UK. This decision was made to ensure that interpretation of the test results could be made with reference to a particular mass media culture that the participants were knowledgeable of. Ten student participants were also recruited from the University of Salford Music Department. These participants could potentially be expected to have a higher aesthesic competence than the other participants due to their knowledge of and enthusiasm for music.

As with Tagg and Clarida's original study, the aim of this listening test was not to map differences of response between different population groups and demographics. All the participants contributed anonymously, and no personal information was collected apart from the age and gender of the participants. This data has not been included in any presentation of the reception test data in this report.

The *Survey Monkey* test participants were given the following instructions (based on very similar instructions used by Tagg and Clarida in *Ten Little Tunes*) before starting the test:

> You will find 11 short pieces of music in the survey. Listen to each one. For each piece of music write down any scenes or images that occur to you in response to listening to the music. Write down the kinds of things you might imagine taking place on a TV or cinema screen if the music was the 'soundtrack' to the scene.
>
> It doesn't matter what you write - a mood you feel, someone you see, what they're doing, what's going on, where it happens. The music might make you think of an image or mood or feeling, or the music might sound like it could accompany a scene from a TV show, movie, music video or video game.
>
> Don't worry about writing complete sentences - just write the words, pictures, moods, or impressions that come into your head for each piece of music.
>
> For example, if one piece makes you think of your Granny eating a cream cake while riding a motorbike through the tundra, just write 'Granny eating a cream cake on a motorbike riding through the tundra'. If you just get a general impression of horror, just put down 'horror' and so on.
>
> To listen to each piece of music just press play on the video clip when you are ready. Then type your responses in the box below the video, writing down any images or feelings that occur to you in response to the music. You can start writing while the music is playing, or after it has finished - it's up to you. Please listen to the full duration of each clip before moving on to the subsequent question.
>
> If there is a particular aspect of the music that triggers a particular image or thought, please write down the event and the time this event occurs in the clip, followed by the response, for instance: 'guitar riff at 0:45 - granny riding a motorbike'.
>
> The pieces of music are all different lengths (approximately between 30 seconds and 2 minutes in length). This is not significant to the experiment.
>
> You can write as much or as little as you like in response to each piece of music - just write what comes into your mind.

Unfortunately, these instructions, by inviting the participants to just write 'what comes into your mind', can be understood to have not been prescriptive enough. The instructions ask participants to imagine and describe a scene in response to the music, but also invites them to respond in any other way they choose. This open tone was adopted in an attempt to ensure

that as many participants responded to the clips as possible, as it was feared that many *Survey Monkey* participants would not engage with the test. As a result, many of the responses given ignored the instruction to imagine and describe a scene and instead described different aspects of the experiences of the participants. These descriptions were either direct descriptions of the music itself, evaluative judgements regarding the music or comments about the listening test itself.

To avoid influencing or directing participant responses, and to only capture responses to the purely musical characteristics of the test music, no paramusical text or information was provided alongside the test music. The clips were labelled as 'Test Music 1', 'Test Music 2' etc. and no indication was given in the instructions regarding the aims of the test or the genre of the music that would be included in the test. The only scenario mentioned in the instructions was the example of the 'Granny eating a cream cake on a motorbike riding through the tundra'. This example is unlikely to have guided any participant responses during the test, as there were no test responses that mentioned 'grandmothers' or 'the tundra' and only two mentions of 'motorbikes'.

The test responses of 51 of the participants were excluded from the results for one or both of two reasons. Some respondents gave nonsensical answers that appeared to have no relation to the test music. These answers appear to have been given so that the participant could move through and complete the test on the *Survey Monkey* site, without engaging with the test. Other responses were excluded because the total time the participant spent completing the test was too short to have engaged with the test material.

The decision to exclude responses was ultimately based on a subjective estimation of whether the participant had engaged sufficiently with the test. The responses of twelve participants, who had each spent less than four minutes completing the test, were included in the results because it was judged from the nature of their answers that they had engaged sufficiently with the test. In total, the responses of 51 Survey Monkey participants were excluded from the results, leaving the responses of 164 Survey Monkey participants and 10 participants from The University of Salford.

To create a statistical description of the responses given, it was necessary to separate individual responses into individual concept categories and assign each concept category a

number. This would allow statistics to be produced showing the frequencies of responses by concept category and ultimately indicating whether there was any correlation between participant responses and variations of stylistic elements in the test music. Each discrete concept, given in response to the listening test music, is known in Tagg and Clarida's terminology as a Verbal Visual Association or 'VVA'. This term describes the fact that a reaction to a musical experience has been translated into a verbal or textual concept of some kind.

To identify any possible correlations between VVAs and the structural elements present in the test music, it was necessary to organise these VVAs according to a taxonomy. Individual VVA categories were grouped into increasingly broader conceptual categories, allowing general trends in the data to be identified. The purpose of the VVA taxonomy, then, is only to provide scheme for categorising the given listener responses.

Each listed 'level 4' VVA category included in the taxonomy categorises at least one response given by a participant in this listening test. So, for example, the VVA category '1130 – Joy' is included in the taxonomy as there were eleven responses in the listening test that could be described as related to the concept of 'joy'. These responses include 'enjoying themselves', 'improved my mood', 'good mood', 'joyful', and 'good mood', which were all given in response to the test music 'I Want To Know'. If no such responses had been given in the listening test, then this category would not be included in the VVA taxonomy.

Categories are positioned in the VVA taxonomy according to conceptual relatedness, so the level 4 VVA category '1130 - Joy' is found in the level 3 category '113 – Joy, Festivity' which includes the categories '1130 – Joy', '1131 – Happy' and '1134 – Fun'. These concepts are generally accepted to be related. The VVA taxonomy used in this research project is based on that used by Tagg and Clarida in *Ten Little Tunes*. This original taxonomy was based in part upon categories found in film music libraries and categories derived from Zofia Lissa's proposed functions of film music (Tagg & Clarida, 2003, p. 124). This method of categorisation therefore reflects the test question, in which participants are asked to imagine what kind of film scene each piece of test music would be appropriate to score.

Table 8: Overview of VVA Taxonomy

Blanks	B – Blanks and unintelligible answers	
Description of imagined scene or media experience	0 – Time position	
	1 - General Attributive Affects	10 - Culturally Ambivalent
		11- Culturally Positive
		12 - Culturally Negative
		13 - Culturally Neutral
	2 – Beings, props, gatherings	
	3 – Location, scene, setting	
	5 - Explicit space-time relations, movements	
	8 – Media references within the imagined narrative	
Not part of imagined scene	M – Direct description of musical object	
	E – Evaluative descriptions of music	
	C – Commentary on listening test	

A general overview of the VVA taxonomy used in this project is given in above table. The most fundamental change revision to Tagg and Clarida's taxonomy was the separation of VVAs into those that offered a 'Description of imagined scene or media experience' and those responses that described objects 'Not Part of Imagined Scene'. As participants had been requested to describe 'any scenes or images that occur to you in response to listening to the music', responses could be categorised depending on whether they followed these instructions. Responses that did not describe the imagined scene tended to be either direct descriptions of the music itself, evaluative judgements regarding the music or comments regarding the value or utility of the listening test itself (categories 'M', 'E' & 'C'). These descriptions were useful for analysis, but it was thought best to differentiate these from the responses that described an imagined scene.

The responses that were given as part of a description of an imagined scene were divided into six main categories. All concepts describing position in time or within a narrative, were categorised together as category 0. All adjectival concepts, describing the qualities of places or objects were categorised as category 1. This category was subdivided into adjectival concepts that might generally be accepted as being ambivalent, positive, negative, or neutral. The 'ambivalent' category describes concepts that could potentially be positive or negative but are too broad, vague, or undefined to be definitively categorised as one or the other. For

instance, the VVA category '1010 – Emotional arousal' describes general emotional excitement, but is ambivalent regarding whether this emotional excitement may be regarded as positive or negative. The 'neutral' category contains concepts that are not ambiguous but instead can be considered inherently neutral, such as '1450 – Big' or '1460 – small'.

Category 2 includes all concepts that describe people, animals, objects, buildings, and social gatherings, while category 3 includes all concepts that describe locations, scenes or settings. Category 5 includes all concepts that describe movement or the relative locations of people and objects, while category 8 includes all concepts that describe mass media genres or elements of media products such as films, television shows or video games. These concepts are being used to describe qualities of the imagined scene. It can be observed that by adapting Tagg and Clarida's taxonomy some illogical naming conventions have been retained, specifically the numbering of the main categories. The only purpose of these taxonomic categories is to aid interpretation of the gathered data, by allowing for responses to be grouped together according to general concepts. These categories are only useful to the extent that they allow trends in the data to be identified.

Some responses proved to be difficult to categorise according to the taxonomy, as it was unclear whether they were referring to an imagined scene or not. It was initially unclear how to categorise such responses as, 'Makes me feel a happy positive feeling' (participant 108, response to 'American-Soviets'). A response of this type does not describe an imagined, fictional scene taking place as outlined in the test instructions . Instead, the participant has described their own emotional response to the music and have described it as being 'directly' caused by listening to the music. It seems appropriate then, that this response should not be categorised in the 'Description of imagined scene or media experience' category. However, it became clear during the categorisation process that such a categorisation would not aid the capture of trends in the response data. The exceptional difficulty in categorising emotional responses is illustrated by the following examples of listener responses:

'Happy moment' (Participant 96, 'I Want You To Know')

'happy, optimistic, young, energetic' (Participant 9, 'Sexual Sportswear)

'happy' (Participant 5, 'American Soviets').

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The first response, 'Happy moment' is clearly a description of an imagined scene. However, in the case of the second response, 'happy, optimistic, young, energetic', it is not at all clear what the object *is* that is being described by these adjectives. It is unclear whether the participant is describing imagined characters in a 'scene' that possess these qualities, or whether it is the music itself that is described as 'happy, optimistic, young, energetic'. In the final example, the response is simply one word: 'happy'. There is no possible way of being able to know from this response 'what' is happy, whether it is the scene, the music, or the participant.

In the case of the 'happy moment' example, then, the term 'happy' is used to describe an aspect of the imagine scene and can be categorised in the 'General Attributive Affects' category. This category contains a wide range of emotional responses sub-categorised as either 'ambivalent', 'positive' 'negative' or 'neutral'. It was eventually decided that all emotional responses should be categorised in the same way, even if they did not obviously describe an imagined scene. It was decided that it was unrealistic to expect to be able to determine the 'location' of the reported emotion in all cases. As emotional terms were applied to so many objects it was decide that it would make interpretation of the test results extremely difficult if these responses were all categorised differently. Ultimately, whether the participant is describing an imagined scene or their own emotional response, in both cases the participant is describing what they think is the appropriate emotional response to the music and are responding to musical structures heard in the clip that are themselves heard to express emotion. It is unlikely that a participant could feel that a piece of music should accompany a 'sad' imagined scene while simultaneously claiming that the same piece of music made them 'feel happy'. For this reason, all emotional responses are categorised as descriptions of the imagined scene, whether that is technically the case or not. In this respect, a pragmatic approach was taken to VVA categorisation, to better allow trends to be read from the data.

The term 'upbeat' was very popular with participants, being used 12 times in response to 'I Want You To Know'. However, it was felt that the use of this term was ambiguous and could not be properly defined in this context. According to the Merriam-Webster dictionary the term has two meanings. Use as a noun, the word may mean 'an unaccented beat or portion

of a beat in a musical measure' or an 'an increase in activity or prosperity'. As an adjective it may mean 'cheerful' or 'optimistic' (merriam-webster.com, 2024).

The term 'upbeat' was given most in response to the clip 'I Want You To Know', which also received the joint most responses in the 'happy' VVA category. This seemed to suggest that the term 'upbeat' was being used by participants according to the definition cheerful' or 'optimistic'. There was, however, a doubt whether the term was being used according to this definition. For example, the response given by Participant 132 to the clip 'I Want You To Know', was. 'upbeat tempo, dancing in the kitchen making dinner with my kids, running music'. In this response, the term 'upbeat' appears to be being used according to the definition of 'up-tempo', a term used to describe a piece of music with a fast tempo, rather than meaning 'cheerful' or 'optimistic'. It seems probable that such a mistake in terminology is easy to make, as 'upbeat' contains the word 'beat' and might be assumed to mean the same as 'up-tempo'. Unfortunately, despite the frequent use of the term by participants in the listening test it was not possible to be sure how the term was intended to be understood. There was an ambiguity in the use of the term that could not be resolved, and so it was decided that the term 'upbeat' could not be given a category in the VVA taxonomy. All 'upbeat' VVAs have therefore been categorised as 'blank' and are not included in the test results.

Another potential issue with the design of the listening test relates to the categorisation of VVAs and the structure of the VVA taxonomy. The VVA categories, consisting of four digits, relate to each other in a branching system of categorisation, so the first level of division is between the categories '1', '2' and '3'. These categories are then sub-divided into sub-categories, so the category '1' is divided into the sub-categories '11', '12' and '13'. This process of sub-categorisation continues until a four-digit code is generated which is assigned to the discretised participant responses. According to this system, a category is closest in content to other sub-categories belonging to the same parent category, so the category '2811 - dog' is most conceptually similar to the category '2813 - cat'. Both are sub-categories of category '281 - pets', which is a sub-category of '28 - domesticated animals' which is a sub-category of '2 - beings, props, and gatherings'.

However, it is also possible that a conceptual category might possess similarities to another taxonomically 'distant' conceptual category, and that similarity will not be captured in this

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system. As an example, the film genre 'horror', as a description of a popular culture genre, has the code '841H' and is categorised as a sub-category of '8 - Media references within the imagined narrative'. But, as a concept, 'horror' may also be regarded as conceptually similar to VVA category '1225 - Scary, danger, peril, horror', which is a sub-category of '1 - General Attributive Affects' and so is found in a completely different section of the taxonomy.

This suggests that it is possible for very similar responses to the clips to be categorised in different ways depending on the way that response is described. When participant 50 gave the response 'Horror movie' to 'Mind Changes', this response was categorised as '841H', but when participant 74 responded 'Scary, suspense, horror', to the same test music, the term 'horror' was categorised as describing an emotional response '1225'. It can be assumed that these written responses are attempting to describe a similar emotional reaction to an element in the music but that the participants have chosen to describe that reaction using different terminology. This difference in terminology results in very different categorisation of responses, that may make the general trend in response difficult to discern in the data.

This taxonomic division of potentially similar responses causes problems when trying to read trends from the listening test data. The fact that similar results are not grouped together might mean that relevant data is missed. For instance, participant 50 may have had a 'negative' response to the 'Mind Changes' clip, but the response is not categorised as a negative attribution and so will not be included in any data showing trends in negative attributions. As will be seen in the following section, I have tried to include all the relevant VVAs when trying to show trends in the data, but some trends may be hard to identify due to this separation of similarly responses into disparate conceptual categories.

3. Results of listening test

In the following section the structural features of each test clip are briefly summarised, and the fifteen most popular categories of VVA for each clip are listed. The list of most popular VVAs allow a characteristic imaginary 'scene' to be constructed to accompany each clip.

Table 9: Overview of structural elements in ''I Want You To Know (Vocal)' (1991)'

Clip	Groove Committee – 'I Want You To Know (Vocal)' (1991) Nu Groove Records (USA) 06:01-06:49
Rhythm	122bpm 'Four to the floor' kick drum pattern, no claps, snare fills with heavily-swung 16th notes, prominent off-beat open hi-hat, closed hi-hat with heavily-swung 16th notes
Timbre	Drum machine sounds, acoustic snare sound, shaker sound
	Synth bass sound ('lately'/'solid bass')
	'House' piano sound (could be Korg M1 or Prophet 2000)
	High synth string sound
Structure	Track form
Harmony	Synth bass - two-bar minor pentatonic pattern: 1-5-♭7-8-♭7-4-5-♭7-8-4 (in C)
	Piano chords, two-bar shuttle: Gm^7/C-Fm^7 (v^7-iv^7 or i^9-iv^7 in C)
	Piano – minor pentatonic 'turnarounds': first (bar 2): ♭7-8-4-5, second (bar 4): ♭7-4-5-♭7
	High string synth sound – four-bar melody: 4-♭3-4-1
Harmonic System	**Consonant static harmony and non-functional chordal harmony** This track can be understood to employ both a consonant static harmony (three of the four tonal parts are repeated melodic riffs based on the C minor pentatonic scale) and non-functional chordal harmony (the chord shuttle is based on an alternation between the foundation chord and its subdominant, so has no harmonic function). The overall macroharmonic collection outlines a diatonic Aeolian scale.

Table 10: Most common VVAs responses for 'I Want You To Know (Vocal)' (1991)

Groove Committee – 'I Want You To Know (Vocal)' (1991)			
Rank	VVA Code	VVA Category Name	Number of responses
1	5652	Dancing	41
2	353D	Nightclub	32
3	2721	Party	30
4	1131	Happy	13
=5	2300	People, group	12
=5	B0U0	'Upbeat'	12
7	2100	Person	10
=8	0220	Scene	9
=8	8230	Advert (general)	9
=10	M11D	Dance (music genre)	8
=10	1134	Fun	8
=12	8210	Cinema, movie/film music	7
=12	380A	1980s	7
=12	3511	Street	7
=12	1130	Joy	7

None of the most common VVAs given in responses to 'I Want You To Know' belonged to the 'culturally negative' category. The participants imagine a 'fun' and 'upbeat' scene, involving happy, joyous groups of people dancing or partying in a nightclub setting or on the street.

Table 11: Overview of structural elements in 'What Time Is Love?' (1988)

Clip	The KLF – 'What Time Is Love? (1988)' (from 'Pure Trance 1') KLF Communications (UK) 0:32.5-01:53
Rhythm	119bpm Straight 16th notes, 'four to the floor' kick drum pattern, 16th-note closed hi-hats, open hi-hats on the off-beats , no snare or clap
	Implied '3+3+3+3+4' rhythms in bass synthesiser part ((Butler, 2001, p. 94))
Timbre	Drum machine sounds (possibly Roland TR-808), with filtered and delayed hi-hats - Panning 16th hi-hats
	'High' synthesiser part playing riff without any bass frequencies
	'Bass' synthesiser part playing identical riff in the bass range
	Synth-string pad sound
	'Oooh' synthesiser 'voice' sound
Structure	Track form
Harmony	Synth parts - eight-bar Phrygian-subset pattern made up of three one-bar patterns (A,B &C): A= 1-1-8-1/1-8-1-1/8-1-1-♭9/1-1-♭7-1, B = 1-1-8-1/1-8-1-1/♭9-1-1-♭7/1-1-♭7-1, C= 1-1-8-1/1-8-1-1/♭9-1-1-♭7/1-1-8-1 (all in B♭) Full eight-bar sequence = ABABABCB
	Synth-string pad – B♭m7 chord (i7 chord)
	'Oooh' synthesiser 'voice' sound – repeating B♭
Harmonic System	**Dissonant static harmony (Phrygian-subset)** 'What Time Is Love' can be described as employing a dissonant static harmony. The bass riff moves around the neighbour-tones of the foundation note of B♭. This is occasionally joined by a single m^7 chord also on the foundation note. The overall macroharmonic collection is 1,♭2,♭3,5,♭7 (in B♭) or a subset of the Phrygian diatonic scale. This collection can be regarded as dissonant as it contains a ♭2 scale degree relative to the foundation note and outlines a static m♭9 harmony.

Table 12: Most common VVAs responses for 'What Time Is Love?' (1988)

The KLF – 'What Time Is Love?' (1988)			
Rank	VVA Code	VVA Category Name	Number of responses
1	1015	Action/intensity	24
2	1223	Suspense, tension, stress	16
3	0220	Scene	15
4	5944	Chase/chased/pursuit/followed	14
5	353D	Nightclub	11
=6	5652	Dancing	10
=6	2300	People, group	10
=6	8210	Cinema, movie/film music	10
=6	272R	Rave	10
10	2100	Person	8
=11	8271	Video games	7
=11	5220	Fast	7
=13	2721	Party	6
=13	1010	Emotional arousal (excitement, adrenaline)	6
=13	841A	Action/adventure	6
=13	5923	Attack/Fight	6

In contrast with the previous clip, participants imagine a scene involving action and suspense, possibly in a film or video game, in which a character is possibly being chased or attacked. There is still an imagined 'dancing' or 'party' scene, but a 'rave' setting is now almost as likely to be imagined as a nightclub.

Table 13: Overview of structural elements in 'Clear & Present' (1995)

Clip	Carl Craig Presents Paperclip People – 'Clear & Present' (1995)
	House Nation (Germany), Dance Street (Germany), Open (UK)
	01:16.4-02:43.6
Rhythm	127bpm
	Four-to-the-floor kick drum, closed hi-hats with heavy 16th note swing, bassline with 16th note swing
Timbre	Drum machine sounds (Roland TR-909), with highly reverberant cymbals – no claps or snares, open hat cymbal sound with 'cavernous' reverb
	Bass synthesiser sound with portamento
	Synth-pad sound
Structure	Track form
Harmony	Bass synthesiser playing polyrhythmic pattern looping every 3 beats, heavily swung - 8-♭7-8-♭10-♭14-15 (in F)
	Synth pad playing 2 slow moving melodic voices - 16 bar melody - 5+8-5+♭7-4+6-♭3+5-//-5+8-5+♭7-4+6-4-♭7-5+8 (in F)
	Implied chords: i-i^7-IV-i//i-i^7-IV-IV^{sus4}-i (in F)
Harmonic System	**Consonant static harmony, Non-functional chordal harmony**
	'Clear & Present', like 'I Want You To Know', employs both a consonant static harmony (the bass part is based on the minor pentatonic scale) and non-functional chordal harmony (like 'I Want You To Know' the chordal harmony alternates between a foundation chord and its subdominant). The overall macroharmonic collection outlines a diatonic Dorian scale.

Table 14: Most common VVAs responses for 'Clear & Present' (1995)

Rank	VVA Code	VVA Category Name	Number of responses
Paperclip People – 'Clear & Present' (1995)			
=1	8210	Cinema, movie/film music	12
=1	2721	Party	12
=3	353D	Nightclub	10
=3	5642	Driving	10
=5	1223	Suspense, tension, stress	8
=5	5652	Dancing	8
=5	1125	Relaxed	8
=8	2100	Person	6
=8	5220	Fast	6
=8	0200	Beginning, start	6
=8	3173	Road	6
=8	855M	Montage	6
=13	0220	Scene	5
=13	M11D	Dance (music genre)	5
=13	8230	Advert (general)	5
=13	0311	About to	5
=13	E110	Good	5
=13	M11B	Disco (music genre)	5
=13	C112	Again, more	5
=13	274E	Exercise	5
=13	5640	Travel	5
=13	8911	Background music	5

Again, dancing in a nightclub is a popularly imagined scene, but many participants imagine driving or travelling at speed down a road. There is a split in responses between those who imagine the scene is suspenseful and those who imagine it is relaxed.

Table 15: Overview of structural elements in 'Bipolar Suns' (2001)

Clip	Polar – 'Bipolar Suns' (2001)
	Certificate 18 (UK)
	0:00-02:08.6
Rhythm	120bpm
	Straight, unswung metre, 'electro' beat pattern
Timbre	Low 'analogue' filtered synth string sound
	High 'cinematic' synth-string sound
	Analogue synth bleep sound
	'Hardcore' stab sound
	Very low-frequency sine bass
	Roland TR-808 drum sounds, snappy snare sounds
Structure	Track form
Harmony	Low synth sound - 1+8-1+♭10-♭3+7 (in F)
	Bleep sound – polyrhythmic pattern - /10-x-♭3-♭10/x-♭3 (in F) - resets every 8 bars
	Cinematic' string sound – four-bar pattern: Fm-EM-Fm-EM (i-VII-i-VII in F)
	Melody, 8 bar pattern: ♭9-♭10, ♭9-♭7-7-♭10
	Creating progression: i-VII^{Maj9} shuttle
	Bass pattern follows chords
	'Hardcore' stab sound - 8-8-8-7-8--7-7-7-7 (in F)
Harmonic system	**Chromatic chordal harmony, Dissonant static harmony**
	'Bipolar Suns' can be described as combining dissonant static harmony with chromatic chordal harmony. The static melodic parts, the high-pitched 'bleep' sound and 'hardcore' stab sound outline a collection of 1,♭3,3,7, which can be considered dissonant as it is not diatonic. The chordal harmony is based on a chromatic chord shuttle of i-VII^{Maj9}.

Table 16: Most common VVAs responses for 'Bipolar Suns' (2001)

Rank	VVA Code	VVA Category Name	Number of responses
Polar – 'Bipolar Suns' (2001)
1	1225	Scary, danger, peril, horror	22
2	1223	Suspense, tension, stress	18
3	841B	Science fiction	16
4	3352	Alien	13
=5	1255	Haunted, creepy, eerie	12
=5	841H	Horror	12
=7	8210	Cinema, movie/film music	10
=7	E210	Bad	10
9	0220	Scene	9
10	3350	Space	8
=11	B000	Blanks	7
=11	5944	Chase/chased/pursuit/followed	7
=11	1251	Mysterious	7
=14	2100	Person	6
=14	1015	Action/intensity	6
=14	M664	Before/after - development	6

The most popular VVAs for 'Bipolar Suns' do not include any reference to dancing or group social activity. Instead, the participants imagine a scene which is scary, suspenseful, and potentially involving fantastical or horrific creatures such as aliens, in which a character is being pursued.

Table 17: Overview of structural elements in 'Sexual Sportswear' (2007)

Clip	Sebastien Tellier – 'Sexual Sportswear' (2007) Record Makers (France) 01:38.9-02:37.9
Rhythm	130bpm Straight, unswung metre, 'heartbeat' drum pattern – 8th note emphasis, synth-arpeggio with 16th note emphasis
Timbre	Drum machine sounds - open hat cymbal sound with 'cavernous' reverb
	Analogue synth bass sound
	Analogue synth arpeggio
	Synth strings with flanging effect
Structure	Repeating verse form. Each verse eight bars – AAAA….
Harmony	Synth strings and synth bass – eight-bar progression: Cm-A♭M-Cm/G-Fm-Fm^6/A♭-GM (i-♭VI-i-iv-iv^6-V) 16th note synth arpeggio follows bass and string parts: 8-5-1, 1-8-♭6, 8-5-1, 8-4-1, 4-9-♭6, 9-5-2 (in C)
Harmonic system	**Functional chordal harmony** 'Sexual Sportswear' employs a functional chordal harmony. Unlike all of the previous examples it contains no repeating static riffs, and so can be understood to be based on a repeated eight-bar verse section. The chord progression follows the 'tonal' behaviours outlined by Walter Everett, in that it resolves with a functional cadence from V-i, and also individual voices resolve by step (the 9-5-2 arpeggio pattern over the V chord moves to an 8-5-1 pattern, so that the 9 and 2 scale degrees can be heard to resolve by step to the tonal centre of C).

Table 18: Most common VVAs responses for 'Sexual Sportswear' (2007)

Rank	VVA Code	VVA Category Name	Number of responses
Sébastien Tellier– 'Sexual Sportswear' (2007)			
1	1131	Happy	13
=2	2721	Party	11
=2	5652	Dancing	11
4	380A	1980s	9
=5	0220	Scene	8
=5	1010	Emotional arousal (excitement, adrenaline)	8
=7	8210	Cinema, movie/film music	7
=7	B000	Blanks	7
=7	2652	Car	7
=7	B0U0	'Upbeat'	7
=7	353D	Nightclub	7
=12	E210	Bad	6
=12	1134	Fun	6
=12	3800	Old/old fashioned	6
=12	8271	Video games	6
=12	1226	Frantic, frenetic	6
=12	3814	Modern/new	6
=12	M11B	Disco	6

In contrast to the previous clip the participants are again imagining a happy scene involving dancing at a party or nightclub. The scene could be taking the place in the 1980s and involves cars and excitement.

Table 19: Overview of structural elements in American-Soviets' (1986)

	C.C.C.P. – 'American-Soviets' (1986) Clockwork Records (Germany) 01:58.8-03:03.4
Rhythm	119bpm Straight, unswung metre, 'electro' drum pattern – 8th note emphasis
Timbre	Drum machine sounds (Linn Drum?)
	Synth bass
	'Reedy' synth lead
	Synth chords - on 2 and 4
Structure	16 bar verse form AA…
Harmony	Synth chords - open fifths, I5-V5-♭VI5-V5-♭VI5 Synth bass follows chords
	'Reedy' synth lead - melody with Hijaz tetrachord - 1-♭2-3-♭2-1-♭2-♭7-♭2-1//4-3-♭2-1-♭7-1-♭2-3-1// 5-♭6-7-8-7-♭6-5-4-5//9-8-♭6-♭6-5-4-5-♭6 Forming the chord progression: $GM^{11♭9}$-$DM^{11♭9}$-$E♭^{Maj7Add6Add♯11}$- $DM^{11♭9}$-$E♭^{Maj7Add6Add♯11}$
Harmonic system	**Non-functional chordal harmony with Hijaz-scale melody** American Soviets' employs a non-functional chordal harmony tonal system, based on I-V-♭VI-V-♭VI chord progression. This progression can be regarded as non-functional as the progression does not resolve from the V to I. The progression is notable for its use of dissonant chords, featuring a ♭9 or ♯11.

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Table 20: Most common VVAs responses for 'American-Soviets' (1986)

Rank	VVA Code	VVA Category Name	Number of responses
C.C.C.P. – 'American Soviets' (1986)			
1	5652	Dancing	16
2	3761	North Africa	11
3	3800	Old/old fashioned	10
4	B000	Blanks	9
=5	8210	Cinema, movie/film music	8
=5	3231	Desert	8
7	380A	1980s	7
=8	1131	Happy	6
=8	353D	Nightclub	6
=8	8271	Video games	6
=8	M11D	Dance	6
=8	M611	Rhythmically engaging	6
=13	2721	Party	5
=13	0220	Scene	5
=13	0200	Beginning, start	5
=13	2100	Person	5
=13	5640	Travel	5
=13	5631	Walk/stroll	5
=13	3751	India	5

The happy, dancing, partying, nightclub scenario continues, but this time the setting appears to be in North Africa or in a desert. Again, the action might be taking place in the 1980s.

Table 21: Overview of structural elements in 'Visions' (2009)

Clip	Gatekeeper – 'Visions' (2009)
	Fright Records (Germany)
	00:34.8-01:51.2
Rhythm	110bpm
	Straight, unswung metre, four to the floor drum beat, kick drums on 16th notes
Timbre	Drum machine sounds (Linn Drum), syn-drum tom sounds, 'fat' snare sounds
	Sequenced synth bass
	Synth chords – heavily delayed
	High synth melody
Structure	Repeated 16-bar verse AA..
Harmony	Chords – Cm-E♭m-Cm-E♭m-Am-G♭m-Am-G♭m (i-♭iii-i-♭iii-vi-♭v-vi-♭v in C). Bass follows chords
	Synth melody – 5-4-♭3-2-♭3-1 transposed to each chord foundation note
Harmonic system	**Consonant static harmony with disjunctive harmonic shifts**
	'Visions' can be understood to create a 16-bar verse section by transposing a static consonant harmony to various foundation notes. This consonant static harmony, comprised of a minor triad, bass, and melody, contains the pitches 1,2,♭3,4,5 and so can be described as an Aeolian-subset macroharmony. The foundation notes of C, E♭, G♭ and A are the notes of a Cdim^7 chord.

Table 22: Most common VVAs responses for 'Visions' (2009)

Gatekeeper – 'Visions' (2009)			
Rank	VVA Code	VVA Category Name	Number of responses
1	0220	Scene	16
=2	5944	Chase/chased/pursuit/followed	12
=2	1015	Action/intensity	12
=4	B000	Blanks	10
=4	8210	Cinema, movie/film music	10
=4	380A	1980s	10
=4	2652	Car	10
=4	5923	Attack/fight	10
=4	1223	Suspense, tension, stress	10
10	5632	Running	8
11	8230	Advert (general)	7
=12	E210	Bad	6
=12	841B	Science fiction	6
=12	841A	Action/adventure	6
=12	5220	Fast	6
=12	5642	Driving	6
=12	M11R	Rock	6

For only the second time there are no dancing or positive VVAs. The typical imagined scene involves action and suspense, driving cars at speed, a character running from a pursuer, again perhaps in the 1980s.

Table 23: Overview of structural elements in 'Illuminated Displays' (2002)

Clip	Arpanet – 'Illuminated Displays' (2002) Record Makers (France) 00:00-01:47.6
Rhythm	135bpm Straight, unswung metre, 'electro' drum pattern
Timbre	Roland TR-808 drum sounds, chorused snare sound
	Synth bass
	Synth chords – heavily delayed
	High synth arpeggio, heavy reverb, modulating filter
Structure	Track form
Harmony	Synth bass – four-bar loop, 1-8-1-4-♭3-1-8-1-♭3-♭2 (in F♯)
	Synth chords – four-bar loop - F♯sus4-Emsus4-Em-F♯m (iSus4-♭viiSus4-♭vii-i in F♯)
	High synth arpeggio – two-bar loop, 1-5-♭6-♭7-♭7-♭3-4-5-1-5-♭6-♭7-♭9-♭2-8-1 (In F♯)
Harmonic system	**Dissonant static harmony (Phrygian), Non-functional chordal harmony** 'Illuminated Displays' combines dissonant static harmony (the synth bass and synth arpeggio parts are both Phrygian-subset), with non-functional chordal harmony. The chord progression shuttles between the foundation chord and a ♭vii chord, which can be considered a subdominant.

Table 24: Most common VVAs responses for 'Illuminated Displays' (2002)

Arpanet – 'Illuminated Displays' (2002)			
Rank	VVA Code	VVA Category Name	Number of responses
1	1223	Suspense, tension, stress	13
2	0220	Scene	10
3	B000	Blanks	9
4	8210	Cinema, movie/film music	8
5	E210	Bad	7
=6	2100	Person	6
=6	3800	Old/old fashioned	6
=6	1125	Relaxed	6
=9	841B	Science fiction	5
=9	2721	Party	5
=9	B030	Partially illegible or unintelligible answers	5
=9	841T	Thriller	5
=9	3350	Space	5
=9	0315	Building up to future event	5
=9	M218	Drums	5

The imagined scene still involves a 'party' but is much more likely to involve suspense or to be a scene from a thriller or science fiction film. Again, like the imagined scene for 'Clear & Present', the scene is imagined as both suspenseful and relaxing.

Table 25: Overview of structural elements in 'What You Make Me Feel (Fierce Mix)' (1986)

Clip	Liz Torres Featuring Kenny "Jammin" Jason – 'What You Make Me Feel (Fierce Mix)' (1986) Underground (USA) 05:19.4-06:07.3 + 05:51.3-06:07.3 (Edited to remove vocals)
Rhythm	120bpm Drum machine - Straight, unswung metre, four-to-the-floor kick drums Synth bass – swing, unquantized, imperfect timing
Timbre	Roland drum sounds (626/707/728?), big snare sound with snare fills, 'timbale' percussion sounds
	Synth bass
	High synth string
Structure	Track form
Harmony	Synth bass – two-bar loop, 7-8-7-8-11, 7-8-7-8-11-♭10 (in D♭)
	High synth string – two bar loop – 8-7 (in D♭)
Harmonic system	**Dissonant static harmony** This clip of 'What You Make Me Feel (Fierce Mix)' suggests a dissonant static harmony with a foundation note of D♭, with the non-diatonic collection 1,♭3,4,7. In the full track this foundation note of D♭ is further established by the vocal performance. It is also possible that C will be heard as the foundation note, in which case the macroharmony will be heard as the equally dissonant 1,♭2,3,♭5 collection.

Table 26: Most common VVAs responses for 'What You Make Me Feel (Fierce Mix)' (1986)

Rank	VVA Code	VVA Category Name	Number of responses
Liz Torres Featuring Kenny "Jammin" Jason – 'What You Make Me Feel (Fierce Mix)' (1986)			
1	0220	Scene	14
2	B000	Blanks	12
3	5652	Dancing	10
=4	E210	Bad	8
=4	5944	Chase/chased/pursuit/followed	8
=4	2300	People, group	8
=4	353D	Nightclub	8
=8	8271	Video games	7
=8	1015	Action/intensity	7
=8	274E	Exercise	7
=11	1223	Suspense, tension, stress	6
=11	2721	Party	6
=11	1131	Happy	6
=14	8210	Cinema, movie/film music	5
=14	M218	Drums	5
=14	C112	Again, more	5
=14	1134	Fun	5
=14	8230	Advert (general)	5
=14	3321	Beach	5

Responses to this clip present no clear imagined scene. The fun, happy, nightclub, partying and dancing scene is once again imagined, but there is a significant association of the clip with suspense, being followed, and action.

Table 27: Overview of structural elements in 'Mind Changes' (1992)

Clip	Model 500 – 'Mind Changes' (1992)
	Apollo (Belgium), Network Records (UK)
	03:58.4-04:28.7
Rhythm	125bpm
	Straight, unswung metre, four-to-the-floor kick drums
Timbre	Roland TR-909 drum sounds, percussion sample with pitch variation
	Detuned low synth bass with portamento
	Synth-string
Structure	Track form
Harmony	Synth bass – two-bar loop, ♭9-♭7-♭9-♭7-♭10 (in C)
	Synth string – six-bar transpositional chord progression, minor triads following the melodic line 8-♭9-♭7, creating the progression Cm-D♭m-B♭m (i-♭ii-♭vii in C)
Harmonic system	**Dissonant static harmony (Phrygian-subset), Transpositional chromatic chordal harmony** This clip of 'Mind Changes' can be understood to employ a dissonant static harmony based on a foundation note of C. The root notes of the synth-string progression and the bass pattern suggest a collection of 1,♭2,♭3,♭7 in C. The bassline in this clip uses portamento and, unusually, does not include the foundation note of C, so the perception of C as the foundation note is based primarily on the transpositional synth-string progression. The synth-string progression is an example of a transpositional chromatic chord progression, creating a progression with the chromatic pitch collection 1,♭2,♭3,3,4,5,♭6,♭7.

Table 28: Most common VVAs responses for 'Mind Changes' (1992)

Model 500 – 'Mind Changes' (1992)			
Rank	VVA Code	VVA Category Name	Number of responses
1	1225	Scary, danger, peril, horror	14
=2	1223	Suspense, tension, stress	10
=2	841H	Horror	10
=4	1011	Dramatic	9
=4	B000	Blanks	7
=4	353D	Nightclub	7
=4	1255	Haunted, creepy, eerie	7
=4	3350	Space	7
=9	1125	Relaxed	6
=9	1233	Depressing, sad	6
=11	0220	Scene	5
=11	5944	Chase/chased/pursuit/followed	5
=11	8210	Cinema, movie/film music	5
=11	3800	Old/old fashioned	5
=11	1251	Mysterious	5
=11	841B	Science fiction	5

The imagined scene for this clip is like that for 'Bipolar Suns'. It suggests a scary and suspenseful scene, perhaps set in space. Contrastingly, some participants describe a relaxing scene, and the nightclub setting is still heard.

Table 29: Overview of structural elements in 'Bludclot Artattack (Dark Mix)' (1993)

Clip	Ed Rush – 'Bludclot Artattack (Dark Mix)' (1993) No U-Turn (UK) 00:44.0-00:45.5+00:44.0-01:12.6+01:06.6-0:12.6+01:06.6-01:09.6 (Edited to remove vocal samples)
Rhythm	160bpm Sampled breakbeats containing swing and metric imperfections
Timbre	Acoustic drum kit breakbeats, occasionally reversed, occasionally pitch-shifted
	Sub-bass synth bass sound
	Sampled minor triad pad sound
Structure	Track form
Harmony	Sampled minor triad – doubling the four-bar riff 8-♭10-♭6-♭9 (in B♭), producing the sequence of chords B♭m-D♭m-G♭m-Bm, i-♭iii-♭vi-♭ii (in B♭)
	Sub-bass synth bass sound - B♭
Harmonic system	**Dissonant static harmony with minor triad doubling** This clip of 'Bludclot Artattack' can be understood to employ a Phrygian-subset dissonant static harmony based on a foundation note of B♭, doubled with minor triads. After doubling, the macroharmony contains the chromatic pitch collection ♭7,7,8,♭9.

Table 30: Most common VVAs responses for 'Bludclot Artattack (Dark Mix)' (1993)

Rank	VVA Code	VVA Category Name	Number of responses
Ed Rush – 'Bludclot Artattack (Dark Mix)' (1993)			
1	5220	Fast	18
2	B000	Blanks	16
3	5632	Running	14
4	2100	Person	12
5	0220	Scene	11
6	1223	Suspense, tension, stress	10
=7	5944	Chase/chased/pursuit/followed	6
=7	8210	Cinema, movie/film music	6
=7	5642	Driving	6
=7	1015	Action/intensity	6
=11	1225	Scary, danger, peril, horror	5
=11	2721	Party	5
=11	272R	Rave	5
=11	5000	Motion	5
=11	M11E	Drum & Bass	5

The imagined scene involves fast motion such as running or driving at speed, in a suspenseful action scene being pursued or chased. The scene is also heard as taking place in a rave or party.

4. Discussion of test results

The first, and most basic conclusion that can be drawn from the listening test data, is that the PMFC varies considerably between the eleven pieces of test music. This variety can be illustrated by contrasting the most popular responses to 'I Want You To Know', which include 'dancing', 'nightclubs', 'parties' and 'happiness' with the most popular responses to 'Bipolar Suns', which include 'horror', 'suspense', 'science fiction' and 'aliens'. Simultaneously, some VVA categories were popular responses across many pieces of test music. The VVAs of 'party' and 'nightclub', for example, were highly popular responses across many pieces of test music. The test results indicate some level of similarity between the PMFC of the clips, which can be explained by the stylistic similarities that exist between the eleven examples of dance music.

Before considering whether differences in harmonic organisation may account for any of the indicated variations in PMFC between the tested music, some clear differences in PMFC may be linked to variations of non-harmonic parameters, such as rhythm and timbre. It was suggested in Chapter Two, that the use of straight, unswung rhythms and electronic instrumental timbres in dance music may be heard as evocative of machines or technology, and it is possible to link some of the variations in PMFC to timbral and rhythmic differences in the test music. The listening test data appears to be consistent with the hypothesis that pieces of test music featuring electronic instrumentation and straight, unswung rhythms were more likely to be associated with machines and technology than those that did not.

The below table lists each of the pieces of test music used in the listening test and indicates whether each clip contains any recognisable acoustic instrumentation timbres (for example, the piano sound in 'I Want You To Know', the percussion sounds in 'What You Make Me Feel' and the breakbeat sounds in 'Bludclot Artattack'), and also whether the clip features a straight, clock-like or 'human' rhythmic feel (either containing swing or rhythmic imprecision). The clips were then scored from 0-2, in terms of the number of potentially 'machinic' rhythmic and timbral elements they possess. This is a crude measure of the structural properties of the test music, but captures the stylistic distinction between, for example, 'I Want You To Know', which features a swung rhythm and acoustic piano timbres (and therefore a score of '0'), and 'Bipolar Suns' which has straight rhythms and no acoustic instrumental timbres (and a score of '2').

Table 31: Relationship between timbre and rhythm and machinic VVA responses

	I Want You To Know	What You Make Me Feel	Bludclot Artattack	Clear & Present	American Soviets	Mind Changes	What Time is Love?	Illuminated Displays	Visions	Sexual Sportswear	Bipolar Suns
Purely electronic instrumentation	x	x	x	0	0	0	0	0	0	0	0
Unswung, metronomic clock-like rhythm	x	x	x	x	0	0	0	0	0	0	0
'Machinic timbre and rhythm'	0	0	0	1	2	2	2	2	2	2	2
211M - Scientist	0	0	0	0	0	0	0	1	0	0	0
2651 - Boat	0	0	0	2	0	0	0	0	1	0	0
2652 - Car	4	3	4	4	2	1	5	2	10	7	4
265C - Open top/window down car	1	0	0	3	0	0	0	0	3	0	0
2654 - Train	0	0	0	0	0	0	1	0	1	0	0
2656 - Spaceship	1	0	1	0	0	1	0	2	3	4	2
2657 - Bike	0	0	0	0	0	0	0	0	1	0	0
2660 - Machines	0	0	0	0	0	1	0	0	0	0	1
266L - Lights	1	1	0	0	0	0	3	0	0	1	0
266M - Manual tools/repair	0	0	1	0	0	1	0	0	0	0	0
266A - Audio technology	0	0	0	1	0	0	1	0	0	1	0
266C - Computers	0	0	3	0	0	0	3	0	1	0	0
266P - Phones/smart phones	0	0	0	1	0	0	0	1	0	1	1
266T - Technology	0	0	0	0	2	0	1	1	1	1	1
266W - Weapons	0	0	0	0	0	1	0	1	0	1	0
27S1 - Scientific research/experiment	0	0	0	1	0	0	1	2	0	0	1
27S2 - Clinical	0	0	0	0	0	0	0	0	0	0	1
27S3 - Medical	0	1	0	0	0	0	0	0	0	0	0
3350 - Space	0	0	1	1	0	7	1	5	1	2	8
3351 - Planet	0	0	1	1	0	2	0	0	0	0	1
3352 - Alien	0	0	1	0	0	3	1	1	0	1	13
3353 - Stars	0	0	0	1	0	0	0	0	0	1	0

381F- Futuristic	0	1	1	2	0	0	1	2	1	2	3
3814 - Modern/new	0	1	1	0	4	0	0	0	1	6	1
382T - Time/time travel	0	1	3	0	0	0	0	1	1	0	0
841B - Science fiction	0	2	4	0	2	5	5	5	6	5	16
841P - Science	0	0	0	0	0	0	0	1	0	0	0
Total	7	10	21	17	10	22	23	25	31	33	53
Average number of machinic VVA responses for each rank	**12.6**		**17**		**28.1**						

The above table lists the number of responses given to these pieces of test music in a number of VVA categories that describe broadly technological concepts, such as science, space travel and modern or futuristic settings. The number of VVA responses for each clip has been totalled, and then averaged, to produce an average score for each 'rank' of 'machinic timbre and rhythm' (highlighted in bold type). The average number of machinic VVAs given in response to each piece of test music with a score of 0 was 12.6. For the single track with a score of 1, the average number of machinic VVA responses was 17. For the seven tracks with a score of 2 the average number of machinic VVA responses for each clip was 28.1. This data is consistent with a hypothesis that the clips that have a 'machinic timbre and rhythm' score of '2' are much more likely to be heard as associated with technological or scientific concepts than those with a score of '0'. These results also suggest that variations in harmonic system did not necessarily have an influence on whether the test music was associated with machines and technology. The number of 'machinic' VVAs given in responses to the clip 'Sexual Sportswear' (33), for example, which uses a functional chordal harmony, was similar to the number of 'machinic' VVAs given in response to 'Illuminated Displays' (25) or 'Visions' (31), which use dissonant and consonant static harmonies respectively.

This thesis has also argued that particular harmonic practices (dissonant harmony, disjunctive harmonic shifts, chordal doubling, and transpositional chord progressions), may be heard as evocative of the disturbing, 'noisy' qualities of machines and technology. The results of the listening test appear to be consistent with the idea that these pieces of test music are heard as more disturbing or 'negative' than the other pieces of test music, but, as was suggested

above, there is no evidence that the test music using these harmonic practices was interpreted as more 'machinic' than those that used more traditional or consonant harmonic systems. The three clips which did not use any of these harmonic practices all elicited at least as many 'culturally positive' VVAs as 'culturally negative' VVAs, while all of the clips that use at least one of these harmonic practices, elicited more negative than positive VVAs.

One track, 'American Soviets, features non-functional chordal harmony combined with a Hijaz scale melody that may be heard as a genre-synecdoche of non-Western music. As a result, this track can be described as containing dissonant harmonies, but does not use any of the harmonic practices that this thesis has argued are associated with machinic dance music. As a result, it is not included in the category of test music that use the distinctive dance music harmonic practices described in this thesis.

This interpretation of the clips as positive or negative, seems to be largely independent of whether the clips are heard to possess a machine aesthetic. The clips 'Sexual Sportswear', 'Visions' and 'Illuminated Displays' for example, were all heard as highly 'machinic' in character, but the clip 'Sexual Sportswear', which features a conventional minor key functional chord progression (i-♭VI-i-iv-iv^6-V (in C)) was heard as significantly more 'positive' than the other two clips, which employed consonant static harmony with disjunctive shifts and dissonant static harmony, respectively. The significance of harmonic organisation can be illustrated by considering the most popular VVA responses for 'Sexual Sportswear' and 'Illuminated Displays'. Both tracks were released on the same record label (Record Makers) in the same decade (the 2000s), and both use entirely electronic instrumentation and have straight, unswung rhythms. They are also in a similar tempo-range, being 130bpm and 133bpm respectively. Whereas the most popular VVAs for 'Sexual Sportswear' are positive, 'happy' 'party' and 'dancing', the most popular for 'Illuminated Displays' which features a dissonant static harmony is ' Suspense, tension, stress'.

Table 32: Relationship between harmony and positive and negative VVA scores

	I Want You To Know	Sexual Sportswear	Clear & Present	American Soviets	Illuminated Displays	What You Make Me Feel	Bludclot Artattack	Visions	What Time is Love	Mind Changes	Bipolar Suns
Dissonant or disjunctive harmony					x	x	x	x	x	x	x
Culturally Positive (VVAs 1100-1170)	35	38	20	15	25	16	14	9	6	15	8
Culturally Negative (VVAs 1200-1291)	2	19	20	21	37	32	34	31	41	63	98
"Positive-Negative Score"	33	17	0	-6	-12	-16	-20	-22	-35	-48	-90
Average 'positive-negative score for each category	**16.6**			**-6**	**-34.7**						

As has been discussed in this chapter, this data cannot be taken as definitive evidence that differences in harmonic organisation play a large role in determining whether a track is heard as possessing a broadly positive or negative character. The most negatively interpreted track, 'Bipolar Suns', for example, as well as employing dissonant static harmony and a highly chromatic chord progression, also contains a 'piercing' high-pitched bleeping riff that may be heard as unsettling or disturbing due to its harsh timbral qualities. This clip's perceived negative qualities may be primarily due to these timbral properties, and it is unclear which properties of the test clips are most significant to listeners. The listening test data, however, does, at least, appear consistent with the hypothesis that dissonant and 'disjunctive' harmonic practices in the test music were more likely to be associated with 'negative' VVAs, and so indicates that dissonance could play a role in listener interpretations of dance music as negative.

The majority of 'negative' responses to these pieces of test music interpreted the music as a kind of filmic 'tension' music, appropriate to score scenes of tension and suspense, such as chases or other stereotypical scenes from a thriller or action film narrative. For example, participant 41, in response to 'What Time Is Love?', imagined the following scene: 'tension, someone can be running from the police maybe even if on a fiction play running from monsters?' Similarly, participant 25 imagined that the same test music could score 'a chase through a European underground railway. A cop chasing a suspect'. These responses suggest that dissonant riffs in the test music were heard to resemble dissonant ostinatos in film suspense music, such as the cue 'At The Bank' from John Powell's score of the action thriller film *The Bourne Identity* (2002), which was discussed in Chapter Three. This common interpretation of dissonance in the test music as evocative of tension and anxiety, can, in part be understood as a response to the listening test instructions, which explicitly directed participants to consider the test music as film music, and to imagine a scene that the music would accompany. This instruction may account for the popularity of responses that interpret the music in terms of emotional arousal, excitement, and stress, as listeners may associate dissonant film music primarily with the depiction of these emotions.

The interpretation of dissonance as evocative of the disturbing 'noise' of non-human machines and technology, which has been suggested in this thesis, is not indicated by the listening test results, but the absence of this interpretation may be explained by the framing of the test itself, which has suggested a particular interpretation of the test music. However, these test results do suggest that, regardless of the intensions of the producer, dissonant static harmony in dance music may often be interpreted by listeners as evocative of tension and anxiety.

As was noted in Chapter Five, chromatic chord progressions have been historically associated, in nineteenth century music and in film music, with depictions of the supernatural and uncanny. It was also argued, in Chapter Five, that transpositional chromatic chord progressions in dance music, produced by transposing fixed chord voicings, are also likely to be heard as evocative of the supernatural and uncanny, and may be interpreted in a similar way to smoothly voiced 'LPR' progressions. Only one piece of test music, 'Bipolar Suns', featured an 'LPR' chromatic progression, i-VII (in F), a highly chromatic progression similar to

that appearing in Hans Zimmer's score for *Inception* (2010), discussed in Chapter Five, that Frank Lehman had described as expressive of 'pure weirdness' (Lehman, 2018, p. 6). One piece of test music included a transpositional chromatic chord progression, Model 500's 'Mind Changes' which features a i-♭ii-♭vii (in C) progression, produced by doubling a 8-♭9-♭7 (in C) melodic line with minor triads (using a synthesiser chord memory function).

Table 33: Relationship between chromatic harmony and 'fantastic' VVAs

	Chromatic chordal harmony	I Want You To Know	What Time is Love?	Clear & Present	Sexual Sportswear	American Soviets	Visions	Illuminated Displays	What You Make Me Feel	Bludclot Artattack	Mind Changes	Bipolar Suns
											T	LPR
1036	Dreams	0	0	0	0	0	0	1	0	0	2	0
1037	Magic	0	0	0	0	0	0	0	0	1	1	1
1201	Evil, villainy	0	0	0	0	0	0	0	0	0	3	2
1251	Mysterious	0	2	3	1	1	1	4	3	1	5	7
1255	Haunted, creepy, eerie	0	1	0	1	2	0	3	1	2	7	12
1275	Weird	0	1	0	1	2	1	1	2	2	2	0
127H	Hypnotism	0	1	0	0	2	0	0	0	0	0	0
2656	Spaceship	1	0	0	4	0	3	2	0	1	1	2
272H	Halloween	0	0	0	0	3	0	1	1	2	1	0
3704	Heaven	0	0	0	0	0	0	0	0	0	1	0
3705	Hell	0	0	0	0	0	0	0	0	0	0	1
841B	Science fiction	0	5	0	5	2	6	5	2	4	5	16
841H	Horror	0	0	0	0	2	1	3	3	4	10	12
841Q	Fantasy	0	1	0	1	0	1	0	0	0	1	0
	Total responses	1	11	3	13	14	13	20	12	17	39	53
	Average number of responses in category	11.5									39	53

The above table lists the responses given to the test music in the VVA categories that can be related to the supernatural, uncanny, strange or weird concepts that Richard Cohn and Frank Lehman have suggested are commonly associated with chromatic harmony in nineteenth century music and film music. The above table indicates that the test music 'Bipolar Suns',

using LPR chromaticism, was the test music most associated with these 'fantastic' VVA categories (53 'fantastical' VVA responses), but Model 500's 'Mind Changes', featuring a transpositional chromatic progression, was the second most associated with these VVA categories (39 'fantastical' VVA responses), while the average number of responses given to the remaining nine pieces of test music was 11.5. These results appear to suggest that transpositional chordal harmony may be associated with depictions of the uncanny and supernatural in a similar way to conventional 'LPR' chromaticism, as was argued in Chapter Five, as the number of 'uncanny' VVA responses elicited by 'Mind Changes' was significantly higher than the average.

5. Limitations of test results

The results of the listening test indicate that the clips were interpreted in significantly different ways to each other, however, the results do not allow for any definitive conclusions to be made regarding the extent to which any particular structural element played a part in these creating these PMFC distinctions. Comparisons between 'I Want You To Know', and 'Bipolar Suns', for example, show that 'I Want You To Know' was heard as the most 'positive' clip and 'Bipolar Suns' was heard as the most 'negative'. It is possible that this difference in PMFC is a result of the significant difference in harmonic system between the two. The consonant static and non-functional chordal harmony of 'I Want You To Know' could possibly have been interpreted by participants as inherently more 'positive' than the chromatic chord progression and dissonant static harmony of 'Bipolar Suns'.

Additionally, the harmonic system of 'I Want You To Know' may be heard as a style flag, both a style indicator for 'garage house' and a genre synecdoche for disco and jazz-funk styles. If functioning as a style flag, this harmony may connote concepts typically associated with house and disco music, such as 'nightclubs' and 'dancing'. Meanwhile, the chromatic chord progression of 'Bipolar Suns' may be heard as genre synecdoche for 'science fiction film music'. The chord progression and melody of 'Bipolar Suns' is very similar to Toto's 'Main Title' from *Dune* (1984), which begins with the progression i-VIIAug. The i-VII progression in 'Bipolar Suns' differs only by one note from this progression. The similarity of these progressions was noted by participant 82, who noted that 'Bipolar Suns' 'reminds me of the movie *Dune*'. This track may have been associated with soundtrack music more than 'dance'

music. The different interpretations of these two clips may therefore be based primarily on the perception of the harmonic differences between them.

However, there are so many stylistic differences between the two clips that it is not possible to isolate the expressive qualities of harmony in this test music. For example, 'I Want You To Know' features a swung rhythm, whilst 'Bipolar Suns' does not. 'I Want You To Know' features a piano sound that evokes familiar acoustic instrumentation, while 'Bipolar Suns' features synthesised strings, snappy unsyncopated Roland TR-808 drum machine beats, and a high-pitched 'alarm' sounding two-note synth motif that has a particularly piercing and harsh timbre. Any of these other, non-harmonic structural elements could have played a significant role in creating the disparity in test results to these clips, to the extent that it is not possible to make any strong conclusions regarding the specific role that harmony plays in this distinction. However, it is equally not possible to rule out the possibility that harmonic distinctions do play an important role in creating the difference in PMFC between these two clips.

The noted limitations, regarding the difficulties linking listener responses to individual musical elements, can be seen to partly result from the decision to use existing recordings of popular music in the experiment. The significant amount of structural variation between recordings made it impossible to isolate the expressive role of any individual structural element. A follow-up experiment might be able to address some of the limitations with the current listening test and collect data that allows the potential meanings of harmony in dance music to be more accurately isolated and tested. Such a follow-up test would collect response data using more controlled test stimuli, whether in the form of specifically re-composed works in a popular music style, or the creation of controlled test stimuli like those found in music psychology experiments. A new study of this kind would be able to much more closely control stylistic variables and so better isolate harmonic organisation as a test variable.

6. Conclusion

This chapter has outlined the rationale for conducting a listening test to accompany the discussion of meaning elsewhere in this thesis. The listening test was intended to collect empirical data that could support or challenge the conclusions made throughout this thesis, regarding the potential meanings of distinctive harmonic practices in dance music. This

chapter discusses the methodology of the listening test and also reflects on the limitations of the test method, which is criticised for not adequately isolating the harmonic variables that were intended to be tested. The results of the test were consistent with the hypotheses that dissonant and disjunctive harmonic practices in dance music were heard as more unsettling or negative than more traditional or consonant forms of harmonic organisation, but also suggested that many listeners were likely to interpret these harmonies in a similar way to film music, as expressive of tension or anxiety. The test results also suggested that transpositional chromatic harmony is, like LPR harmony, likely to be associated with themes of the supernatural and uncanny. Finally, this chapter suggested follow-up experiments that could better isolate and test the meanings of harmony in dance music.

Chapter Seven – Conclusion

The central claim of this thesis is that specific harmonic practices in dance music can be understood to evoke the movements or sounds of machines and technology. This thesis has also argued that the perceived machinic qualities of these harmonic practices can explain their historical popularity in styles of dance music such as electro, techno, acid house and drum and bass, where they have been employed as part of a wider machine aesthetic. By identifying the meaningful role that harmony plays in dance music aesthetics, this research makes an important contribution to the academic study of dance music. While previous discussions of a machine aesthetics in dance music writing have focused on the role of timbre and rhythm, this thesis has argued that harmony may also be heard to anaphonically suggest machinic properties. This discussion of dance music harmony has focused on three distinctive practices in machinic dance music tracks: the use of dissonant static harmonies and riffs, the use of disjunctive harmonic shifts and the use of sampled chords and other fixed chord voicings. This thesis has argued that all three of these distinctive practices may be heard as evocative of machines and technology in the context of machinic dance music.

Chapter Three identified some of the common types of dissonant riff and static harmonies employed in machinic dance music: harmonies with chromatic pitch collections, Phrygian harmonies, diminished harmonies, and riffs that are randomly generated. Chapter Three also outlined criteria by which dissonant static harmonies may be identified, arguing that any static harmony that does not fit into an Aeolian, Dorian, Mixolydian, Ionian or Lydian scale, is likely to be heard as dissonant. In Chapter Four, the practice of disjunctively transposing static riffs and melodic patterns was identified and discussed. This practice was differentiated from the use of harmonic shifts in rock and R&B, where shifts typically follow discursive chord progressions. Chapter Five described two related harmonic practices in dance music, the first of which being the doubling of static riffs with fixed chord voicings, which was understood to often add dissonant properties to static harmonies. The use of chord samples and chord memory functions to produce chromatic chord progressions was also identified and discussed in the same chapter.

This thesis, then, brings together a number of brief discussions of dance music harmony, from a diverse range of writers, into one detailed and extended account of harmonic practice in

machinic dance music tracks. For example, Philip Tagg had previously identified a distinction between the harmony of 'techno-rave' and 'R&B dance' styles of dance music, but Tagg's writing represents a preliminary survey of harmony in dance music and does not attempt to describe this practice in detail. Tagg concedes that dance music is a genre that he knows 'very little about' and suggests that the 'main aim' of his paper is to 'raise questions, not to answer them' (Tagg, 1994, pp. 6, 14). Similarly, writers such as Simon Reynolds (1996) and Ben Williams (2001) have noted that harmony in techno and hardcore styles is often dissonant, but have not related this observation to specific examples. Journalistic writing has also occasionally noted the dissonance of harmony in machinic styles. For example, David Bradwell notes that 'the use of discordant musical intervals such as minor seconds and tritones is a feature of acid house' (Bradwell, 1988, p. 119) but does not relate this observation to any detailed description of acid-house riffs. In academic writing several authors have described the harmonic practices discussed in this thesis but have not linked them to harmonic practice in dance music. Carsten Brocker has identified the use of flattened ninths and harmonic shifts in the music of Kraftwerk (2010), while Robert Fink has described the influence of Kraftwerk's harmonic practices on electro in the early 1980s (2005) and Karen Collins has also identified the use of similar Phrygian riffs in industrial music (2005). However, this research has not related these practices to harmony in later dance styles such as techno and acid house.

This thesis has also considered harmonic practice in dance music in relation to practices in earlier styles of machine music, in Western art and film music, identifying structural continuities that may be heard as evocative of machines and technology in both contexts. Allison Wente has argued that dissonance in film and orchestral music may be evocative of the noise of machines (2018) and William Rosar has identified the use of Phrygian harmony in film machine music (2006, p. 409). This thesis has argued that similar dissonant static harmonies in dance music may also be interpreted as evocative of machine noise. James Buhler has argued that the use of chromatic, non-functional harmony in John Williams' music from the *Star Wars* franchise may be heard as expressive of 'a kind of technology' (2000, p. 48) and it was argued that the use of similarly 'arbitrary' harmony in dance music, produced by harmonic shifts and melodic doubling, may similarly be heard as evocative of technological processes. In Chapter Five, research on chromatic chordal harmony in orchestral music and film music (by Richard Cohn (2012) and Frank Lehman (2018)), was related to dance music

harmony, and it was argued that transpositional chromatic harmony in dance music may similarly be heard as evocative of the uncanny and supernatural . This is the first research to apply these insights from outside of dance music studies to the analysis of the meaning of harmony in dance music tracks.

Harmony in dance music tracks, then, might be heard as 'machinic' primarily because it is heard to contravene established style expectations in popular music (regarding consonance, diatonicism, mode and changes of scale) that are heard as 'natural' or 'human', and because it is heard to exceed the limitations of 'human' performance (the ability for humans to perform melodies and chord voicings), while simultaneously lacking the nuance and sensitivity of human performance. This machinic harmonic practice may be defined both by its speed and precision, but also by its perceived strangeness, clunkiness, brutality, noisiness, and rigidness in contrast to 'human' harmonic practices, and it is through this difference that harmony in dance music is heard to anaphonically resemble the sounds and movements of machinery and technology. The interpretation of these harmonic practices as inherently 'unnatural' and mechanical may explain why they have been far more commonly employed in machinic styles of dance music than in other styles such as house and garage. It also indicates that, like timbre and rhythm, harmony may be heard to embody technological or even futuristic associations, a possibility that has not previously been considered in dance music writing.

However, as was noted in the introduction, not all tracks in machinic dance music styles employ the distinctive harmonic practices discussed in this thesis, and use of these harmonic practices is certainly not necessary for dance music to be heard as machinic. The results of the listening test were consistent with this assumption, as they seemed to indicate that the presence of electronic timbres and straight, metronomic rhythms was sufficient to suggest that a piece of music would be heard as machinic, regardless of the harmonic system employed. The use of the distinctive harmonic practices discussed in this thesis then, can be understood as another means, in addition to timbre and rhythm, by which dance music artists and producers may construct a machine aesthetic, although one which is supplementary to rhythmic and timbral aspects. These distinctive harmonic practices have, historically, been employed in combination with machinic timbres and rhythms, and so can be regarded as part

of a wider multi-parameter aesthetic strategy, in which producers use all parameters of musical expression in order to create a machine aesthetic.

While it has been argued, throughout this thesis, that these harmonic practices are likely to be heard to evoke the sounds and movements of machines, this research has also noted the possibility of codal interference in the interpretation of this harmony. Research by Robert Fink (2005) and Karen Collins (2005) has suggested that dissonance in static harmony may often be heard as expressive of human emotions, such as sadness, anxiety and despair. It was also noted in Chapter Six that many listeners interpreted dissonant test music as expressive of tension and suspense. It is possible, then, that the sense that dissonant harmony in dance music is expressive of fear, anxiety, and suspense, may often override any sense that the same harmony is expressive of machine noise. It was noted, in Chapter Three that while there is little in the paramusical text of Kraftwerk's 'Trans-Europe Express' (1977) or in Afrika Bambaataa's 'Planet Rock' (1982) to suggest that these tracks were intended to be heard as expressive of negative emotions, it is possible that the dissonant melodies of these tracks may be heard as expressive of anxiety and 'gloom' (2005, p. 347). The possibility that there are two competing interpretations of dissonance has implications regarding how machinic dance music is to be understood more generally. The assumption that dissonance in machinic dance music is always evocative of emotional pain or anxiety, and associated with a dystopian industrial aesthetic (Pope, 2011), may lead to neglect of alternative interpretations of dissonance in machinic dance music as evocative of technology that is noisy and disruptive, but possesses both utopian and dystopian potential. It is possible, then, that dissonant dance music harmony is typically intended to be heard as evocative of machine noise, but that this meaning of dissonant harmony is often overridden by a competing interpretation of dissonant harmony as expressive of negative emotional states. Both interpretations, however, suggest that dance music harmony plays an important role in the production of meaning and affect.

The argument presented in this thesis, then, that harmonic differences and distinctions, within the context of repetitive and harmonically static dance music tracks, may be meaningful to listeners, is intended to problematise the assumption, identified in the writing of Simon Reynolds (2007), and in the work of scholars such a Butler (2001), Rietveld (2014) and Garcia (2005), that such non-discursive harmony in dance music tracks is essentially

without meaning. For example, the clear 'family resemblances' between many of the examples of dissonant harmony cited in Chapter Three, suggests that many 1980s and 1990s dance music producers deliberately incorporated dissonant harmonic practice into their work in the knowledge that such harmony would be meaningful or appealing to audiences in ways that differed from consonant harmony. This understanding of dissonant harmonic practice in machinic dance music tracks, as employed deliberately by artists and producers to create particular meanings and effects, is incompatible both with the view that harmonic organisation within the context of dance music tracks is without significance for listeners and the view that dissonance in dance music implies a rejection of all stylistic conventions (Reynolds, 1996). The analysis of static harmony presented in this thesis, then, suggests that further musicological analysis of harmony in dance music may lead to further insights about how dance music is composed and how harmony has been used by artists to communicate meanings and affects.

1. Harmony in machinic dance music as a point of continuity with and difference from other styles

This thesis has argued that distinctive harmonic practices in dance music are likely to be heard as evocative of machines and technology, and that this explains the popularity of these practices in styles such as electro and techno that have thoroughly machinic aesthetics. However, these harmonic practices are not only identifiable in these explicitly machinic styles and have also been employed in the context of the many 'cyborg' styles of dance music that freely combine machinic and 'human' elements.

The machinic harmonic practices identified in this thesis can also be understood as distinctive modifications and variations of harmonic practices that are common to many styles of dance and popular music, such as the use of riffs, harmonic shifts and doubling of riffs with chords. Harmony in machinic dance music, then, can simultaneously be understood as a point of difference from, and continuity with, practice in other styles of popular music. For example, while dissonant static harmonies can be identified both dance music and heavy metal (as Walter Everett (2004) and Robert Walser (1993) have noted), the particular types of dissonant riff common in machinic dance music, such as riffs based on a m♭9 chord, may be relatively distinctive and unlike dissonant harmonies in many other styles in popular music.

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Similarly, the practice of doubling riffs with chords is common in rock, but the doubling of riffs with minor triads can be identified as a relatively distinctive aspect of dance music harmony. This thesis has also identified points of similarity between harmonic practice in machinic dance music and film music and Western art music, whilst noting the distinctive aspects of machinic dance harmony. As was argued in Chapter Five, chromatic chord progressions in machinic dance music may be heard to resemble passages of chromatic harmony in film music, but the centrality of transposition to practice in machine dance music can be identified as a distinctive point of difference between these styles.

In addition to being fundamentally related to practice in other styles of music, the distinctive harmonic practices discussed in this thesis can also be identified across many styles of dance music. Although most common in explicitly 'machinic' styles of dance music, such as techno, acid-house or drum & bass, the use of these harmonic practices has not, historically, been limited to these styles. This research has shown that harmonic practices that may be heard as evocative of machines and technology are widely distributed across various styles and genres, such as house and garage, hip-hop, R&B and industrial. While 'machinic' styles of dance music may be, in part, defined by their prevalent use of appropriately 'machinic' harmonic practices, it cannot be argued that these harmonic practices are exclusively employed only in machinic dance music.

An understanding of these harmonic practices as, simultaneously, both a distinctive feature of machinic dance music and related to other harmonic practices in 'cyborg' dance music and other styles of popular music, helps to problematise Kodwo Eshun's claim that machinic dance styles represent a historic 'break' with other styles of 'humanist' Black popular music (Eshun, 1998, pp. -001). Kodwo Eshun has linked the specific 'break' between Detroit techno and R&B with the adoption, within Detroit techno, of structural elements from European synth-pop music. Eshun has argued that 'there's the sense that Techno betrayed an unspoken oath. It was seduced by Manuel Göttsching, by Liaisons Dangereuses - by all that Euro synth music - and this triggers the unspoken but persistent sense of abandoning African-American tradition' (Eshun, 1998, p. 104). However, Eshun's claim that Detroit Techno can be separated from other styles of Afro-Diasporic popular music due to its use of incorporation of elements of

'Euro synth' style, can be complicated by noting the widespread use of dissonant harmonic practices derived from 'Euro synth music' across R&B and other styles of 'cyborg' dance music.

As was argued in Chapter Three, the use of dissonant static harmony can be identified in late 1970s recordings by German synth artists Kraftwerk and Tangerine Dream, and similar harmonic practices can be identified in Detroit techno and in the other styles of explicitly 'machinic' dance music championed by Eshun and Simon Reynolds. However, dissonant harmonic practices, derived from the same 'Euro synth' tradition can also be identified in many other 'cyborg' styles of dance music that have not been understood to have explicitly broken with the traditions of Afro-Diasporic popular music. As was noted in Chapter Three, dissonant static harmony has been employed in numerous electro hip-hop tracks, combining dissonant static harmony with rap and hip-hop beats, such as Afrika Bambaataa's 'Planet Rock' (1982), Man Parrish's 'Hip Hop, Be Bop (Don't Stop)' (1982), NWA's 'Panic Zone' (1987) and Imperial Brothers 'We Come To Rock' (1984). The style of 'hip-house', popular in the late 1980s and in the early 1990s, combined elements of house and techno styles with rap and other elements of hip-hop, and often featured dissonant riffs, for example, Twin Hype's 'For Those Who Like To Groove (Club Groove Remix)' (1989) and King Sun's 'On The Club Tip' (1989) (which samples a dissonant bassline from Chip E's earlier house track 'Time To Jack' (1986)). The hip-house sound was recalled in later house tracks such as 'Renegade Master' (1995) by Wildchild and 'Booty Call (Extended Club Mix)' (1994) by Fast Eddie / DJ Sneak, both of which also feature dissonant static harmony.

These hip-house tracks contain many of the same 'Euro synth' elements that are common in techno and other styles of machinic dance music but freely combine them with elements from house and hip-hop. The track 'Booty Call', for example, contains a sample of the dissonant bass riff of 'Peut Etre...Pas' (1981) by German industrial group Liaisons Dangereuses ♭5-3-♭3-1 (in B♭), a riff that was also sampled in the Detroit techno track 'Galaxy' (1990) by BFC (an alias of Detroit producer Carl Craig). The use of musical elements from 'Euro-synth' bands like Liaisons Dangereuses was specifically identified by Eshun as a practice that differentiated Detroit Techno from other styles of dance music, but the use of this sample in 'Booty Call' and Parris Mitchell's 'Ghetto Booty' (1994), in addition to Detroit techno tracks such as 'Galaxy',

suggests that the use of dissonant static harmony, derived from 'Euro-synth' music, cannot be exclusively associated with Detroit techno.

Simon Reynolds has also contrasted machinic dance styles with deep house and garage, arguing that 'the songful style of 'deep' house rapidly collapsed into an affirmation of traditional musicianly values and uplifting humanist traditions' (Reynolds, 1998, p. 19). Yet, styles such as deep house and garage have also incorporated explicitly machinic, dissonant harmonic elements derived from 'Euro synth' music. For example, the Chicago deep house track 'Night Moves' (1988) by Rickster, features a 'Kraftwerk-esque' Phrygian bass riff which is incorporated into a conventional deep house track with vocals and a verse/chorus structure. Again, the use of machinic harmonic practices in garage house music complicates the assertion of absolute distinctions between house and more explicitly machinic styles of dance music.

Dissonant static harmony is not the only harmonic practice that crosses the boundaries between explicitly machinic dance styles and other styles of dance and popular music. The practice of doubling riffs with chord stabs, common in early 1990s techno (for example, Underground Resistance's 'Sonic Destroyer' (1991), discussed in Chapter Five), can be understood to have developed from earlier practice in hip-hop, such as the use of sampled stab sounds in Mantronix's 'Hardcore Hip-Hop' (1985). Todd Terry's hip-house tracks such as 'A Day In The Life' (1988) by Black Riot, also freely combined these doubled-riffs, with the funk and disco breakbeats of hip-hop. Similar use of sampled chords can be found in hip-house tracks, such as the intro of 'Cub Scene' (1989) by Special Ed, and in later deep house tracks, such as the Danny Tenaglia produced 'Surrender Yourself (Ballroom Mix)' (1992) by The Daou. When Eshun argues that 'UR break with the street' (Eshun, 1998, p. 117), this stylistic break is complicated by the use of these transphonographic matrices across techno, house and hip-hop styles.

Richard Pope has also contrasted Detroit techno with the 'banalities of trance and popular music generally' (Pope, 2011, p. 36), and has claimed that 'Detroit techno *is* altogether more "serious" and artistic than a genre like trance' (Pope, 2011, p. 36). Pope argues that harmonic organisation in Detroit techno is fundamentally different to that in trance, suggesting that the shorter-term musematic repetition of riffs common in Detroit techno may be contrasted with

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the longer, discursive chord progressions of trance. However, many trance and progressive house tracks also contain sections of dissonant static harmony, in common with European styles of techno, and earlier European dance styles such as Belgian New-Beat. For example, trance tracks such as 'Teleport' (1996) by The Man With No Name, and 'Harlequin - The Beauty And The Beast' (1994) by Sven Vath, both feature passages of Kraftwerk-like Phrygian static harmony. Vath is an artist that Simon Reynolds has singled out for particular scorn, as epitomising a self-indulgent 'prog-rock' trance sound that is the antithesis of the 'hardcore continuum' (Reynolds, 1998, p. 185) and machinic dance music more generally. However, the dissonant static harmony of these particular trance tracks is similar to that common across machinic styles such as Detroit techno and UK hardcore.

Categorical distinctions between 'machinic' dance styles and other styles of dance music can be complicated, then, by identifying systems of harmonic organisation that are common across dance music styles. While many objective stylistic differences between Detroit techno and R&B, trance or deep house can be identified (which account for the different meanings and affects associated with those styles), these different styles may equally share many structural commonalities, such as the use of similarly machinic harmonic systems.

2. Future research

As was noted in Chapter Six, there is scope for further experimental testing of the meanings of the harmonic practices discussed in this thesis, and the experimental methods presented in this project may be improved upon in future research. The listening test was carried out an early stage during this research, and the conclusions that could be drawn from this data were limited. As was noted in Chapter Six, the listening test, using existing recordings of dance music, did not properly isolate the harmonic variables that were being tested, and harmonic variables could be better isolated in future experiments, through the use of bespoke musical stimuli.

Future research could also specifically investigate the meanings of dissonant harmony, disjunctive harmonic shifts, and chordal doubling in contemporary dance music. While this research project has argued that these harmonic practices may function as style flags in contemporary dance music and EDM, it has also primarily focused on the development of

these practices in 1970s, 1980s and 1990s dance music. Future studies may focus on more recent use of dissonant static harmony in dance music, for example CamelPhat & Ali Love's 'Compute' (2023), which was released in September 2023, close to the completion of this thesis. This EDM track samples Kraftwerk's 'It's More Fun To Compute' (1981) and features a music video with retro science-fiction imagery. Future research might specifically investigate how dissonant static harmony is meaningful in contemporary EDM music and how its meanings have developed over the last forty years.

Future research could also specifically focus on the role of harmony in the work of individual producers, for example, Detroit techno producer Jeff Mills. Mills' work is often explicitly inspired by classic science fiction films, such as the albums *Metropolis* (2000) and *Metropolis Metropolis* (2023) both inspired by Fritz Lang's *Metropolis* (1927), *Woman In The Moon* (2015) inspired by Fritz Lang's *Frau im Mond* (1929) and *A Trip To The Moon* (2017) inspired by Georges Méliès *Le voyage dans la lune* (1902). Mills has staged live performances in which he accompanies screenings of these science fiction films with his music, in what he has termed 'Cine-Mix' events ("Jeff Mills presents Woman In The Moon Cine-Mix (All Seated Show)," n.d.), and has also written original science fiction narratives, such as *Dark City*, published in the magazine *Mixmag* (Mills, 2019), to accompany his musical work. Mills' 'Sleeper Wakes' series of albums describe an ongoing narrative, which is often illustrated, in the album notes, with images of the artist. This work, which blurs the lines between electronic dance music and film score, and which uses many of the harmonic practices described in this thesis to explicitly evoke machines and technologies depicted in science fiction films, would represent an exciting subject for future research.

Future research of this kind, focusing on the work of individual artists in greater depth, could also incorporate interviews with those artists, in order to investigate whether dance music producers attribute the same meanings to harmony that have been proposed in this thesis. Such interviews could further clarify how harmonic practices in machinic dance music are likely to be interpreted.

Possible future work might also use the model of dance music harmony presented in this thesis to improve the accuracy and utility of 'key detection' software for DJs, such as *Serato* and *Mixed In Key*. Such software typically assigns dance tracks only one of two scales, a 'major'

scale, or a 'minor' scale, relative to a particular foundation note. As a result, current key-analysis software struggles to correctly determine the foundation notes of dance tracks using modal scales other than the Aeolian or Ionian modes. For example, after analysing the E Phrygian macroharmony of the house track 'Night Moves', *Serato* suggests that this track belongs to the key of A minor. This indicates that current key-finding software, classifying tracks as belonging to either minor or major keys, is not able to accurately 'find' the correct foundation note of Phrygian macroharmonies, or many of the other macroharmonies considered in this thesis.

Future research may also investigate the use of 'machinic' harmonic practices in the context of video game music. Some video game music of the early 1990s can be identified that used the harmonic practices outlined in this research project to emulate contemporary house and techno styles. For example, the cue 'Go Straight' (2016) by composer Yuzo Koshiro, from the game *Streets of Rage 2* (1992), begins with a doubled riff that is highly reminiscent of the riff from Inner City's 'Good Life' (1988). This indicates an attempt within 1990s video game music to emulate the distinctive harmonic practices of dance music, which could be explored in future research.

Dissonant static harmony has also been used in contemporary video game music as a genre synecdoche of 1980s synth-pop, electro, and industrial music, appropriate for games with 'cyberpunk' settings. The cue 'Scavenger Hunt' (2020) from the recent video game *Cyberpunk 2077* (2020) features a dissonant static harmony, that may also be heard as an anaphone for machine noise, and so as appropriate for the soundtrack of a game depicting a futuristic, technological environment. The cue 'Summer Heat Los Angeles' from the similarly cyberpunk-themed *Satellite Reign* (2015), contains an 8-♭10-♭7-♭9-8 melody (at 01:13) that is very similar to the 8-♭10-♭7-♭9-8 synth -string melody from Kraftwerk's 'More Fun To Compute' (1981). Further research could focus on the use of dissonant static harmony in video game music as both an anaphone of machine noise and as a genre synecdoche for dance music styles such as electro and techno.

As these examples of recent dance music and video game music suggest, the harmonic practices described in this research project are still relevant and meaningful to contemporary

audiences, even as these dissonant, disjunctive, and unsettling harmonic practices may, paradoxically, be heard to evoke now-dated twentieth century technologies and machines, such as factories, trains, cars and early computers. Machinic dance music of the 1970s, 1980s and 1990s may be heard to evoke technologies that are noisy, angular, brutal, and dangerous, and which, therefore, belong to an artistic tradition that has been superseded by a twenty-first century conception of ergonomic, silent, smooth, concealed and inconspicuous technologies. Yet it may be precisely because they are heard to evoke an anachronistic angularity and 'noisiness' that the harmonic practices discussed in this thesis remain meaningful to dance music artists and audiences. As was discussed in chapter two, these harmonic practices, as part of a wider machine aesthetic, may, for some audiences, be heard as 'authentic', as they can be understood to make audible the role that technology plays in the production of modern popular music, and by extension, the part that technology plays in producing the perpetual 'maelstrom' of the modern world (Berman, 1983, p. 15). Instead of suggesting a technology that is concealed, invisible, inaudible and perfectly 'in harmony' with humanity and society, these noisy, clunky, robotic harmonic practices allow audiences to continually re-experience the strangeness and the difference of machines, and the excitement, anxiety and hope for the future that new technologies continue to inspire.

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