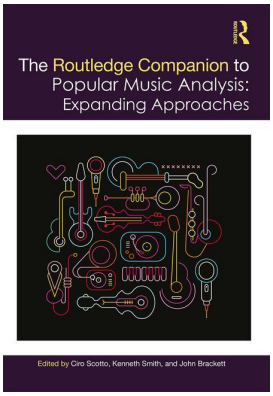

The Routledge Companion to Popular Music Analysis Expanding Approaches

Ciro Scotto, Kenneth Smith, John Brackett

System 7

Publication details
https://www.routledgehandbooks.com/doi/10.4324/9781315544700-17
Ciro Scotto
Published online on: 18 Oct 2018

17
SYSTEM 7

Ciro Scotto

> Probably, satisfactory analyses of the preserial works of Stravinsky will, when they finally appear, employ theories that graft nontonal referential collections and unique Stravinskian transformation rules into a wildly Schenkerian-derived kind of theory of pc set "prolongation" in various pitch-structural and rhythmic-structural "levels."[1]

John Rahn's conjecture about the structure of adequate theories for analysing Stravinsky's preserial works highlights the inadequacy of analyses employing either strictly tonal or post-tonal theories. Nevertheless, theoretical bias can easily tip the analytical balance in favour of tonal over post-tonal relationships and vice versa because Stravinsky's preserial music shares so many structural elements with both tonality and post-tonal systems, but, as Rahn suggests, the imbalance will probably produce unsatisfactory analyses.[2] Like Stravinsky's preserial music, heavy metal presents a similar problem for the analyst since its roots connect it to rock music and the roots of rock firmly connect to common-practice tonality. Local pitch events and syntactic relations in heavy metal, such as scales, chords, tonics, progressions, and apparent scale steps often recall or resemble tonal structures, yet behind the tonal façade the framework of the music often has more in common with post-tonal compositional techniques. This essay constructs a theoretical framework for analysing tonal and post-tonal relationships in heavy metal. The theory combines set-class, pc centric, and tonal syntactic relationships to create a hybrid analytical system. For example, the framework separates the concept of scale-step from the order position of a pc, ordered pc collections are treated as scales, and any ordered pc collection can function as a macro-harmony.[3] The concept of a macro-harmony expands the chord repertoire and intervallic scope of heavy metal to include non-triadic chords and post-tonal dissonance treatment.

Although music of the common-practice period and rock share many musical elements and syntactic relationships, they each uniquely define their tonal architecture. Of course, the attraction of common-practice theories for analysts resides in their explanatory power as evidenced by the complex, coherent, and cogent analyses they produce, but common practice theories also perpetuate a monolithic perception of tonality in rock. Moreover, a narrow analytical focus on common-practice tonal structures tends

to obscure other analytical points of view. A similar situation was prevalent in studies of jazz until Steven Block demonstrated that set-theoretic methodology applied to free jazz yielded analytical insights into the music's structure.[4] Recent rock scholarship has similarly begun to take a multifaceted approach to analysing tonal syntax in rock music. Since the work of these scholars laid the groundwork for analysing tonal and post-tonal relationships in heavy metal, a review of current scholarship provides a context for the development of the proposed analytical method.

Walt Everett, for example, constructs a theoretical model consisting of multiple tonal systems that dislodge the monolithic view of rock harmony and hence expand the theory of tonality in rock.[5] Everett's model contains six tonal systems that incrementally progress from the (Schenkerian) voice-leading and harmonic structures of major–minor tonality associated with the common-practice period in system 1 to the syntactically unsupported tonal centres and chromaticism of system 6b. Metal compositions form the bulk of the musical examples exhibiting system 6b syntactic relationships, such as functionless semitones among roots. Everett, in fact, invokes pc sets 3-3[0,1,4] and 4-2[0,1,2,4] to categorise root movements in some system 6b pieces, which he says strongly suggest an atonal quality, potentially expanding the analytical and theoretical focus beyond the boundary of tonality.[6] Everett does not develop the syntax of system 6b any further nor does he extend his model to systems supporting a tonic with non-tonal syntax,[7] but the structures that place system 6b at the end of the tonal continuum can form the kernel of a theory for analysing tonal and post-tonal relationships in heavy metal. Although Everett limits the model of tonal syntactic relationships in rock to six systems, I will develop system 6b's kernel into a theoretical framework that hybridises set-class, pc centric, and tonal relationships called "System 7."[8]

Nicole Biamonte also expands the framework governing rock harmony beyond the limits of major–minor tonality.[9] But, unlike Everett's model where higher numbered systems abandon common-practice harmonic function, Biamonte's model essentially extends common practice scale-degree and harmonic-function theory to modes and pentatonic scales, which traditionally do not support functional harmony. Scale-degree (sd) theory determines chord function based on the sd of chordal roots while harmonic function creates classes of chords based on similar actions, so various modal and pentatonic sds acquire tonic, pre-dominant, and dominant functions allowing modal and pentatonic chord patterns to fulfil traditional "phrase functions such as tonic prolongation, dominant preparation, or cadential arrival."[10] Context determines stability and tension among sds and chords, so rhythm, contour, phrase structure, hypermeter, texture, and other musical parameters establish or reinforce function and hierarchy in chordal patterns.

Everett's system 5 proposes a new harmonic relationship for rock where each degree of a minor pentatonic scale supports a major triad, but the chords are not functionally related. In Biamonte's modal/pentatonic model, which expands Everett's system 5, the major triads acquire the harmonic function associated with the pentatonic sd serving as the chord's root. Moreover, each degree of a pentatonic scale potentially functions as a tonic in the expanded system, so one pentatonic scale also produces four "modal" variations by rotating the scale (the same process that generates the church modes by rotating the C major scale), and each pentatonic rotation potentially generates new harmonic patterns. Guitarists know about rotating the minor pentatonic scale because once they master the basic box pattern, they learn four additional patterns each beginning on a different sd of the minor pentatonic; thus pattern 1 starts on $\hat{1}$, pattern 2 starts on $\hat{2}$, pattern $\hat{3}$ starts on $\flat\hat{3}$, and so on. The five basic pentatonic patterns are identical in pc content to Biamonte's

"modal" pentatonic system, but the tonic does not change and the sds associated with each pc remain fixed in each of the five box patterns while in Biamonte's "modal" pentatonic system the tonic changes in each rotation and so do the sds associated with the pcs.

Although the tonic does not shift to different sds in the five rotations of the minor pentatonic box system guitarists learn, at least one rock theory book, *The Guitar Grimoire* by Adam Kadmon, treats the rotations as independent modes. Essentially, *The Guitar Grimoire* serves as a scalar reference tool for musicians containing many five-, six-, seven-, and eight-note scales, such as the harmonic major, Hungarian minor and major, Neapolitan minor and major, enigmatic minor, enigmatic, composite II, Ionian ♭$\hat{5}$, diminished, whole tone, augmented, and bebop Locrian ♮$\hat{2}$.[11] The book contains formulae that transform the rotations of the minor pentatonic scale into a modal system where the first pc of each rotation of the scale becomes the tonic. Kadmon assigns the minor pentatonic scale the label mode I, and the rotations become modes II (major pentatonic), III, IV, and V. As well as charts illustrating the fretboard layout for each mode, the text also contains an algorithmic chart for transposing any of the five pentatonic modes to any pc (Figure 17.1). For example, to generate a mode II (major pentatonic) scale that begins on pc E♭ first locate E♭ in the mode I column, then locate the pc occupying the intersection of the E♭ row and the mode II column, which is C. Beginning the C minor pentatonic scale on pc E♭ produces a mode II (major pentatonic) scale. Not only does *The Guitar Grimoire* treat the rotations of the pentatonic scale as independent modes, but it also generalises the rotation process for producing modal systems to all the scale types in the book.

In addition to the transposition chart for generating the modes of any scale, the text also contains charts that list the chordal forms possible in each mode (Figure 17.2). The chord chart for mode IV of the minor pentatonic systems, for example, lists quartal or double fourth chords, which are members of set-class 3-8[0,2,7], as a possibility, while the chart

I	II	III	IV	V
C	A	G	F	D
C♯/D♭	B♭	A♭	F♯/G♭	E♭
D	B/C♭	A	G	E
E♭	C	B♭	Ab	F
E	C♯/D♭	B/C♭	A	F♯/G♭
F	D	C	B♭	G
F♯/G♭	E♭	C♯/D♭	B/C♭	A♭
G	E	D	C	A
A♭	F	E♭	C#/D♭	B♭
A	F♯/G♭	E	D	B/C♭
B♭	G	F	E♭	C
B/C♭	A♭	F♯/G♭	E	C♯/D♭

Figure 17.1 Adaptation of a mode generator chart for the minor pentatonic scale from *The Guitar Grimoire* by Adam Kadmon

SCALE / MODE – CHORD CHART		
I	MINOR PENTATONIC	-7
II	MAJOR PENTATONIC	sus2, M, 6
III	MODE 3	sus2, sus
IV	MODE 4	Q3
V	MODE 5	sus2, sus

Figure 17.2 Adaptation of chord/scale chart from *The Guitar Grimoire* by Adam Kadmon

for mode IV (Lydian dominant) of the melodic minor lists major seventh ♯5 chords (Δ^{+}), which are members of set-class 4-19[0,1,4,8], as a possibility. *The Guitar Grimoire* suggests how musicians have expanded or might expand the scalar and chordal palette of rock (or any other music) beyond common practice major and minor scales and sd harmonic functions. It also suggests that any ordered collection can essentially function as the scalar foundation for a composition. Moreover, the non-triadic chord formations outlined in *The Guitar Grimoire* also suggest that an ordered collection can function as macro-harmony, generating subset chords that do not have sd harmonic functional associations. Both concepts form the foundation of System 7.

David Temperley's scalar shift theory pushes past the boundaries of major, minor, and modal scales as models of pc and harmonic organisation in popular music to a supermodal framework whose outer edge flirts with the boundary, leading to a collection-based model of organisation. Temperley notes that the pc content of many rock and pop songs, as well as many other forms of popular music, extends beyond the confines of a single scale or mode. For example, many songs contain $\hat{3}$ in one section and $\flat\hat{3}$ in another. While a change from major to minor might explain the shift, Temperley, among many other theorists, considers the common practice major–minor distinction an inadequate explanation.[12] The supermode model consists of a line-of-fifths starting with $\flat\hat{6}$ and ending with $\hat{7}$ ($\flat\hat{6}$, $\flat\hat{3}$, $\flat\hat{7}$, $\hat{4}$, $\hat{1}$, $\hat{5}$, $\hat{2}$, $\hat{6}$, $\hat{3}$, $\hat{7}$) that contains the other modes (Ionian, Mixolydian, Dorian, Aeolian, major pentatonic, and minor pentatonic) as subsets. The supermode essentially functions as a macro-harmony or, as Temperley states, "a global constraint on scale-degree content in rock," from which smaller subset collections define sections of a song.[13] Thus, if a song contains $\hat{3}$ in one section and another section contains $\flat\hat{3}$, the change from one collection to the other represents a scalar shift along the line-of-fifths to the flat side of the line, and shifts can be either momentary or sectional. The line-of-fifths begins and ends with $\flat\hat{6}$ and $\hat{7}$ because extending the line to $\flat\hat{2}$ and ♯4, the next fifths on either side of the line, introduces chromaticism (i.e., those scale degrees (sds) do not occur diatonically in the subset modes of the supermode). When $\flat\hat{2}$ and $\sharp\hat{4}$ occur in a composition, they represent a move to a new tonal centre.[14]

Although, for many songs, the supermode and scalar shifts along the line-of-fifths explain the presence of $\hat{3}$ in one section and $\flat\hat{3}$ in another, a difficult issue arises when both sds lie in close proximity or occur simultaneously. Temperley acknowledges the ambiguity caused by the situation for a scalar shift model. Does the close proximity or simultaneous occurrence of two forms of the same diatonic sd represent a momentary scalar shift or a single scale collection?[15] Ultimately, he decides the single scale collection explanation seems unavoidable, so he labels any collection including both $\hat{3}$ and $\flat\hat{3}$ a mixed collection. The simultaneous occurrence of two forms of the same diatonic sd in a mixed collection can also lead to new harmonic possibilities, such as the famous $F\sharp^{7\sharp9}$ chord in "Foxey Lady" by Jimi Hendrix, which contains both $\hat{3}$ and $\flat\hat{3}$ (A♯ and A♮,

respectively).[16] Non-tertian added tone chords, such as F♯$^{7\sharp9}$, stretch the boundary a little further since the mixed collections they belong to essentially function as macro-harmonies allowing chord formation from any members of the collection, not just pcs related by thirds. Breaking the major, minor, and modal scale boundaries potentially opens new territory where any ordered pc collection can act as a global constraint on pc content in rock while crossing the non-tertian harmonic barrier into macro-harmonic territory may transform non-tertian chord forms like F♯$^{7\sharp9}$ into their pc-set counterparts, 4-Z29[0,1,4,6], the all interval tetrachord.

The sectional centricity (SC) model of rock tonality developed by Guy Capuzzo also breaks the major, minor, and modal scale boundaries, but, unlike Temperley's scalar shift model, it does not establish limits on the content of a collection.[17] SC potentially allows any ordered pc collection to function as a global constraint on content in rock. If a collection other than a major or minor scale generates the pc content of a section in a rock song and one or more of the collection's pcs functions as a contextually defined centre/s, then Capuzzo claims the song exhibits SC rather than functional tonality. Essentially, several repurposed principles of post-tonal centricity discussed by Joseph Straus form the foundation of the SC model.[18] For example, if analysing the total pc content governing a section of music reveals properties of the collection that contribute to establishing a pitch centre in a post-tonal composition, then the technique should also work for rock, especially when the section contains pc content other than a major or minor scale. Both post-tonal centricity and SC in rock share a contextually adaptive approach to establishing a pc centre with a variety of techniques that may change from section to section and piece to piece. Finally, although post-tonal centricity and SC in rock both incorporate attributes of common-practice tonality, both systems also assert the structural independence of centricity from common-practice tonality. Contextual techniques borrowed from post-tonal centricity to establish pc priority in rock include metric or rhythmic stress, register, dynamics, and frequency of occurrence. Capuzzo adds instrumentation, timbre, lyric content, and tonal allusions to the list of contextual techniques for establishing SC.[19]

Capuzzo's analyses of SC in rock primarily demonstrate how allusions to common-practice tonality along with other contextual factors establish tonal centres, but they also reveal as a by-product the tenuous bond between harmonic sd functions and members of a pc collection. Sds in Schenkerian analysis do not, of course, simply identify the ordinal position of a pc; they imply a pc's support or have the capability of supporting structural triads in a syntactic framework of hierarchical relationships determined by the properties of the major–minor scale system. The pc collections in the pieces analysed do not form major or minor scales, but they support triads, and so naturally their presence establishes a connection to common-practice tonality, facilitates associating rock progressions with common-practice harmonic functions, and links the pcs of a collection to major and minor sd functions. In other words, the pcs of the collections emulate sd functions and the harmonic functions they imply.

Specifically, the analyses focus on pentatonic segments of two or three notes, so the term pentatonic-SC more precisely describes the system underlying the analyses and the generality of SC, which, unlike common-practice tonality, does not depend on a specific pc collection. A pentatonic segment in the SC model may function as the roots of parallel major triads, as a line doubled or harmonised in parallel fifths (power chords), or as a single-note bass line.[20] Essentially, the pcs of a pentatonic segment acquire their sd

functions from segments of common-practice major and minor scales that have an identical intervallic structure, which transfers the syntactic function of the associated sds to the segment, thus alluding to its possible harmonic functions. For example, harmonising the pentatonic segment C–B♭–C with major triads implies the pentatonic segment supports the harmonic function I–♭VII–I, a typical rock cadence where ♭VII functions as a dominant substitute. The harmonisation also implies that a line doubled or harmonised in parallel fifths has the same harmonic function, and it implies the association of C–B♭–C with sds $\hat{1}$–$\hat{\flat 7}$–$\hat{1}$.[21] In other words, coupling pentatonic segment C–B♭–C to sds $\hat{1}$–$\hat{\flat 7}$–$\hat{1}$ begins by associating the segment with triads and the harmonic function I-♭VII–I. The association of the triads with the pentatonic segment essentially transfers the harmonic function of the triads to the line harmonised in parallel fifths (power chords) and to the single note line.

Transference, for example, equates triads and power chords in Biamonte's model of triadic modal and pentatonic harmonic patterns. As stated earlier, the model essentially extends common practice sd and harmonic-function theory to modes and pentatonic scales. Sd theory determines chord function based on the sd of chordal roots while harmonic function creates classes of chords based on similar actions, so various modal and pentatonic sds emulate tonic, pre-dominant, and dominant functions. The model also extends the concept of non-chord tone beyond triadic limits to include added notes, such as seconds, fourths, sixths, and sevenths as well as extensions, such as ninths, elevenths, and thirteenths noting that rock, blues, and jazz stylistic conventions do not require added notes and extensions to resolve, and so common-practice conventions of voice-leading and dissonance treatment are not applicable.[22] The model also extends the concept of triad to the other end of the spectrum to include power chords, which lack thirds. Biamonte states that the highly distorted guitar timbres prominently featured in heavy metal require open fifth power chords rather than complete triads because distortion renders chordal thirds dissonant due to intermodulation, which produces sum and difference tones not related by simple ratios to the pitches in the power chord.[23] Essentially, an amplifier or stompbox generates distortion by increasing the amplitude of the upper harmonics and adding partials, which transforms the guitar signal into a square wave or pink noise if the signal contains enough intermodulation distortion.[24] Although the chordal third does not appear as a stopped note in power chords, Biamonte notes it can often be heard as the fifth harmonic, so power chords can imply triads that essentially transfer their harmonic function to the power chords by association.

In System 7 however, a power chord does not automatically equate functionally with a triad just because distortion adds a third as a harmonic to the sound.[25] Distortion amplifies all upper harmonics and partials in the composite sound of a power chord almost equally, so it does not necessarily or reliably set the third into relief producing an audible triad.[26] Moreover, power chords often do not lack thirds only to avoid the dissonance produced by intermodulation since many hard rock songs contain complete triads or thirds played with distortion. "You Shook Me All Night Long" by AC/DC, for example, includes complete D major triads with distortion in the verse, and third double stops (essentially a power chord of a third without a fifth) and double stop seconds with distortion occur quite frequently in heavy metal. The motive at the beginning of "Orion" from *Master of Puppets* by Metallica, for instance, contains only double stop thirds and seconds played under heavy distortion (Figure 17.3). Third power chords add a fifth as a harmonic above the lower note of the interval, but they also do not necessarily or reliably produce an audible triad.[27]

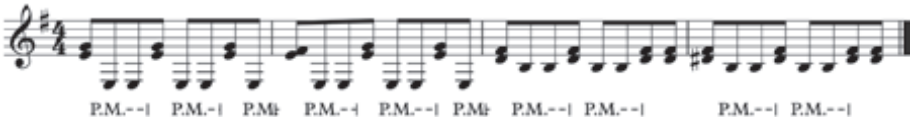

Figure 17.3 Opening riff of "Orion" from *Master of Puppets* by Metallica

The interval of fifth in a power chord might suggest an association with triads and triadic function even if the third was not present as a harmonic. However, if a song contains few or no triads, and the power chords do not replicate common-practice chordal progressions, the power chords do not automatically suggest or imply triadic equivalency. Also, the complexity of a power chord's waveform with heavy distortion creates a unique sound distinct from the sound of triads that does not necessarily suggest common-practice chord function based on the sd of chordal roots. Often, a fourth below harmonises the lower note of the fifth, which also undermines triadic associations by reducing the prominence of the fifth and increasing the chord's dissonant effect. The bridge section following the verse (2'35") in "Blackened" by Metallica, for example, contains an E♭^{5} power chord harmonised by a lower B♭, so the chord actually sounds like two stacked fourths, B♭–E♭/B♭–E♭, which increases the chord's dissonant effect and decreases the prominence of the fifth. Furthermore, the uniqueness of the power chord sound suggests they can possibly function independently of their association with triads both timbrally and motivically. Since context often determines the role power chords play, they perform a trans-harmonic function. In the presence of other triads or strung together in patterns that replicate common-practice progressions, they can function as triadic substitutes. However, in other contexts such as heavy metal, they also have the potential to function independently of their association with triads both timbrally and motivically.[28]

Transference may not automatically equate functionally with a triad, and it also may not endow a segment of a pc collection with syntactic sd functions especially if a song contains few or no triads. Besides, the pcs in a collection can emulate tonal syntactic functions in the absence of triads and sd associations. The first member of an ordered collection in System 7, for example, does not necessarily function more effectively as a pc by labelling it sd $\hat{1}$ since members of any collection can establish pitch centres, allude to tonal functions, or create hierarchical relationships without being tethered to functional sds and their harmonic implications. For example, in "A Hybrid Compositional System: Pc Composition with Tonal Syntax,"[29] I create syntactic relationships for non-triadic pc sets that emulate tonal functions.[30] I label the trichords that emulate tonic and dominant functions primary and secondary to avoid creating expectations of common-practice voice leading and treatment of dissonance. While associating members of a collection with tonal sd functions does provide significant analytical insight into the systems underlying the organisation of pc content in rock music, assuming sd status for pc collections and triadic status for power chords also potentially hinders exploring other analytical approaches to pc structure.

An analysis of the main theme or riff from "Iron Man" by Black Sabbath suggests how the association between harmonic sd functions and members of a pc collection potentially hinders exploring other analytical approaches to pc organisation (Figure 17.4). The theme consists of a series of power chords whose lower voice becomes the vocal melody. A nearly symmetrical approach to pc E establishes it as the pitch centre. The D moves to E in the first bar from a whole tone below while in the second bar the G5–F♯5 power chord slide figure

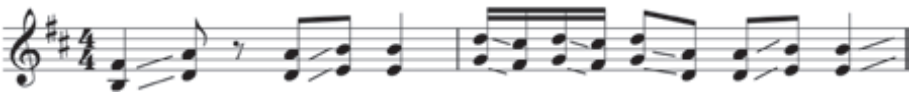

Figure 17.4 Main riff or motive from "Iron Man" from *Paranoid* by Black Sabbath

would essentially approach E from a whole tone plus a semitone above before an extension of the slide to the lower D interrupts the approach to E by overshooting the goal. The D then returns to E by replicating the D-E motive on beat 3 of bar 1. The E^5 power chord occupies the same metric position in each bar, and the D^5 power chord and an anticipatory E^5 power chord on the previous beat create a motivic figure in the first bar that repeats in the second bar preceding the return to E. Similarly, the falling perfect fourth from G to D in the second measure balances the rising perfect fourth from B to E in the first measure. In spite of the symmetry, the fourth from G to D crossing into the registral space of the fourth from B to E creates a new imbalance requiring the D to move back to E.[31] The rising and falling fourths also outline different trichordal set class, 3-7[0, 2, 5] and 3-5[0, 1, 5] respectively. Their different intervallic content creates another imbalance that distinguishes the rising and falling fourths.

Furthermore, when the voice enters doubling the lower notes of the power chord theme at the octave, the guitar abandons power chords and just plays the lower notes of the theme as well. The power chord version of the theme only appears before vocal entries, which transforms the power chords into a motivic element that defines a section of the music distinct from the verse even though the verse contains the same melody. Reducing the theme to a single line serves as more than an accommodation that makes room for the voice in the mix. The guitar, for example, introduces new thematic material, which it also plays as a single line, at the end of the second verse and before the power chord theme returns prior to the start of the third verse. The power chords most often appear with the return of the Iron Man motive in the sections preceding verses, which reinforces their motivic function.

The first bar contains a familiar 3-7[0, 2, 5] pentatonic segment, B–D–E. Of course, associating the pentatonic segment with sds $\hat{5}$-$\flat\hat{7}$-$\hat{1}$ implies the power chords have the harmonic function V-$\flat$VII-I, a dominant axe-fall progression.[32] The second bar, however, contains a segment of an E minor scale, G–F$\sharp$–D–E, and associating the segment with sds $\hat{3}$-$\hat{2}$-$\hat{7}$-$\hat{1}$ implies the power chords have the harmonic function III-ii-$\flat$VII-i. But the song contains no triadic structures to reinforce the harmonic implications of the sd associations nor do the distorted power chords sound like triads. The analysis of the theme did not require harmonic associations to establish E as the pitch centre and determine the functional role of the other power chords. Furthermore, the pentatonic and E minor segments taken together along with their doublings at the fifth form a Dorian collection, but the theme does not exhibit many characteristics of the Dorian mode. In fact, maintaining the perfect fifths of the power chords provides a more convincing explanation for the C$\sharp$ than establishing a Dorian collection. Associating the power chords of the theme with sds and their implied harmonic functions adds little to the analysis of the centricity of pc E and the structure of the riff, which interval structures, motives, and rhythm establish. Chord pattern analysis, for example, provides little insight into the parallel motivic pattern connecting bars one and two that helps establish E as a pitch centre. The analysis of the "Iron Man" motive suggests that power chords not only function independently of their association with triads but also function motivically.

Motivic analysis provides more insight into the structure of the "Iron Man" theme than an analysis of triadic structures, sds, or chord patterns because the primary technique for composing heavy metal compositions consists of creating and developing riffs (i.e., motives). The structural analysis of the motive, however, incorporated techniques commonly associated with post-tonal pc set relationships and pc centricity. Since analytical techniques designed exclusively for triadic tonal music could not adequately account for all structural features of a riff, System 7 grafts aspects of set-class theory, pc centricity, transformation theory, and generalised tonal syntactic relationships into a hybrid system for analysing the structure of riff-generated heavy metal compositions. Moreover, the system divorces the order position of a pc from the concept of sd and triadic function. Essentially, scales become ordered pc collections that function as a macro-harmony, and any subset of a collection can become a chord or a motive, which expands both the chord repertoire and intervallic scope of heavy metal to include non-triadic chords and post-tonal dissonance treatment. Even though the system incorporates post-tonal techniques and structures, a composition's architecture often emanates from a central pc, so the techniques for establishing a pc centre become the bedrock of the system that informs the analytical process.

Salient compositional attributes such as metric placement, accents, placement in register, and intervallic symmetry, contextually establish the centricity of pc E in the "Iron Man" theme, the centricity of the pieces in Capuzzo's study, and pitch centres in Straus's study of post-tonal centricity. Heavy metal compositions employ another method of establishing a central pc or tonic in addition to salience. Chugging, a ubiquitous component of heavy metal compositions, produces a rhythmically activated pedal or drone by repeatedly sounding the lowest string on the guitar (most often tuned to E but can be tuned as low as B) with a continuous quaver or triplet rhythmic pattern that establishes the pitch of the open string as the centre or tonic of the work.[33] The rhythmically activated pedal or drone can occur throughout or in any part of a composition, but it most often appears in a composition's introduction as a way of establishing the tonic.

Chugging resembles Daniel Harrison's concept of dronality, which he defines as the process of establishing a secure and perceptual tonic for a composition with instruments capable of producing a drone, especially with the interval of a perfect fifth, and instruments capable of imitating drone effects.[34] Dronality differs from contextually establishing a tonic with salience features because it produces "a tonal hierarchy palpably congruent with the overtone-series hierarchy" whose elements feel and sound traditionally like tonics.[35] Moreover, dronality, a form of overtonality, reinforces or relates to traditional tonality through its emphasis of pcs related to each other by the interval of a perfect fifth. According to Harrison, the lengthy tonic pedal points of organ music in the seventeenth and early eighteenth centuries, indicate the significant place held by dronality in Western art music, and dronality reinforces the root of the guitar power chord, an overtonal timbre/pitch effect, in rock music. Drone techniques can also support a framework for constructing more complex tonal hierarchies as Harrison demonstrates in his analysis of the song "Sister Surround" by The Soundtrack of Our Lives. The bass line in the song establishes a rhythmically activated drone consisting of the repeated pitch D while the rhythm guitar repeatedly sounds the pitches D and A to establish the basic overtone relationship followed by the entrance of the lead guitar with a series of non-overtone power chords.[36] Because the drone elements of the song establish its sense of tonality, the other material is "freer to fly acrobatically," which allows the lead guitar to enter with a series non-overtonal power chords.[37]

While drone elements can certainly support a framework for constructing tonal hierarchies that resonate with common practice procedures, they can also simultaneously subvert tonal relationships and support methods of pitch organisation usually associated with post-tonal music. In other words, the freedom a firmly established drone tonic affords pc material to "fly acrobatically" can also introduce alternative methods of organising pc relationships that subvert the framework for constructing tonal hierarchies. The main riff from "Blackened" by Metallica, for example, establishes pc E as the tonic through a chugging pattern droning on pc E, the same droning technique that established D as the pitch centre in "Sister Surround" (see Figure 17.5). The pitch material that flies around the drone E, however, undermines constructing a framework that supports additional layers of tonal hierarchy. For example, the B♭ subverts congruence with the overtone-series hierarchy by replacing the perfect fifth above the E drone with a tritone. Moreover, B♭ does not perform the embellishing function usually associated with sd ♭$\hat{5}$ (a "blue note"), which would pass between the dominant B, sd $\hat{5}$, and subdominant A, sd $\hat{4}$, nor does the B♭–E tritone resolve or move to a consonant interval. The B♭ essentially performs a post-tonal structural function in the riff as a symmetrical counterbalance to the tonic E. Nevertheless, the subversion of a fifth-based tonal hierarchy centred on E by the B♭ and resultant tritone fits the aesthetic of heavy metal as outsider music that chafes against convention. In other words, while the chugging E establishes a tonal centre, the other pc material forms conventionally unstable intervals, the tritone and minor second, which undermine and resist or counterbalance the stability of a conventional tonic.[38]

The role B♭ plays in the "Blackened" riff undermines the establishment of a fifth-based tonal hierarchy and tonal sd functions, but it also suggests alternative methods of organising the pc material. The pc collection underlying the riff produces an extended version of Temperley's supermode that pushes it further to the flat side by including ♯$\hat{4}$/♭$\hat{5}$ and ♭$\hat{2}$, the sds marking the tonal boundaries, and excluding sds $\hat{6}$, $\hat{3}$, and $\hat{7}$ (Figure 17.6).[39] The extended supermode includes both the E Aeolian and E Locrian modes as subset, and the modes differ by the fifth B♭-F for the Locrian replacing the fifth B–F♯ of the Aeolian. Since the overall pc collection of the riff contains both of the fifths that define the modes, it represents a mixed collection. The sds in Figure 17.6 do not indicate pc function; they simply demonstrate the congruence of the pc collection with the extended supermode and highlight the differences between the modal subsets. Treating either the Locrian or Aeolian subsets at ordered pc collections simply

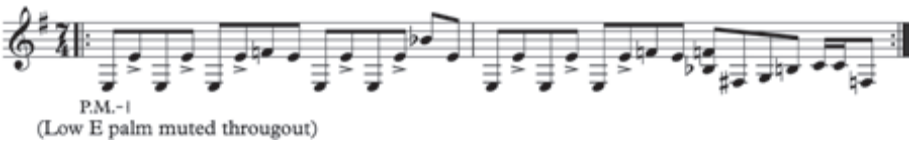

Figure 17.5 Main riff of "Blackened" from *And Justice for All* by Metallica

♯$\hat{4}$/♭$\hat{5}$	♭$\hat{2}$	♭$\hat{6}$	♭$\hat{3}$	♭$\hat{7}$	$\hat{4}$	$\hat{1}$	$\hat{5}$	$\hat{2}$	$\hat{6}$	$\hat{3}$	$\hat{7}$
B♭	F	C	G	D	A	E	B	F♯	(C♯)	(G♯)	(D♯)
		C	G	D	A	E	B	F♯			
B♭	F	C	G	D	A	E					

Figure 17.6 Extended supermode that includes E Aeolian and E Locrian

reinforces the function of the pc in order position 0 as the pitch-centre or tonic. The ordered E Locrian and Aeolian pc collections as well as the mixed collection function as macro-harmonies, so any subset of the collection can become a chord or a motive, which expands both the chord repertoire and intervallic scope of the riff to include non-triadic chords and post-tonal dissonance treatment.

The first bar and the first four beats of the second bar emphasise the E–F–B♭ subset of the E Locrian collection, and the pcs F and B♭ produce ics 1 and 6, respectively with the E drone. Since the interval class 6 produced by the B♭ does not resolve and both intervals contain pc E as a member, the subset fuses into a member of set-class 3-5[0,1,6] that defines the sound of the passage. The ordered pc string F♯–G–B–C that occurs at the end of the riff simultaneously shifts the collection to the E Aeolian side of the extended supermode and reinforces the presence of set class 3-5[0,1,6]. The boundary interval of the F♯–G–B–C pc string, of course, outlines an interval class 6, but coupling either pc G or C to the interval class 6 produces two inversionally related members of set class 3-5[0,1,6], and the entire string is a member of set class 4-8[0,1,5,6], which of course contains two inversionally related members of set class 3-5[0,1,6].

Set classes 3-5[0,1,6] and 4-8[0,1,5,6] and inversionally related members of set class 3-5[0,1,6] become the focus of the bridge section (Figure 17.7). Against the backdrop of the drone E, the guitar interjects motivic statements that contain either the Locrian defining pcs B♭ or B♭ and F. The motivic statement in the first bar of Figure 17.7 contains the pc set E–A–B♭, which forms a member of set class 3-5[0,1,6]. Moreover, the operation T_2I relates the E–A–B♭ member of set class 3-5[0,1,6] to the member of the set class appearing in the opening riff, pc set E–F–B♭. The motive introduced in the second measure of Figure 17.7 reinforces the inversional relationship since the pc set of the motive, A–B♭–F–E, is a member of set class 4-8[0,1,5,6], which contains both pc sets E–A–B♭ and E–F–B♭ as inversionally related subsets. The second phrase essentially repeats the motives of the first phrase with only a bare ic 6 replacing set class 3-5[0,1,6]. Each phrase cadences on the stacked fourth power chord B♭–E♭/B♭–E♭, which substitutes an E♭ for the E of the riff motive's set class 3-5[0,1,6].[40] The substitution helps differentiate the functions of the two chords containing pc B♭ by interval, pc content, and timbre while still maintaining an interval class 6 relationship with the pitch centre E. Essentially, the stacked fourth power chord B♭–E♭/B♭–E♭ fulfills the syntactic function of a secondary chord, i.e., the chord that leads back to the primary chord and pitch centre E.

Besides the Locrian and Phrygian collections, heavy metal compositions frequently use the Phrygian dominant scale. As stated earlier, *The Guitar Grimoire* serves as a scalar reference

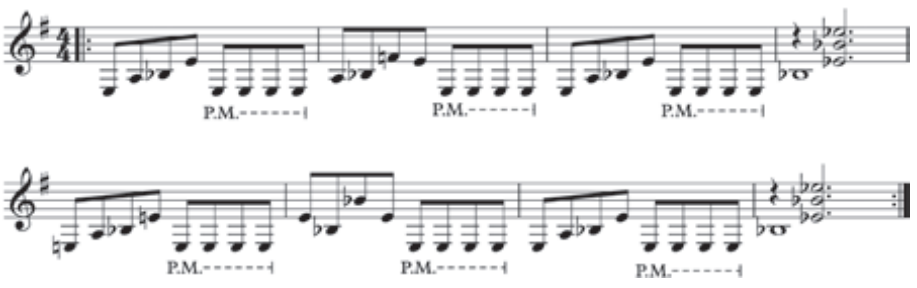

Figure 17.7 Bridge section from "Blackened" by Metallica

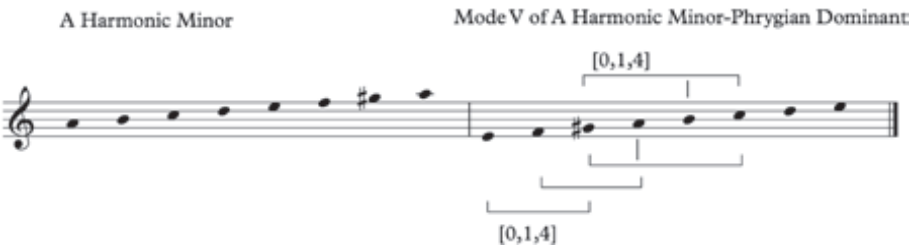

Figure 17.8 The Phrygian Dominant collection

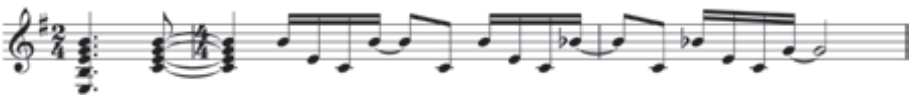

Figure 17.9 Introductory motive from "Where the Wild Things Are" by Metallica

tool that contains formulas that transform the rotations of any scale into a modal system where the first pc of each rotation of the scale becomes the tonic. The fifth mode of the harmonic minor scale becomes the Phrygian Dominant by rotating a harmonic minor scale to begin on its fifth pc. For example, rotating a harmonic minor scale with tonic pc A so that it begins on pc E produces the Phrygian Dominant scale (Figure 17.8). Viewed as an ordered pc collection, the Phrygian Dominant possesses an interesting macro-harmonic property. Every pc in the collection, except for D, belongs to a member of set 3-3[0,1,4], and the Phrygian Dominant collection embeds the members of set class 3-3[0,1,4] as ordered segments (Figure 17.8). Metallica exploits the set-class 3-3[0,1,4] macro-harmonic potential of the Phrygian Dominant in their song "Where the Wild Things Are" from the album *Reload*.

The song begins with a conventional third related triadic rock progression sounding a pair of triads (Em followed by C^7), essentially a Neo-Riemannian L relationship (leading-tone exchange operation) that preserves three common tones in the case of a seventh chord.[41] An arpeggiation of the CM^7 follows its introduction leading to arpeggiations of C^7 followed by C (Figure 17.9).[42] Although the song begins by establishing a conventional tonal framework, under the triadic façade the arpeggiations shift the music to the post-tonal side of the equation and foreshadow developments related to the Phrygian dominant. The upper notes of the arpeggiations create the pitch progression B–B♭–G through rhythmic accentuation, which introduces a member of the set class that defines the Phrygian dominant, 3-3[0,1,4]. Roman numeral analysis and sd functions do little to explain the structure and function of the motive. For example, the dominant seventh, C^7, does not resolve, nor do the chords become part of a larger progression. In fact, the chords only appear in the introduction and breaks between chorus and verse where the guitars do not use heavy distortion. Moreover, assigning B♭ the label sd $\flat\hat{5}$ does little to explain its function since it does not proceed to A to complete the chromatic passing function of sd $\flat\hat{5}$. The voice enters on the third repetition of the arpeggiations singing the B–B♭–G sequence setting into relief and establishing the autonomy of the set class 3-3[0,1,4] as a structural component of the song (Figure 17.10).

Following the introductory triadic material, the guitars enter with a drone or chugging pattern that reinforces E as the pitch centre of the composition (Figure 17.11). The guitar plays the tritone F–B leading to an E^5 power chord, and the pc collection underlying the

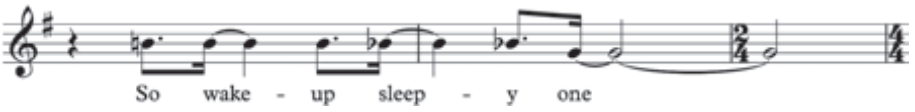

Figure 17.10 Introduction of set class 3-3[0,1,4] in the vocal part

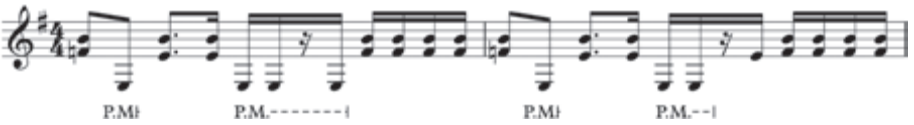

Figure 17.11 Set class 3-5[0,1,6] in the bridge to the first verse

#4̂/♭5̂	♭2̂	♭6̂	♭3̂	♭7̂	4̂	1̂	5̂	2̂	6̂	3̂	7̂
B♭	F	C	G	D	A	E	B	(F♯)	(C♯)	(G♯)	(D♯)
	F	C	G	D	A	E	B				
B♭	F	C	G	D	A	E					

Figure 17.12 Extended supermode that includes E Phrygian and E Locrian

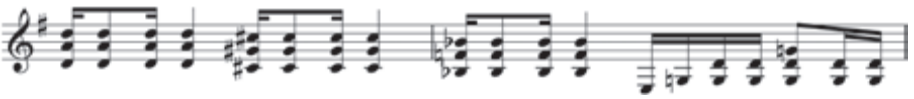

Figure 17.13 Set class 3-3[0,1,4] from A Phrygian Dominant in the pre-chorus

passage produces a member of set class 3-5[0,1,6], the same pc collection found in the main riff of "Blackened." While the extended supermode comprising the E Aeolian and E Locrian collections accounts for the pc collection underlying the main riff of "Blackened," the extended supermode comprising the E Phrygian and E Locrian collections accounts for the pc collection underlying the main triadic introduction and set class 3-5[0,1,6] chugging pattern of "Where the Wild Things Are" (Figure 17.12). The Phrygian Dominant comes to the foreground in the pre-chorus when the guitars introduce the series of power chords D^5–$C♯^5$–$B♭^5$ whose pcs outline a member of set-class 3-3[0,1,4] derived from a Phrygian Dominant collection built on A (A–B♭–C♯–D–E–F–G–A), the fifth mode of the D harmonic minor collection (Figure 17.13).

Although the choice of A Phrygian Dominant appears to contradict the E pitch centre of the song, structurally it meshes with the other collections. Its second tetrachord (E–F–G–A) is identical to the first tetrachord of the E Phrygian, which helps reinforces the pitch centricity of E as Figure 17.13 illustrates when members of the E–F–G–A tetrachord follow the set class 3-3[0,1,4] "Wild Things" motive.[43] The guitar solo begins by presenting in order the entire Phrygian Dominant collection on pc E (Figure 17.14). The first three measures of the solo present two inversionally related members of set-class 3-3[0,1,4] (E–F–G♯ and F–G♯–A) that form the larger set-class 4-7[0,1,4,5] while the fourth bar ascends to a pitch bend on D that reaffirms the pitch centre E as its goal. The solo continues to develop both the Dominant Phrygian collections on E and A.[44] The work closes with the voice singing the original "Wild Things" motive over guitar feedback.

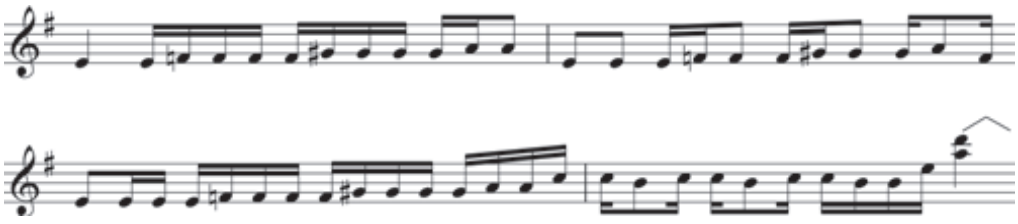

Figure 17.14 E Phrygian Dominant at the opening of the guitar solo

The intermixing of triadic structures with the post-tonal structures developed in the Phrygian Dominant scale fits the aesthetic of heavy metal in general and the subject of the song in particular. The song's title, of course, recalls Maurice Sendak's book *Where the Wild Things Are*; the story of a young boy Max angry at his mother for chastising him. Max travels to the land of the wild things where they crown him king, and he freely indulges in behaviour that prompted admonishment from his mother. The narrator wakes the song's protagonist, a young child, and informs the child that it is time to save the world. The narrator tells the child "you are where the wild things are, a toy soldier off to war." During a recitative section of the song that follows the solo, the narrator describes a fantasy battle where hand puppets storm the beach, fire trucks are out of reach, all clowns reinforce the rear, and stuffed bears hold the hill till death. Essentially, the song is about innocence lost and the tragedy of war. The simple triadic introduction of the song, of course, represents the innocence of childhood while the Phrygian Dominant with its embedded 3-3[0,1,4] set classes represents the fantasy battle.

This essay demonstrates that adequate theories for analysing heavy metal will graft non-tonal referential collections and elements of tonal syntax into a hybrid theory such as System 7, which combines set-class, pc centric, and tonal syntactic relationships. The theoretical framework separated the concept of scale-step from the order position of a pc, and ordered pc collections are treated as scales, and any ordered pc collection can function as a macro-harmony, a concept that expands the chord repertoire and intervallic scope of heavy metal to include non-triadic chords and post-tonal dissonance treatment. Subsequent studies will build on System 7's foundation by exploring how other bands continue push the syntactic boundaries of heavy metal. For example, compositions by Gorguts (a Canadian metal band led by Luc Lemay) contain extensive dissonance usage and post-tonal procedures. The main harmonic structure of the song "Inverted," for instance, is an altered form of the stacked fourth power chord from "Blackened." Lowering the bottom note of the power chord a semitone (B♭–E♭–B♭ becomes A–E♭–B♭) produces a power chord consisting of an interval classes 1, 5 and 6, which is of course, a member of set-class 3-5[0,1,6]. Besides highlighting post-tonal procedures, System 7 provides some insight into the highly creative and innovative compositional world of heavy metal.

Notes

1 John Rahn, *Basic Atonal Theory* (New York: Longman, Inc., 1980), 78.
2 The *locus classicus* of a strict tonal bias in the analysis of Stravinsky's music is Roy Travis's employment of Schenkerian theory to analyse the opening of *The Rite of Spring*. Travis, "Towards a New Concept of Tonality?" *Journal of Music Theory*, Vol. 3, No. 2 (November 1959): 257–84.
3 Dmitri Tymoczko introduced the term "macro-harmony" in his study of harmony and counterpoint and defined it as a large harmony that subsumes the individual chords, which is exactly how it will be defined in this essay. I suggested the term to Tymoczko, which he acknowledges in a footnote, because his conception of a scale as a large collection that generates sub-collections or subsets is how I use pc-sets in my Hybrid Theory compositional system. The difference

between our uses of the term resides in the subsets extracted from the macro-harmony, which for Tymoczko are tonal chords and for me are any pc-set that is a subset of the larger collection. Tymoczko, *A Geometry of Music*: *Harmony and Counterpoint in the Extended – Practice*. (Oxford and New York: Oxford University Press, 2011), 6. Ciro Scotto, "A Hybrid Compositional System: Pitch-Class Composition with Tonal Syntax." *Perspectives of New Music*, Vol. 38, No. 1 (Winter, 2000): 169–222.

4 Steven Block, "Pitch-Class Transformation in Free Jazz." *Music Theory Spectrum*, Vol. 12 No. 2 (Fall, 1990): 181–202.

5 Walter Everett, "Making Sense of Rock's Tonal Systems." *Music Theory Online*, Vol. 10.4 (December, 2004): [37].

6 Walter Everett, "Making Sense of Rock's Tonal Systems," [25].

7 Everett says of systems 6 and 6b "if tonic is supported at, it may be so primarily by assertion rather than by syntax." I read syntax to be common-practice tonal syntax in this passage. Everett, "Making Sense of Rock's Tonal Systems," [23].

8 Of course, Everett's goal was not to develop such a system, but to demonstrate that a single tonal system is inadequate for analysing the rock repertoire. My theory simply takes the next step in the progression.

9 Nicole Biamonte, "Triadic Modal and Pentatonic Patterns in Rock Music." *Music Theory Spectrum*, Vol. 32, No. 2 (Fall 2010): 95.

10 Nicole Biamonte, "Triadic Modal and Pentatonic Patterns in Rock Music," 108.

11 "For the advanced players who already understand music theory, this book will have scales for you to readily explore new realms of music…This book is a 'where to' book, showing you exactly where to find any scale in any key on your fretboard. It is a professional reference tool to enhance your music library and playing the you will use for many years to come." Adam Kadmon, *The Guitar Grimoire*. (New York: Carl Fischer, 1991): copyright page. *The Guitar Grimoire*, as a theory text, reflects both theory following practice and theory influencing practice.

12 David Temperley, "Scalar Shift in Popular Music" *Music Theory Online*, Vol. 17.4 (December 2011): [1.2].

13 David Temperley, "Scalar Shift in Popular Music," [3.1].

14 From the perspective of the ♯IV(♭V) hypothesis, the supermode excludes ♯$\hat{4}$ because it cannot be directly related to the tonic, which places ♯IV(♭V) at the outer limits of common practice functional tonality at the atonal border. Matthew Brown, Douglas Dempster, and Dave Headlam, "The ♯IV(♭V) Hypothesis: Testing the Limits of Schenker's Theory of Tonality." *Music Theory Spectrum*, Vol. 19 No. 2 (Fall, 1997): 159–160.

15 David Temperley, "Scalar Shift in Popular Music," [5.1].

16 Technically, the ♯9 in an F♯$^{7\sharp9}$ would be a GX, which would be an altered $\hat{2}$ not ♭$\hat{3}$, but enharmonically, of course, there is no difference between ♯$\hat{9}$ and ♭$\hat{3}$.

17 Guy Capuzzo, "Sectional Tonality and sectional Centricity in Rock Music." *Music Theory Spectrum*, Vol. 31 No. 1 (Spring 2009): 157–174.

18 Joseph Straus, "Centricity, Referential Collections, and Triadic Post-Tonality," in *Introduction to Post-Tonal Theory*, 3rd ed. (Upper Saddle River, NJ: Pearson Prentice Hall, 2005), 130–181.

19 Guy Capuzzo, "Sectional Tonality and sectional Centricity in Rock Music," 160.

20 Guy Capuzzo, "Sectional Tonality and sectional Centricity in Rock Music," 160.

21 Guy Capuzzo, "Sectional Tonality and sectional Centricity in Rock Music," 160 and Nicole Biamonte, "Triadic Modal and Pentatonic Patterns in Rock Music," 96.

22 Nicole Biamonte, "Triadic Modal and Pentatonic Patterns in Rock Music," 95.

23 Nicole Biamonte, "Triadic Modal and Pentatonic Patterns in Rock Music," 97.

24 For a more complete explanation of guitar distortion and its productions see Ciro Scotto, "The Structural Role of Distortion in Hard Rock and Heavy Metal." *Music Theory Spectrum*, Vol. 38 No. 2 (Fall 2016): 178–199.

25 The interval of fifth in a power chord might suggest an association with triads and triadic function even if the third was not present as a harmonic. However, a fourth below often

harmonises the lower note of the fifth, which undermines the triadic association by reducing the prominence of the fifth in the chord and increasing the dissonant effect of the chord. For example, in the bridge section following the verse (2'35") in "Blackened" by Metallica, a lower B♭ harmonises the E♭^{5} power chord, which gives the chord the impression of being two stacked fourths, B♭-E♭/B♭-E♭, increasing its dissonant effect.

26 "As I Am" by Dream Theater begins with the keyboard sustaining a C^5 power chord that produces an audible third as both the volume and distortion increase while the chord is sustained. Nevertheless, as the level of distortion increases and the signal fully saturates, the perception of individual harmonic becomes more difficult. See Ciro Scotto, "The Structural Role of Distortion in Hard Rock and Heavy Metal," 178–199.

27 In fact, the third generated as a harmonic often sounds disconnected from the fundamental. That is, the notes do not fuse into a single triadic sound.

28 See Ciro Scotto, "The Structural Role of Distortion in Hard Rock and Heavy Metal," 178–199 for a discussion of both the motivic and timbral function of power chords in heavy metal.

29 Ciro Scotto, "A Hybrid Compositional System," 169–222.

30 For another approach to creating tonal functions with non-triadic pitch-class sets see David Lewin, "A Formal Theory of Generalized Tonal Functions." *Journal of Music Theory*, Vol. 26 No. 1 (Spring 1982): 23–60.

31 Since the riff is played entirely on the A and D strings of the guitar sliding from one power chord to the next, the falling upper fourth G to D does feel as if it balances the lower fourth B to E, but also moves past the intended goal and needs to balance overshooting the goal by returning to E.

32 For a discussion of dominant axe-fall progressions see Nicole Biamonte, "Triadic Modal and Pentatonic Patterns in Rock Music," 106.

33 In fact, drone metal or drone doom bands deactivate the rhythm of the pedal to produce a conventional drone. Jonathan Bernard's essay in this collection contains a discussion of the doom metal band Sunn O))).

34 Daniel Harrison, *Pieces of Tradition, An Analysis of Contemporary Tonal Music.* (New York: Oxford University Press, 2016), 18–20.

35 Daniel Harrison, *Pieces of Tradition, An Analysis of Contemporary Tonal Music*, 17.

36 Daniel Harrison, *Pieces of Tradition, An Analysis of Contemporary Tonal Music*, 19.

37 Daniel Harrison, *Pieces of Tradition, An Analysis of Contemporary Tonal Music*, 19.

38 Counterbalancing a stable tonic with an unstable B♭ also fits the lyrical content of the song, which describes the destruction of all life on the Earth.

39 Although pitch-class A is not in the pitch-class collection underlying the riff, its appearance in the bridge connects the riff and bridge, which reinforces the pitch-class collection underlying the riff.

40 The extended supermode accounts for the E♭ if another fifth is added before the B♭. With the addition of the E♭, the first seven fifths of the extended supermode produce a transposition of the Locrian beginning on A: A–B♭–C–D–E♭–F–G–A.

41 For a study exploring Neo-Riemannian transformation in rock music, see Guy Capuzzo "Neo-Riemannian Theory and the Analysis of Pop-Rock Music." *Music Theory Spectrum*, Vol. 26 No. 2 (Fall 2004): 177–200.

42 The guitars are actually tuned a semitone lower to E♭.

43 Connecting collections with common tetrachords is reminiscent of Stravinsky's use of the octatonic and Dorian collections.

44 A complete transformational analysis of the solo demonstrating the interaction of the Phrygian Dominant collections on E and A is beyond scope of the current paper, but I will present a complete analysis of its structure in later work.