Neo-Riemannian Theory and the Analysis of Pop-Rock Music

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# *Neo-Riemannian Theory and the Analysis of Pop-Rock Music*

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This article outlines the use of neo-Riemannian operations (NROs) for the analysis of certain pop-rock chord progressions whose features invite a transformational approach. After presenting the NROs used in the paper, I delineate the general features of the progressions under discussion, distinguish the progressions from the late-Romantic progressions analyzed with NROs by Richard Cohn, Brian Hyer, Henry Klumpenhouwer, and David Lewin, and contrast *pc parsimony* (one or two pcs shared by two triads) with *p parsimony* (one or two pitches shared by two triads). I then offer a series of analyses, which fall into three categories: sequences, progressions with chromatic lines from $\hat{8}$ or $\hat{5}$, and a song that combines triads and seventh chords. I close with an analysis of a complete song.

## 1. introduction

Pop-rock music overflows with harmonic diversity. Walter Everett writes of the "manifold tonal systems present in popular music, some no different than those of two hundred years ago, others hardly related at all, and still others combining aspects from both of these extremes."[1] This diversity has given rise to distinct analytic approaches to harmony and voice leading in pop-rock music. One approach, taken by scholars such as Matthew Brown, Lori Burns, Everett, Peter Kaminsky, and Timothy Koozin, employs Schenkerian techniques.[2] Richard Middleton and Allan Moore argue against the use of Schenker for the analysis of pop-rock music, opting instead for approaches that feature musical gesture and root-motion formulae respectively.[3] Still other approaches are represented by the pioneering work of John Covach, Dave Headlam, Susan McClary, Philip Tagg, and Robert Walser.[4] Like the music it seeks to elucidate, the field of pop-rock studies is young, and consensus regarding analytic method has yet to emerge. This article advances the use of neo-Riemannian operations (henceforth, NROs) for the analysis of certain pop-rock chord progressions whose features, detailed below, invite a

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1 See Everett 2001b, ¶3.

2 See Brown 1997, Burns 1997 and 2000, Everett 1999, 2000a, and 2001a, Kaminsky 1992, and Koozin 2000.

3 See Middleton 2000a, Moore 1993, 10 (on Schenker), and Moore 1992 (on root-motion formulae).

4 See Covach 1991 and 1995, Headlam 1995, McClary 1991, Tagg 1982, and Walser 1993.

transformational approach to harmonic progression.[5] While analytic applications of neo-Riemannian theory have to date focused primarily on late-Romantic concert music, research by Kevin Holm-Hudson on Genesis, Jonathan Kochavi on Radiohead, Matthew Santa on John Coltrane, and Steven Strunk on post-bebop jazz demonstrates the ability of neo-Riemannian theory to address a wide range of musics.[6]

* * * * *

Example 1 lists the NROs used in this article.[7] They fall into four categories, the first of which includes the identity operation, I.[8] This operation maintains three common tones, mapping a triad onto itself. The second category includes L, P, and R.[9] These operations maintain two common tones between triads while moving the third tone by half-step (for L or P) or whole-step (for R). The third category includes L′, P′, and R′.[10] These operations maintain one common tone between triads while moving the other tones by half-step (for L′ and P′) or whole-step (for R′). The fourth category includes compound operations, including members of the same category or different categories. Compounds are performed using right orthography: begin with the leftmost operation and proceed to the rightmost one. For example, PP′ maps C+ onto B+, because P maps C+ onto C-, and P′ maps C- onto B+.[11]

1. Operation that preserves three common tones

| *Name* | *Abbreviation* | *Example* |
|---|---|---|
| Identity | I | C+ ↔ C+ |

2. Operations that preserve two common tones

| *Name* | *Abbreviation* | *Example* |
|---|---|---|
| Leading-tone exchange | L | C+ ↔ E- |
| Parallel | P | C+ ↔ C- |
| Relative | R | C+ ↔ A- |

3. Operations that preserve one common tone

| *Name* | *Abbreviation* | *Example* |
|---|---|---|
| L prime | L′ | C+ ↔ F- |
| P prime | P′ | C+ ↔ C♯- |
| R prime | R′ | C+ ↔ G- |

4. Compound operations

Use right orthography: begin with the leftmost operation and proceed to the rightmost one. Example: PP′ maps C+ onto B+.

example 1. *Neo-Riemannian operations (NROs).*

The NROs in Example 1 can model many pop-rock chord progressions. One such progression appears in Example 2(a): the chorus of "Shake The Disease" by Depeche

5 Although they are sometimes referred to as transformations, NROs are indeed operations. Hyer (1995, 138, n. 19), Lewin (1987, 3), and Morris (2001, 2–3) note that an operation is a type of transformation that is one-to-one and onto. Every NRO maps each major or minor triad (henceforth "triad") onto just one other triad, fulfilling the one-to-one and onto conditions.

6 Holm-Hudson 2002a, Kochavi 2002, 112–30, Santa 2004, Strunk 2003.

7 In Example 1, the symbols + and – designate major and minor qualities respectively.

8 The I operation is employed by Hyer 1995 and Lewin 1987.

9 The L, P, and R operations are employed by Cohn 1997, Hyer 1995, Klumpenhouwer 1994, and Lewin 1987, 175–9, among others.

10 See Morris 1998. Two of these operations have precedents in the literature. L′ is equivalent to Weitzmann's 1853 *Nebenverwandt* relation, brought into current use by Cohn 1998b, 290, and Cohn 2000, 98. P′ is equivalent to Lewin's 1987 SLIDE operation.

11 Morris 1998, 186, notes that L′, P′, and R′ may be understood as compound operations using L, P, and R: L′ = PLR or RLP, P′ = LPR or RPL, and R′ = LRP or PRL. I use L′, P′, and R′ for their succinctness; they differ from their compound counterparts in the number of *Tonnetz* moves they effect—one instead of three.

Mode, which contains the triads ‖: D-, F-, D♭+, B♭+ :‖.[12] This progression lends itself to numerous diatonic interpretations, four of which are provided in Examples 2(b) through 2(e). Example 2(b) assumes a single key for the progression, D minor. As in much pop-rock music, repetition and metric strength are paramount in establishing the tonal center of this chord progression—the D- triad comes first and is metrically emphasized.[13] A Roman numeral analysis such as i–iii♭–♭I–VI, shown in Example 2(b), does little to explain the progression's organization. Reading D♭+ as ♭I—a major inflection of the triad on the flatted tonic degree—is awkward; D♭+ acts less as an altered tonic chord than the result of common-tone voice leading from F-. Alternately, one could notate D♭+ (♭I) as C♯+ (♯VII), but this creates the dissonant and atypical root progression F–C♯–B♭. The interpretation in Example 2(c) labels the chords in the key of F minor. This reveals a descending thirds progression, i–♭VI–IV, but the key clashes with the firm D minor tonal center. The third interpretation, shown in Example 2(d), labels the chords in two keys: F minor and D minor. This orientation reveals a pair of tonic-submediant progressions but conflicts with the metric organization. Finally, the interpretation shown in Example 2(e) also labels the chords in two keys: D minor and D♭ major. This reading accords with the four-bar metric organization of the progression and suggests the following relation between ⟨D-, F-⟩ and ⟨D♭+, B♭+⟩.[14] The first two chords are minor, and their roots ascend by minor third; the second two chords are major, and their roots descend by minor third. However, it is difficult to defend the idea that the progression modulates every two measures. In sum, Examples 2(b) through 2(e) demonstrate that modal mixture and chromatic-third relations in "Shake The Disease" make a Roman numeral analysis anything but straightforward.

Alternatively, a neo-Riemannian analysis of "Shake The Disease" seizes on the progression's transformational patterning and F pedal tone. The analysis in Example 2(f) takes the form of a transformational network containing four triads and four arrows labeled with NROs. The relationship between D- and F- is interpreted as RP, which maintains one common tone, F, and moves the other two notes by interval-class (ic) 1 or 2. The relationship between F- and D♭+ is interpreted as L, which maintains two common tones, F and A♭, and moves the other note by ic 1. The relationship between D♭+ and B♭+ is interpreted as RP, which maintains one common tone, F, and moves the other two notes by ic 1 or ic 2. Lastly, the relationship between B♭+ and D- is interpreted as L, which maintains two common tones, F and D, and moves the other note by ic 1. A correspondence emerges between ⟨D-, F-, D♭+⟩, whose successive NROs are ⟨RP, L⟩, and ⟨D♭+, B♭+, D-⟩, whose successive NROs are also ⟨RP, L⟩.[15] The analysis also reveals that the progression forms an LPR loop: a set of triads sharing a single pitch class—here, F—that proceed via the NROs ⟨L, P, R, L, P, R⟩, in reverse and with compounds: ⟨RP, L, RP, L⟩.[16] Example 2(g) presents a *Tonnetz* representation of the LPR loop. One or more of the six triads in the LPR loop may be absent from the music itself; compound operations "elide across" the absent triads.[17] The progression rotates clockwise on the *Tonnetz* from D- to D-, eliding across F+ and B♭-. The LPR

12 See Depeche Mode 1985. The musical examples in this study represent harmonic reductions, not transcriptions. The pitches shown represent the pitches as performed; voice leading and register have not been normalized. I omit non-chord tones, surface rhythms, and repetitions of chords. The notated durations represent the number of beats each harmony sounds, which is not necessarily the number of attacks.

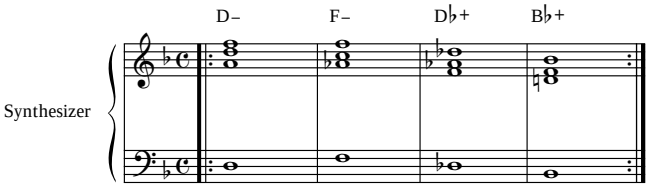
13 Temperley 2001, 263, discusses the role of metrical emphasis in establishing tonal centers in pop-rock music.

14 Angle brackets ⟨ ⟩ order sets from left to right; curly brackets { } indicate unordered sets.

15 Lewin's description of a similar passage in Wagner's *Das Rheingold* is apposite: ⟨D-, F-, D♭+⟩ and ⟨D♭+, B♭+, D-⟩ "run through the same configuration of 'moves,' differing only in the place where they begin their journeys." See Lewin 1992, 52.

16 LPR loops are introduced in Cohn 1997, 43–6.

17 The elisions follow the methodology of Cohn 1997, 43.




*(a) Depeche Mode, "Shake The Disease," chorus.*

| | | | | |
|---|---|---|---|---|
| Chords: | 𝄆 D- | F- | D♭+ | B♭+ 𝄇 |
| D minor: | i | iii♭ | ♭I | VI |

*(b) First interpretation of Example 2(a).*

| | | | | |
|---|---|---|---|---|
| Chords: | 𝄆 D- | F- | D♭+ | B♭+ 𝄇 |
| F minor: | ♮vi | i | ♭VI | IV |

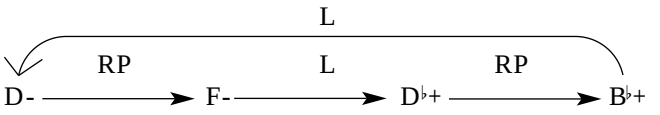
*(c) Second interpretation.*

| | | | | |
|---|---|---|---|---|
| Chords: | 𝄆 D- | F- | D♭+ | B♭+ 𝄇 |
| F minor: | | i | VI | |
| D minor: | i | | | VI |

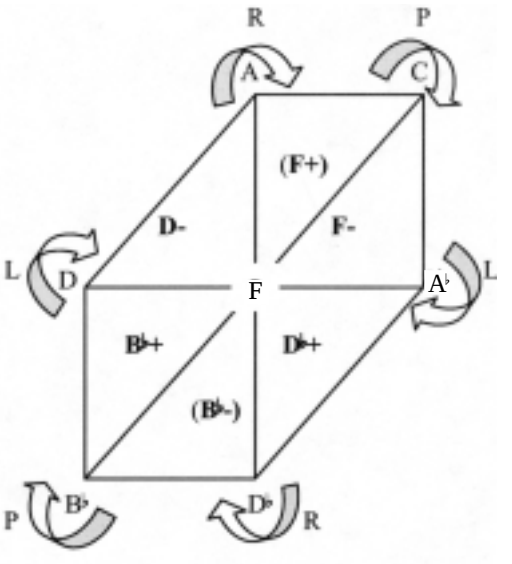
*(d) Third interpretation.*

| | | | | |
|---|---|---|---|---|
| Chords: | 𝄆 D- | F- | D♭+ | B♭+ 𝄇 |
| D minor: | i | iii♭ | | |
| D♭ major: | | | I | VI |

*(e) Fourth interpretation.*




*(f). Transformational network for Example 2(a).*




Vertices = notes
Triangles = triads
( ) = not present in Example 2(a)

*(g) Tonnetz representation of the LPR loop in Example 2(f).*

example 2

loop graphically displays the F pedal tone and highlights the consistency between triads afforded by overlapping notes.[18]

Progressions like that of Example 2(a) appear throughout the pop-rock repertory. In the remainder of this article, I discuss the general features of such progressions, then present a series of analyses. The analyses fall into three categories: sequences, progressions involving chromatic motions with $\hat{8}$ or $\hat{5}$, and a song that combines triads and seventh chords.[19] The analyses chart the relationship of NROs to tonal organization in pop-rock music.

## ii. general features

Pop-rock progressions that are well-modeled by NROs typically contain modal mixture and root motion by third. The common tones that result from these root motions are often realized as held pitches, not just pitch classes. As Example 2 suggests, NROs are useful tools in analyzing progressions that lack structural dominant harmonies, and that lack leading tones that might carry dominant function. That said, NROs *can* be of use in contexts with strongly directed tonal motion, particularly in passages where Roman numerals are typically used sparingly, such as the interior of a sequence. Example 3 examines a sequence from a Schubert sonata. Consider the progression that begins in the fourth measure, where a 5–10–8–5 outer voice pattern guides the descending tetrachord D–C–B♭–A, whose notes fall on the downbeat of every second measure. A stepwise $\frac{5}{3}$–$\frac{4}{2}$–$\frac{6}{3}$–$\frac{4}{3}$–$\frac{5}{3}$ motion to F+ ends the passage. The bracketed triads engage parsimonious voice leading; the NROs ⟨R, L, R⟩, ⟨R, L, R⟩, ⟨L, R, L⟩ trace the path of the triads.[20]

The pop-rock chord progressions in this article differ in three ways from the late-Romantic progressions analyzed by Cohn, Hyer, Klumpenhouwer, and Lewin.[21] First, complete cycles of NROs (other than LPR loops) are rare in pop-rock music. Second, the enharmonic relationships and equal subdivisions of the octave often created by these cycles are also rare.[22] Third, the parsimonious voice leading associated with NROs does not always obtain in pitch space since parallel fifths and octaves are common in pop-rock music. For example, the progression ⟨F-, D♭+⟩ is parsimonious in pitch-class space because the chords share two pcs, F and A♭, while the remaining pcs, C and D♭, form an ic 1. But in pitch space, the triads need not share two notes and move the third by semitone. Example 2(a) is a case in point: both the similar motion from F- to D♭+ and the parallel planing from D♭+ to B♭+ could be rewritten with parsimonious voice leading in pitch space, as shown in Example 4. For this reason I shall distinguish *pc parsimony*—one or two *pitch classes* shared by two triads—from *p parsimony*—one or two *pitches* shared by two triads. While the presence of p parsimony can highlight and draw the ear to an underlying pc parsimony, an absence of p parsimony need not diminish the compatibility of NROs

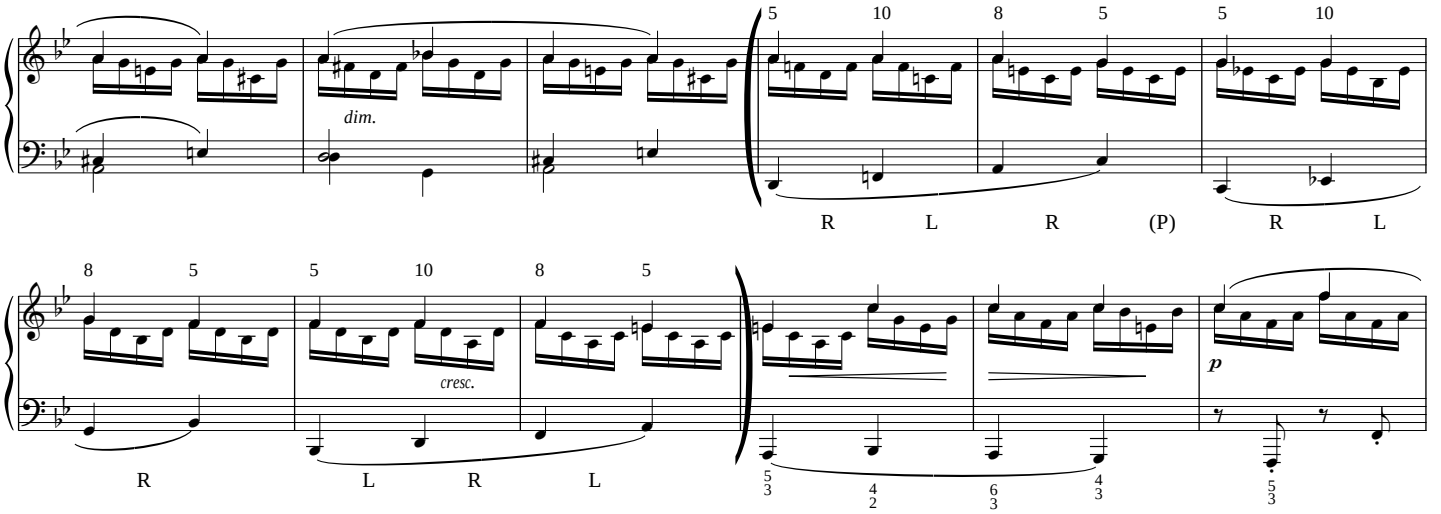
18 The transposition and inversion operators of atonal theory offer another way to relate the chords of Example 2(a). The inverse relation between ⟨D-, F-⟩ and ⟨D♭+, B♭+⟩ and the parallel voice leading from D♭+ to B♭+ are two features that suggest this approach. Yet portraying Example 2(a) as manifesting the series of operations ⟨$T_3$, $T_1I$, $T_9$, $T_7I$⟩ gives short shrift to the F pedal note and the cyclic nature of the progression, both of which are shown by the *Tonnetz* representation of the LPR loop. Further, transposition and inversion operators cannot map sets of different cardinalities onto one another, a feature that NROs will be shown to possess in Part V. In this article, I reserve transposition operators for mappings between portions of transformation networks.

19 Everett 2000a, 317–20, discusses chromatic motions with $\hat{8}$ or $\hat{5}$ in pop-rock songs.

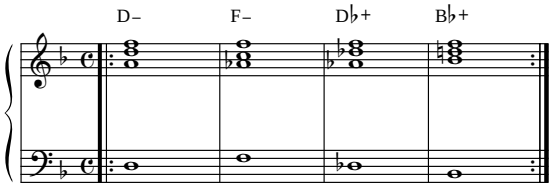
20 After Cohn 1997, 1–2, two triads are parsimonious if they share *two* common tones while the third moves either by half- or whole-step (ic 1 or ic 2). Following Douthett and Steinbach 1998, 243–4, I use the term parsimonious to refer to Cohn's definition as well as to describe two triads sharing *one* common tone while the other two move by ic 1 or ic 2 (e.g. C+ and F+). For additional commentary on the Schubert passage, see Ricci 2004, 94–7.

21 See Cohn 1996, 1997, and 2000, Hyer 1995, Klumpenhouwer 1994, Lewin 1987, 175–9 and 1992.

22 We shall see exceptions to this in Examples 5 and 6.




example 3. *Schubert, Sonata in B-flat Major (1828), IV, mm. 119–130.*




example 4. *Rewrite of Example 2(a), with parsimonious voice leading in p space.*

with pop-rock chord progressions. The pitch space voice-leading conventions of pop-rock music are too diverse to demand a one-to-one relation between pc- and p parsimony; parallel planing, p parsimony, and common-practice voice leading frequent the repertory.[23] Further, some of these voice-leading techniques are specific to certain instruments, and even to the keys that are easy to play in on those instruments. In sum, a distinction between pc and p parsimony clarifies the use of the term voice leading in discussions of pop-rock music.

How and why do modal mixture, root motion by third, and pc parsimony arise in the pop-rock chord progressions under discussion? Pop-rock chord progressions involving NROs arise stylistically in two primary ways. First, the ubiquitous minor pentatonic scale is routinely harmonized with parallel major triads in pop-rock music. This creates multiple chromatic mediant relations, such as ⟨C+, E♭+, F+, G+, B♭+⟩.[24] Second, as noted in the previous paragraph, tactile considerations can play a significant role in the composition of pop-rock chord progressions. As Allan Moore observes,

23 Everett 2000a, 307–11, surveys types of voice leading in pop-rock music.

24 Everett 2002 discusses rock songs based on pentatonic scales harmonized with major triads.

much pop-rock music is composed "at the fretboard" or "at the keyboard." While the keyboard is "comparatively undifferentiated with respect to chord shapes, the guitar is highly differentiated with respect to chord shapes; it clearly forces a songwriter into a limited repertoire of harmonies."[25] The open-position major triads familiar to all guitarists—C+, D+, E+, G+, A+, whose roots form a pentatonic scale—form the harmonic backbone of many pop-rock songs, and their combinations frequently yield chromatic relations. Consider, for instance, the PR-related triads ⟨E+, G+⟩ or ⟨A+, C+⟩; the PL-related triads ⟨E+, C+⟩; or the RR′-derived progression ⟨C+, D+, E+⟩. In keyboard-driven pop-rock music, chromaticism frequently stems from passages characterized by minimal finger movement, common tones, and stepwise motion—passages that respond well to NROs.

## iii. sequences

Example 5(a) presents a sequence for electric guitar in "Flying High Again" by Ozzy Osbourne.[26] For notational clarity, a durational reduction is provided; each written quarter note equals one sounding whole note. The upper staff of each system shows the sequence in standard notation; the lower staff, containing one line for each string of the guitar, shows tablature notation. The triads in m. 1 recur five semitones lower in m. 2 ($T_7$ is realized in pitch space as $T_{-5}$), creating a I–V progression in A, the tonal center of the entire song. A beat-to-beat Roman numeral analysis, such as I–♭VI–IV–♭II–V–♭III–I–♭VI, fails to capture the sequential drive of the progression. It may alternately be described as a I–V–I progression with the intervening chords resulting from the succession of NROs ⟨PL, RP, PL⟩. The initial tonic occurs on the downbeat of m. 1, V occurs on the downbeat of m. 2, and the closing tonic occurs on the downbeat of the following measure (not shown). Example 5(b) arranges these observations in a transformational network that represents the I–V relation as two $T_7$-related nodes containing four chords each.[27] Save for ⟨B♭+, E+⟩, adjacent chords in the sequence exhibit pc parsimony but not p parsimony.

The tablature in Example 5(a) lays bare the tactile origins of this sequence. The letter "T" stands for "tap," a technique in which notes are sounded by tapping the guitar fretboard with the index or middle finger of the picking hand.[28] The highest note of each sextuplet is tapped; slurs on the fretting hand sound the remaining notes. The tablature shows that the finger pattern for A+ repeats one fret higher and one string lower for F+. The pattern continues through D+ and B♭+, then repeats wholesale five frets lower. For the performer, this creates the somewhat unusual (and paradoxical) effect of steadily ascending the fretboard while steadily descending in register, the string changes notwithstanding.

Example 6(a) reproduces an excerpt from "Easy Meat" by Frank Zappa.[29] The excerpt opens with $\frac{5}{3}$–$\frac{6}{4}$–$\frac{5}{3}$ neighboring motions on G+ and A+; slurs indicate groupings within each measure. A sequence follows in mm. 3–6, which exhibits Lewin's "downshift" voice leading: every chord tone is held or leads "to the next chord tone encountered in a downward direction."[30] In contrast, m. 7 is characterized by ascending-fifth root motion. Measure 8 restores the downshift voice leading and leads to a restatement of mm. 1–6. The upper voice of the sequence spells out an octatonic scale ⟨C–B–A–G♯–F♯–E♯–E♭/D♯–D♮⟩, while the lower voice descends chromatically from $F_5$ to $F_4$. Each measure of the sequence transposes the previous measure three semitones lower,

25 See Moore 1993, 54–5.

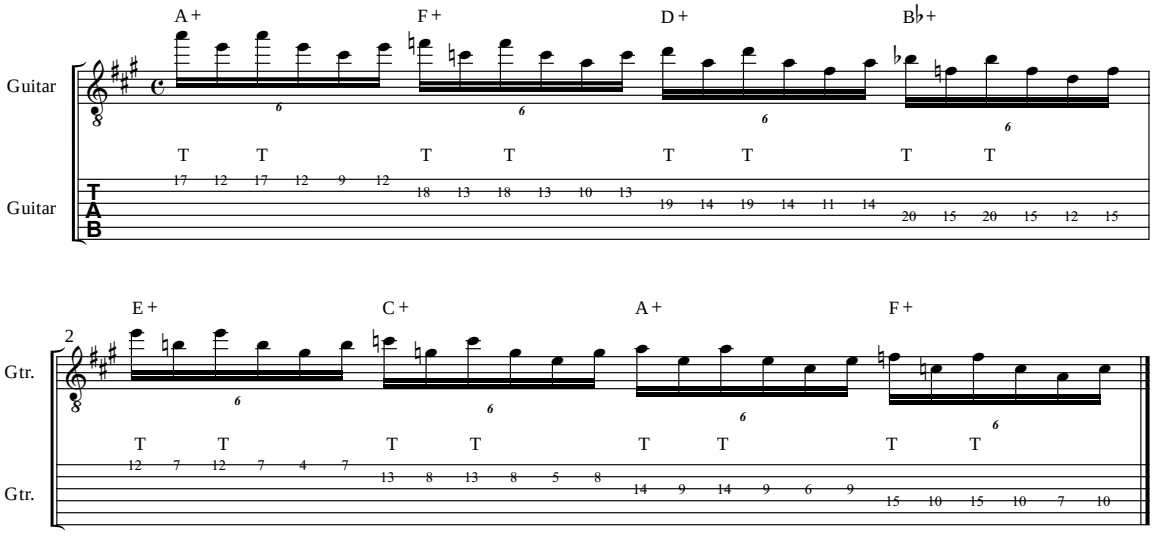
26 See Osbourne 1981.

27 Nodes are "containers" for the "objects" in a transformational network. See Lewin 1987, 193–7.

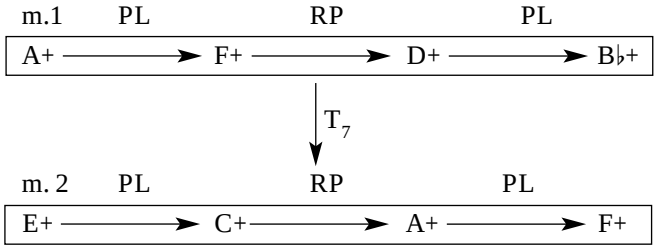
28 On tapping, see Capuzzo 1995.

29 See Zappa 1981a. Zappa considered the excerpt to be self-standing; he refers to it as "the classical section of the song" in Zappa 1981b. With the term "classical," he likely refers to the excerpt's performance on a keyboard instrument and the smooth voice leading of the sequence.

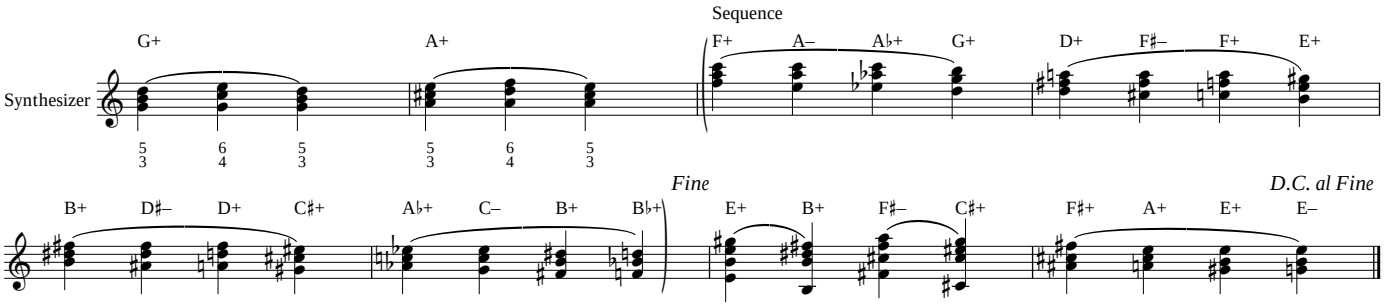
30 Lewin 1998, 18.



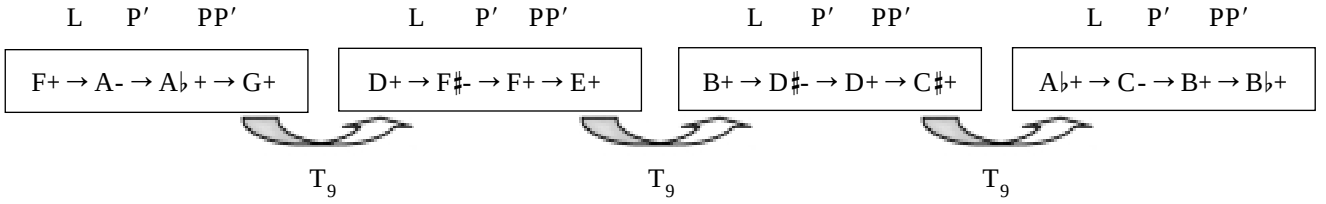

example 5. *(a) Ozzy Osbourne, "Flying High Again," sequence.*



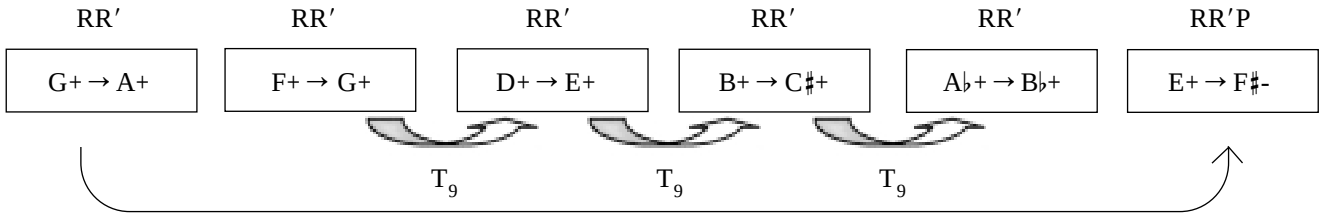

example 5. *(b) Transformational network for Example 5(a).*




*(a) Frank Zappa, "Easy Meat," excerpt.*




*(b) Transformational network for the sequence in Example 6(a).*




Almost $T_9$

*(c) Transformational network for Example 6(a).*

example 6

forming a chain of RP-related triads on the downbeats of mm. 3–6: ⟨F+, D+, B+, A♭+⟩.

Example 6(b) presents a transformational network for the sequence. L maps the first chord of each measure onto the second, P′ maps the second onto the third, and PP′ maps the third onto the fourth. The downshift voice leading and close-position voicings make the mappings of each NRO easy to hear. By way of conclusion, Example 6(c) shows a transformational network for all but the final, transitional measure of the excerpt. Two recurring transformations organize the network: RR′ and $T_9$. To begin, the network interprets the relationship between G+ and A+ (mm. 1–2) as RR′. RR′ then maps the first chord in each measure of the sequence onto the last chord of the same measure: ⟨F+, G+⟩, ⟨D+, E+⟩, etc. Only the closing ⟨E+, F♯-⟩ breaks the pattern, since F♯ is the root of a minor (not major) triad. The second recurring transformation, $T_9$, maps each measure of the sequence onto the next. If F♯- were instead F♯+, $T_9$ would also map the first node of the network onto the last node, embedding the sequence's $T_9$ chain within a "higher level" $T_9$ gesture. The network represents this with an arrow labeled "almost $T_9$." In all, Example 6 illustrates the interaction of NROs and transpositions in a sequence that is triadic yet void of a tonal center.

### iv. chromatic lines with $\hat{8}$ or $\hat{5}$

Example 7 addresses two songs by Radiohead, "Creep" and "Morning Bell."[31] Each song features modal mixture, an emphasis on subdominant harmony, and common tones between adjacent triads. The latter is a hallmark of Radiohead's music; when critic Alex Ross pointed this out to Radiohead songwriter Thom Yorke, Yorke earnestly replied, "That's my only trick: pedals banging away through everything!"[32]

"Creep" uses the guitar chords in Example 7(a), 𝄆 G+, B+, C+, C- 𝄇, which may be heard in G major as I–III♯–IV–iv. The chords act as an ostinato, creating a musical analog to the song's obsessive lyrics, which depict the "self-lacerating rage of an unsuccessful crush."[33] The highest pitches of the ostinato form a prominent chromatic line that "creeps" up, then down, involving scale degrees $\hat{5}$–♯$\hat{5}$–$\hat{6}$–♭$\hat{6}$. As the line ascends, the lyrics strain towards optimism, with $\hat{5}$ and ♯$\hat{5}$ set to the words "you float like a feather, in a beautiful world" in the second verse. As the line descends, the subject sinks back into the throes of self-pity, with $\hat{6}$ and ♭$\hat{6}$ set to the words "I wish I was special, you're so fucking special" in the same verse. The enharmonic relationship between ♯$\hat{5}$ (D♯) and ♭$\hat{6}$ (E♭) thus serves distinct expressive ends—optimism in ascent, despair in descent. The guitarist's fretting hand mirrors this contour, ascending from G+ to B+ to C+, then descending from C- to G+.

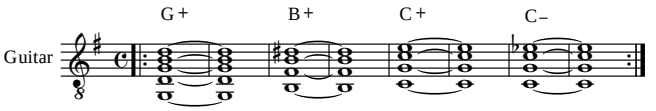
Example 7(b) shows that the progression's adjacent chords relate by ⟨LP, P′P, P, L′⟩. In particular, the P operation exerts a strong influence on the progression, both alone and as part of a compound NRO. For instance, LP maps G+ onto B+, creating the progression's first chromatic relation. P′P maps B+ onto C+, effectively "undoing" the prior chromatic relation by returning to the diatonic realm of G major. P then maps C+ onto C-, introducing ♭$\hat{6}$. Lastly, L′ (= PLR or RLP) maps C- onto G+, again undoing a chromatic relation by returning to G major. Tracking the P operation shows how the chromatic progression ⟨G+, B+, C+, C-⟩ is a variation of an implicit diatonic progression, ⟨G+, B-, C+, C+⟩. The chromatic progression supports the chromatic line from $\hat{5}$.

"Morning Bell" begins with the chords in the first system of Example 7(c), 𝄆 A-, C♯-, G+, D+ 𝄇. The progression contains two pairs of triads, {A-, C♯-} and {G+, D+}, each sharing one common pitch, $E_4$ and $D_4$ respectively. The song features an upper voice chromatic descent, $A_4$–$G♯_4$–$G♮_4$–$F♯_4$, which represent scale degrees $\hat{8}$–♯$\hat{7}$–♮$\hat{7}$–$\hat{6}$ in A minor. Mea-

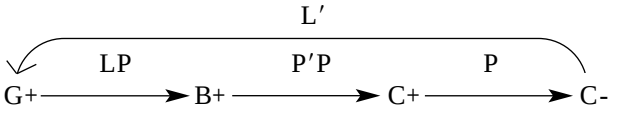
31 Radiohead 1993 and 2000 respectively.

32 Ross 2001, 118.

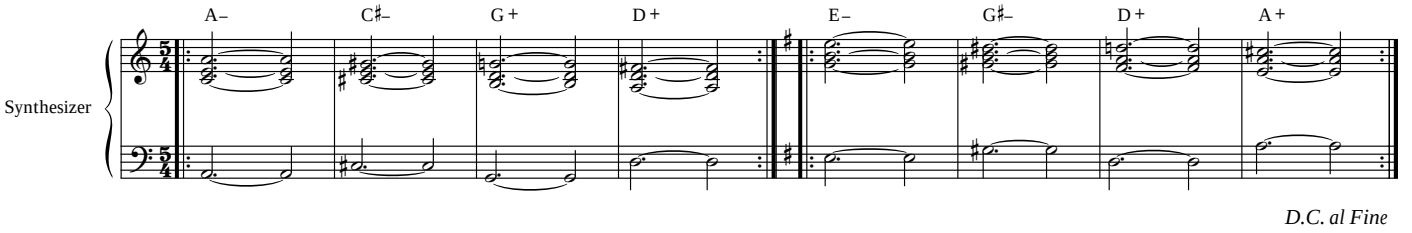
33 *Ibid.*




*(a) Radiohead, "Creep," ostinato.*




*(b) Transformational network for Example 7(a).*



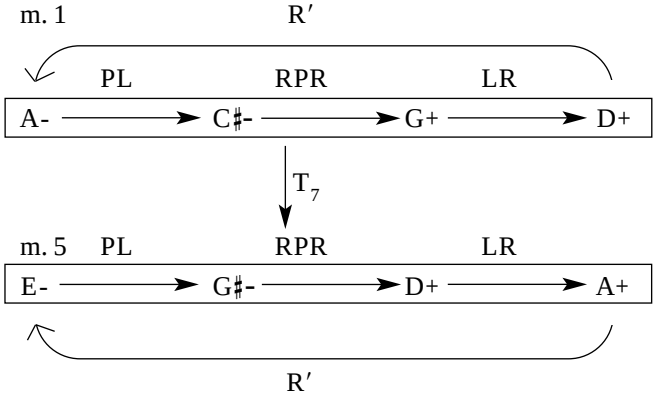

*(c) Radiohead, "Morning Bell."*

example 7

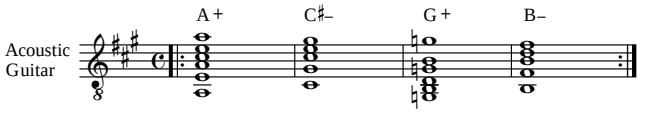
sures 5–8 restate mm. 1–4 seven semitones higher. The P operation maps A+ in m. 8 onto A- in m. 1; repetitions of mm. 1–2 close the song.[34]

34 The "Morning Bell" progression is similar to that of Example 5(a): both consist of eight chords, and the final four chords are the $T_7$ transposition of the first four. However, since the final four chords of "Morning Bell" are not heard immediately after the first four, I do not consider it to be a sequence.

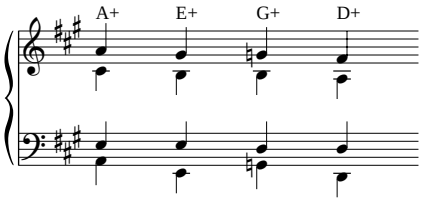
Semitonal wedging marks the outset of the progression. From A- to C♯-, $A_4$ descends to $G♯_4$ as $C_4$ ascends to $C♯_4$; $E_4$ holds. However, to continue the wedging from C♯- to G+, $C♯_4$ must ascend to $D_4$ as $G♯_4$ descends to $G♮_4$; this contradicts the progression's actual voice leading—$C♯_4$ leads instead to $B_3$ to provide the chordal third of G+. Two further voice-leading procedures characterize the excerpt: downshift voice leading in the upper voices of ⟨C♯-, G+, D+⟩, and root




*(d) Transformational network for Example 7(c).*




*(e) Bob Dylan, "Lay, Lady, Lay," verse.*




*(f) Chromatic descending 5–6 sequence from which Examples 7(c) and 7(e) are derived.*

example 7. [*continued*]

motion by fifth from G+ to D+ to A-. All of these procedures exhibit p parsimony save for ⟨C♯-, G+⟩, which share no common tones.

Jonathan Kochavi notes that NROs are well-suited to describing harmonic progression in "Morning Bell," particularly in light of the song's p parsimony.[35] To this end, Example 7(d) presents a transformational network for the song. The chords in each four-measure unit map onto each other under ⟨PL, RPR, LR, R′⟩, while $T_7$ maps the first unit onto the second. Kochavi's transformational network for the song is identical save for one point: he interprets the relation between D+ and A- as LRP, while I opt for the simpler designation R′.

Example 7(e) presents a progression that is similar to mm. 1–4 of "Morning Bell." The chords in the verse of Bob Dylan's "Lay, Lady, Lay" are ⟨A+, C♯-, G+, B-⟩.[36] Both progressions realize $\hat{8}$–$\sharp\hat{7}$–$\flat\hat{7}$–$\hat{6}$ in the upper voice; both also relate to the root position variant of a descending 5–6 sequence, shown in Example 7(f).[37] Each progression features a descending chromatic line in the top voice; NROs allow us to chart the (often subtle) differences between the harmonies in Examples 7(c) and (e).

Beck's "Lonesome Tears" offers a closing example of a descending chromatic line.[38] The song begins with an introduction, proceeds to a verse-chorus-bridge succession, and ends with repeated statements of the introduction. The harmonic language involves two groups of triads, shown in Example 8(a).[39] Each group emphasizes a shared note, realized as a shared pitch in Example 8(a) but as a shared pitch class in the music. Group 1 consists of four triads that share

35 Kochavi 2002, 125–7.
36 Dylan 1969.
37 Everett 2000a, 318, discusses the use of this sequence in pop-rock music.
38 Beck 2002.
39 In the context of Example 8, the term "group" is not intended to carry mathematical connotations.

the note C♯: A♯-, F♯+, A+, and C♯+. The chords of Group 1 are found in the introduction, verse, and chorus, where the only exceptions to it involve harmonies that are "borrowed" from Group 2. Group 2, found in the bridge, consists of four triads that share the note B: G♯-, E+, G+, and B+. Group 2 is the $T_{10}$ transposition of Group 1. Example 8(a) also reveals the song's chromatic line, which I shall refer to as the "tears motive." In Group 1, the tears motive appears as $A♯_4$–$A♮_4$–$G♯_4$, scale degrees $\hat{6}$–♮$\hat{6}$–$\hat{5}$ in C♯ major. In Group 2, the motive appears two semitones lower as $\hat{6}$–♮$\hat{6}$–$\hat{5}$ in B major. The triads of Groups 1 and 2 form LPR loops around the notes C♯ and B respectively. Example 8(b) shows how the loops operate in the song, using an analytic précis of "Lonesome Tears" in which each written quarter note represents one sounding whole note. The introduction traverses the LPR loop around C♯ in clockwise fashion—the NROs that map one chord to the next are ⟨LPR, LP, R⟩.[40] In the verse, the Group 1 tears motive is part of every chord except B+.[41] The tears motive persists through the chorus as well, using $A♯_4$–$A♮_4$–$G♯_4$ as in the introduction but newly harmonized as ⟨A♯-, A+, E+⟩. The chorus's plagal progression ⟨A+, E+⟩ echoes the ⟨B+, F♯+⟩ and ⟨F♯+, C♯+⟩ plagal progressions of the verse. As in the introduction, the progression that ends the bridge traverses an LPR loop in clockwise fashion—the consecutive NROs are ⟨LPR, LP⟩; the final R is absent since the bridge does not repeat.

To summarize these harmonic processes, Example 8(c) presents a transformational network for the song. The layout of the network places the introduction at its center to demonstrate how the harmonies of the chorus and bridge may be understood as transformations of those in the introduction. Because the verse is adequately described in terms of functional harmony, it does not appear in the network.[42] Arrows labeled with an I operation map the first two harmonies of the introduction onto the first two of the chorus. An arrow labeled PR relates the terminal harmonies of these sections. $T_{10}$ arrows map the harmonies of the introduction onto those of the bridge. A rich fusion of pop-rock harmony and transformational procedures, "Lonesome Tears" illustrates how NROs, functional harmony, a chromatic line involving $\hat{5}$, and transformational relationships interact in a pop-rock song.

## v. seventh chords

Many pop-rock chord progressions combine triads and seventh chords. In such progressions, chordal sevenths typically act non-functionally as colorations of triads. To illustrate, Example 9(a) presents the introduction to "Dinosaur" by King Crimson.[43] The introduction divides into two four-measure units; mm. 5–8 vary the harmonies and voicings of mm. 1–4. Each four-measure unit harmonizes a series of five chord roots, E–C–E♭–C–G, with triads and seventh chords. I interpret the $E^{\circ 6}_{3}$ triad in m. 3 as a $C^7$ chord with no root, and I interpret the C minor-minor seventh chord ($C\text{-}^7$) in m. 7 as an embellishment of E♭+. Each four-measure unit features a pedal pitch: $G_3$ in mm. 1–4, $G_4$ in mm. 5–8.

The progression's ambiguous tonality (E minor or G major?), chromatic relations among E-, E♭+, and G+, and non-functional dominant-seventh chords make a meaningful Roman numeral analysis difficult.[44] The seventh chords also strain a neo-Riemannian approach. One way to approach this problem is to excise the chordal sevenths. The progression then reads ⟨E-, C+, E♭+, C+, G+⟩, and the NROs that

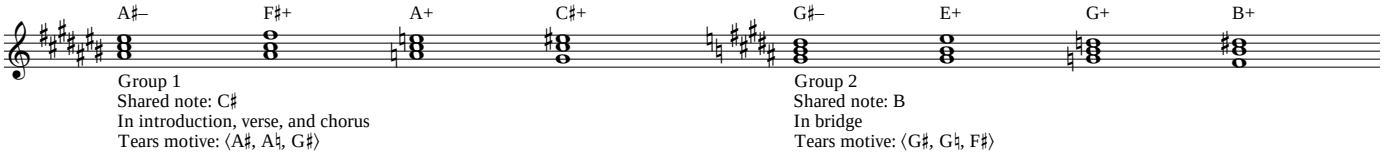
40 I interpret the relation between A♯- and A+ as LPR instead of P′ to draw the connection with LPR loops.

41 Although B+ could be said to harmonize $F♯_4$ from the Group 2 tears motive, the chords in the verse belong to Group 1, and inserting $F♯_4$ at this juncture upsets the strict chromatic ordering of the motive.

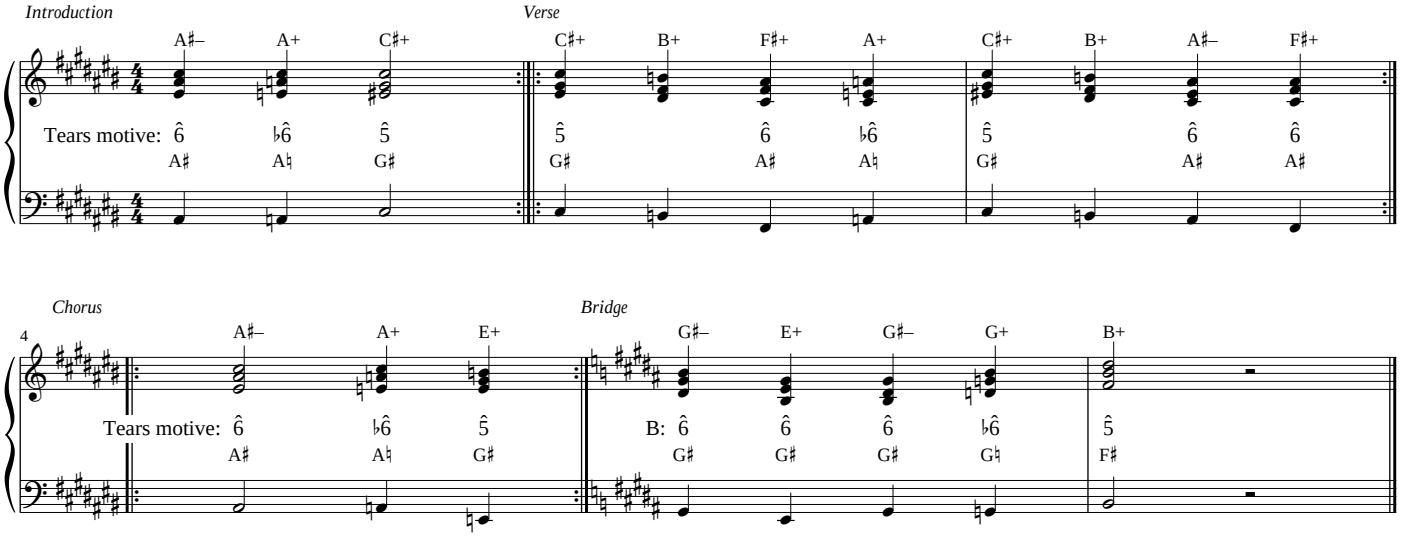
42 Each four-measure unit in the verse may be understood as an elaborated I–♭VII–IV progression.

43 King Crimson 1994.

44 For further discussion of the tonal structure of "Dinosaur," see Robison 2002.

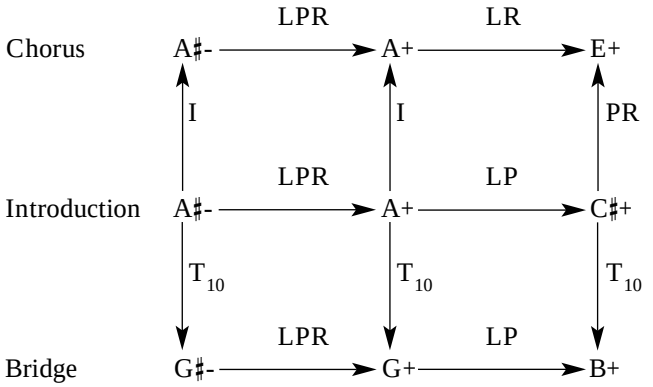



*(a) Beck, "Lonesome Tears," two groups of triads.*




*(b) Beck, "Lonesome Tears."*

example 8




N.B.: LPR = P′

*(c) "Lonesome Tears," transformational network.*

example 8. [*continued*]

map one triad to the next are ⟨L, PR, RP, LR⟩. These NROs can then be modified to accommodate seventh chords. Julian Hook's *cross-type transformations* use NROs in tandem with the inclusion transformation ⊂ to map a major or minor triad to the unique major-minor seventh or half-diminished seventh chord that contains that triad.[45] To illustrate, Example 9(b) provides a transformational network for the King Crimson progression. Horizontal arrows are labeled with cross-type transformations. L⊂ maps the opening E- triad onto $C^7$.[46] This transformation may be understood in two stages: L maps E- onto an implicit C+, and ⊂ maps C+ onto $C^7$. ⊃PR maps the second chord, $C^7$, onto E♭+. This may likewise be understood in two stages: ⊃, the inverse of ⊂, maps $C^7$ onto an implicit C+, and PR maps C+ onto E♭+. In similar fashion, RP⊂ maps E♭+ onto $C^7$ through an implicit C+, and ⊃LR maps $C^7$ onto G+ through an implicit C+. An analysis that invokes cross-type transformations has the advantage of employing the NROs discussed in connection with the triads-only analysis, ⟨L, PR, RP, LR⟩, extending them in a natural way to accommodate seventh chords: ⟨L⊂, ⊃PR, RP⊂, ⊃LR⟩. Two further operations appear in the network: "P," so named because of the parallel relation between the C+ and C- triads contained in $C^7$ and $C\text{-}^7$ respectively, and ⊂, the traditional inclusion transformation, which maps E♭+ onto $C\text{-}^7$.[47]

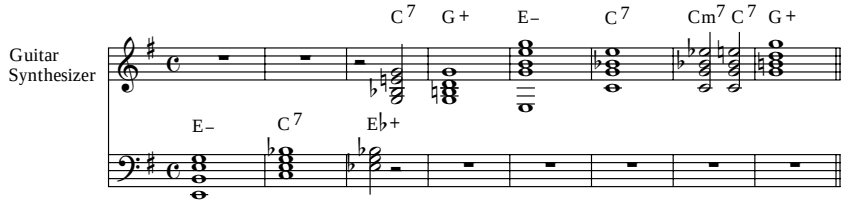
The verse of "Dinosaur," shown in Example 9(c), varies the E–C–E♭–C–G root progression of the introduction, omitting all chordal sevenths and even some chordal thirds. However, the vocal and bass lines frequently provide the thirds missing from the transcribed guitar part, clarifying the quality of each triad. Like the introduction, the verse divides into two four-measure units. The first unit omits the second C root, harmonizing E–C–E♭ as "power chords" consisting of a root and a fifth, and the G root as G+. The second unit truncates the series of five roots further still: E–C–E♭. The ensuing tritone motion from E♭+ to A+ is smoothed by the intervening stepwise chords ⟨E-, F+⟩ as well as the stepwise $B♭_3$–$B_3$–$C_4$–$C♯_4$ inner voice motion over ⟨E♭+, E-, F+, A+⟩.

Example 9(d) provides a transformational network for the verse. Despite the harmonic detour that lands the verse on A+, both four-measure units end with LP. The opening triads ⟨E-, C+, E♭+, G+⟩ form an LPR loop around the note G. The progression rotates counterclockwise on the loop from E- to E-, eliding across C- and G- through compound operations: ⟨L, PR, LP, R⟩. The LPR loop reveals how a single pedal tone, G, supports varied harmonies while maximizing pc parsimony in "Dinosaur."

45 See Hook 2002, 110–12.

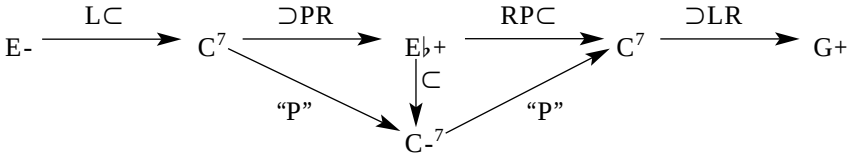
46 Callender's 1998, 224, "split" relation effects the same mapping by "splitting" the fifth of a minor triad into the two notes that flank it by semitone, e.g. {E, G, B} → {E, G, B♭, C}.

47 For additional operations on seventh chords, see Childs 1998, Douthett and Steinbach 1998, Gollin 1998, Hook 2002, 98–101 and 110–18, and Strunk 2003.

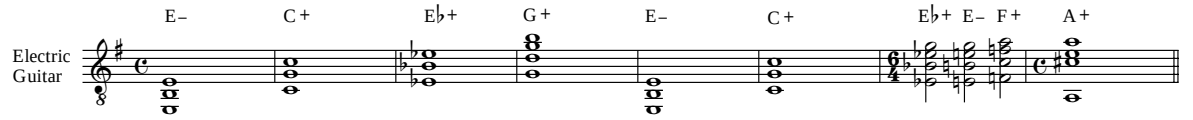



(C7 in measure 3 lacks a root.)

*(a) King Crimson, "Dinosaur," introduction.*



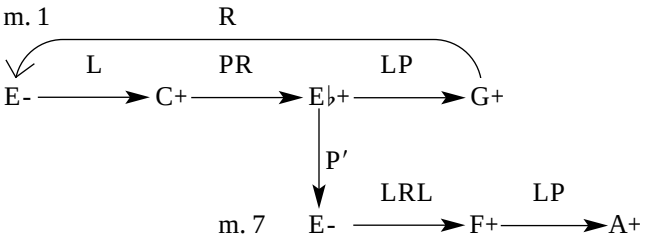

*(b) Transformational network for Example 9(a).*




(Missing chordal thirds appear in the bass and vocal parts.)

*(c) "Dinosaur," verse.*

example 9




*(d) Transformational network for Example 9(c).*

example 9. [*continued*]

| Section | Tonal Center | Chord Progression |
|---|---|---|
| Introduction | E | 𝄆 E+, C+ 𝄇 |
| Verse | E → F♯ | See Example 10(b) |
| Bridge | A → F♯ | See Example10(c) |
| Chorus | E | 𝄆 E+, C+ 𝄇 |
| Guitar Solo | E | 𝄆 E+, C+ 𝄇 |
| Stop Time | E | 𝄆 $A^5$, $C^5$, $A^5$, $D^5$ 𝄇 ($^5$ = root/fifth) 𝄆 E+, C+, $A^5$, $D^5$, $A^5$ 𝄇 |
| Chorus | E | 𝄆 E+, C+ 𝄇 |
| Coda | E | 𝄆 E+ 𝄇 |

*(a) Soundgarden, "Blow Up the Outside World," formal diagram.*

example 10

## vi. soundgarden: "blow up the outside world"

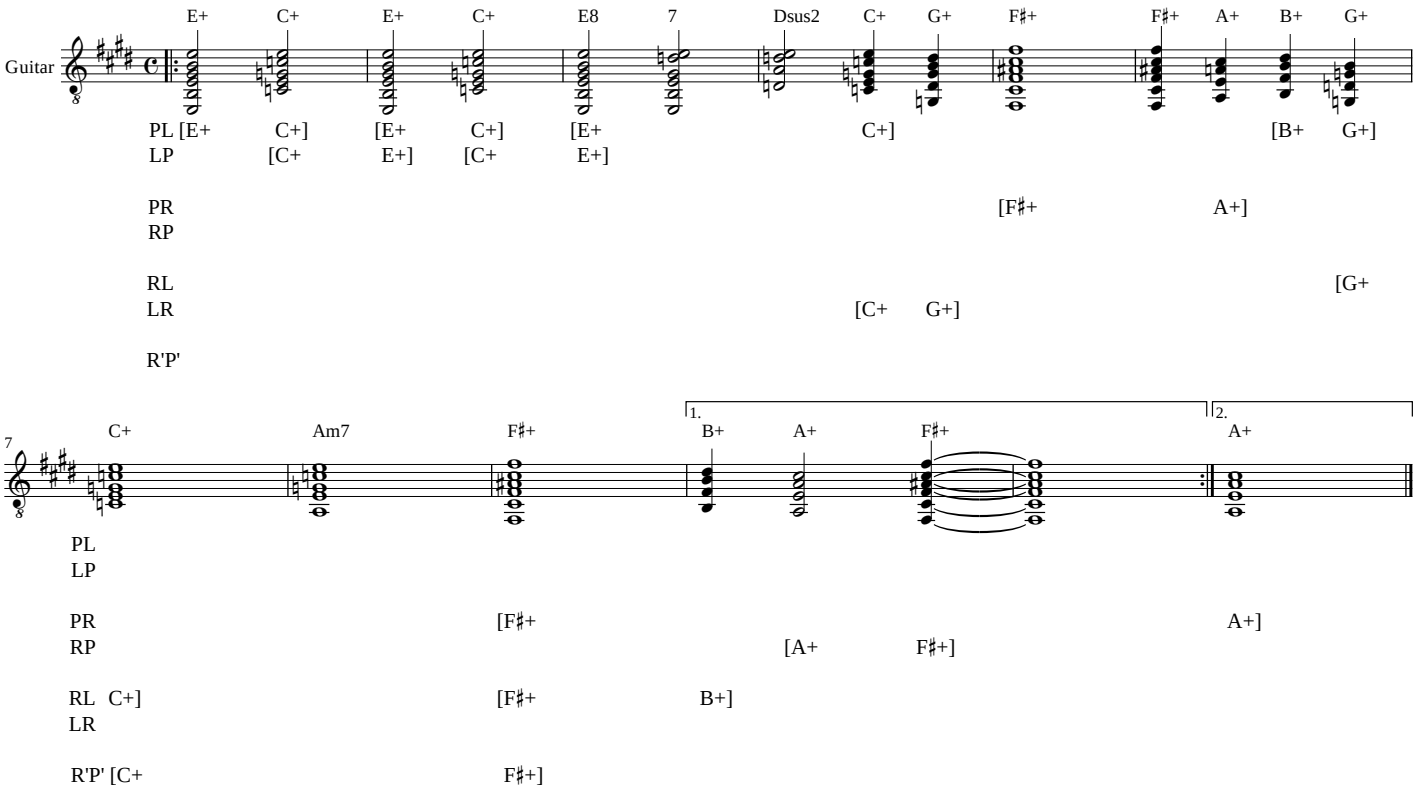
Example 10(a) gives a formal diagram of "Blow Up the Outside World."[48] The introduction, chorus, guitar solo, and coda contain either two chords, 𝄆 E+, C+ 𝄇, or just E+. These sections establish E+ as tonal center through sheer repetition and relative metric strength (not through typically tonal chord progressions). The 𝄆 E+, C+ 𝄇 progression recurs throughout the song, and the coda repeats the E+ voicing of the introduction. The p parsimony between E+ and C+ in the introduction (identical to mm. 1–2 of Example 10(b)) embellishes E+ through semitonal neighbor motions involving the notes {B, C♮} and {G♯, G♮}.[49] The stop-time section intensifies the pull toward E+ through root motions by fifth involving $A^5$ (containing a root and fifth), $D^5$, and E+. In short, E+ is the harmonic focus of much of the song, both as chord and tonal center.

The role E+ plays in the verse and bridge, however, is less obvious. These sections contain many more than the one or two chords of the other sections, and functional harmonic progressions are largely absent. I shall first discuss the verse, shown in Example 10(b). The chord roots in the verse form an E natural minor scale, with most scale degrees harmonized by major triads. The order in which the triads appear all but cancels out the possibility of generating a Roman numeral analysis that will reveal much of solid worth. That said, harmonic progression in the verse is organized in two ways. The first is the presence of three-chord segments whose root successions can be derived from pentatonic collections. For instance, the roots of {E+, C+, Dsus2} in mm. 1–4 and ⟨A+, B+, G+⟩ in m. 6 can be extracted from the {A, C, D, E, G} or {E, G, A, B, D} collections respectively.[50] Similarly, ⟨F♯+, A+, B+⟩ in m. 6 and mm. 8–12, and ⟨G+, C+, $A^{-7}$⟩ in mm. 6–8 can be drawn from the {F♯, A, B, C♯, E} and {A, C, D, E, G} collections. The verse can thus be understood in part as the combination of small tonal units that are stylistically typical of pop-rock music. The song's thoroughgoing chromaticism coexists with tinges of a blues/rock-based

48 Soundgarden 1996.

49 P parsimony may be said to obtain even though the E+ and C+ voicings contain six and five pitches respectively. Save for the lowest note of E+, each E note in E+ leads to an E note in C+, while each B ascends to a C♮ and G♯ descends to G♮.

50 A sus2 harmony contains a root, second, and fifth.




*(b) "Blow Up the Outside World," verse.*

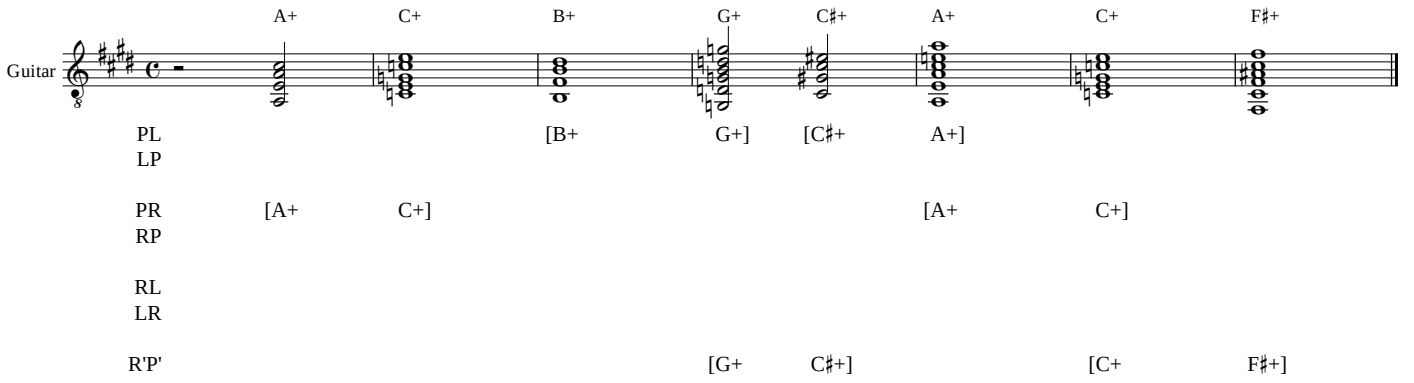
example 10. [*continued*]

harmonic language, and the pentatonic subsets begin to account for this feature.

The second organizing factor in the verse is the parsimony afforded by a select set of NROs, which appear below each staff in Example 10(b).[51] The set consists of the three retrograde-related pairs of NROs—PL/LP, PR/RP, and RL/LR—along with R′P′.[52] Each pair of NROs is identified

51 In contrast to the preceding analyses, no transformational network is provided for the Soundgarden song since its chord progressions do not exhibit the regularity and symmetry that transformational networks so aptly illustrate. The format of Examples 10(b) and 10(c) better represents the various harmonic processes involving the NROs that imbue the song.

52 Cohn 1997, 24–42, studies the retrograde-related pairs of NROs.




*(c) "Blow Up the Outside World," bridge.*

example 10. [*continued*]

with a pair of root motions. PL and LP relate triads whose roots form an ic 4, such as ⟨E+, C+⟩ or ⟨C+, E+⟩. PR and RP relate triads whose roots form an ic 3. RL and LR relate triads whose roots form an ic 5. Lastly, R′P′ relates triads whose roots form an ic 6.

The NROs in Example 10(b) do not label every adjacent pair of triads. In addition, I exclude the $E^7$, Dsus2, and $A\text{-}^7$ chords from the analysis, since $E^7$ and $A\text{-}^7$ include the triads that immediately precede them and Dsus2 lacks a chordal third, rendering its quality indeterminate. Rather than labeling all root motions, Example 10(b) demonstrates how R′P′ and the set of retrograde-related NRO pairs reflect the general sound of the verse's harmonic progression and its pervasive pc parsimony. To begin, alternations of PL and LP establish E+ as tonal center in mm. 1–2. Dsus2 forms a stepwise connection between E+ and C+, extending the prior ⟨E+, C+⟩ alternations. The PL/LP alternations cease at m. 5, at which point F♯+ enters. The ensuing pentatonic segments, ⟨F♯+, A+, B+⟩ in m. 6, and ⟨F♯+, B+, A+, F♯+⟩ in mm. 9–11, confirm F♯+ as a new tonal center. Notably, while root motions by fifth involving the RL/LR pair crop up in the verse, only the RL mapping from F♯+ to B+ (mm. 9–10) lends support to E or F♯, the competing tonal centers.

Many of the verse's identifying features—p and pc parsimony, PL/LP alternations, RL/LR root motions by fifth, and three-note pentatonic segments—vanish in the bridge, shown in Example 10(c). The bridge equally distributes its root motions, with two instances each of PL, PR, and R′P′; these NROs form a subset of those found in the verse. The bridge divides on the basis of the repeated ⟨A+, C+⟩ segment into two subsections of four and three measures respectively. This pair of chords and the compound operation R′P′ help to organize each subsection. The bridge begins with ⟨A+, C+⟩ and proceeds through B+ to ⟨G+, C♯+⟩, which relate by R′P′. Measure 5 begins with ⟨A+, C+⟩, which overlaps with the R′P′-related ⟨C+, F♯+⟩. PL links the subsections, mapping B+ to G+ and C♯+ to A+. These mappings recall the prominence of PL in the verse, here without its inverse LP.

Repetition and metric emphasis establish A+ as the initial tonal center; the F♯+ center appears only in the final measure but is presaged by ⟨G+, C♯+⟩, which suggests ♭II–V in F♯.

The change in NROs and voice-leading procedures in the bridge coincides with equally marked changes in timbre, dynamics, and lyric content. The verse's clean-tone guitars, quiet drumming, and soft vocals give way to loud, distorted guitars, pounding drums, and flat-out screaming in the bridge. The lyrics change as well, shifting from the verse's present tense to the bridge's past perfect and conditional tenses; a change from the second person to the first person and an abandonment of the repeated word "nothing" in favor of "everything" are also prominent. The forceful timbres, loud dynamics, and aggressive lyric content set up the insistent repetitions of the song's title in the chorus, where the return of the ⟨E+, C+⟩ progression reestablishes the song's E+ tonal center.

## vii. final considerations

This article has demonstrated ways in which NROs can aid in the analysis of a variety of pop-rock chord progressions, including sequences, progressions involving chromatic motions with $\hat{8}$ or $\hat{5}$, and progressions that combine triads and seventh chords. The songs by Ozzy Osbourne and Frank Zappa reveal strategic patterns of triadic transformation in environments where beat-to-beat functional analysis becomes strained by symmetrical divisions of the octave. The Radiohead, Bob Dylan, and Beck examples demonstrate the interaction of line and harmony in progressions where subdominant harmonies and rampant chromaticism hold sway. King Crimson's "Dinosaur" shows how cross-type transformations permit the use of the L, P, and R operations in a progression equally populated by triads and seventh chords. Finally, the analysis of Soundgarden's "Blow Up the Outside World" pinpoints how the song establishes, elaborates, and departs from its E+ and F♯+ tonal centers.

The analyses present an opportunity to reflect on and refine the claims of a neo-Riemannian approach as set out by Cohn, Hyer, Klumpenhouwer, and Lewin.[53] Through its focus on pc parsimony, common-tone maximization, and enharmonic equivalence, neo-Riemannian theory has been able to demonstrate coherence in music that resists Schenkerian, functional harmonic, or other "classical" tonal approaches. As Cohn elaborates, "Neo-Riemannian theory arose in response to analytical problems posed by chromatic music that is triadic but not altogether tonally unified. Such characteristics are primarily identified with the music of Wagner, Liszt, and subsequent generations, but are also represented by some passages by Mozart, Schubert, and other pre-1850 composers."[54] Neo-Riemannian theory is also useful in the analysis of musical genres other than Western concert music that are tertian, tonally centric, and routinely chromatic, including certain strains of pop-rock music, as this article has argued, as well as some contemporary film music. To illustrate the latter, Example 11(a) displays a representative passage in "The Council of Elrond" from the motion picture *The Lord of the Rings*.[55] The passage is shot through with chromatic third relations and p parsimony, a few octave doublings and register shifts notwithstanding. Example 11(b) highlights the passage's p parsimony in a three-staff format.[56] Each staff reveals a tight voice-leading bandwidth, with {A, A♭/G♯, G♮} huddling in the low register, {C/B♯, B♮} in the middle register, and {F, E, D♯} in the highest register.

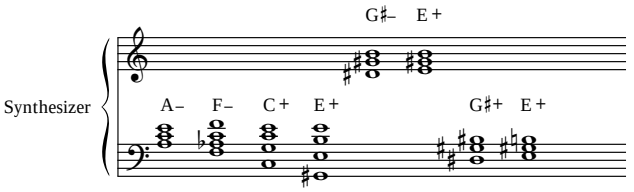
If the fit of neo-Riemannian theory with pop-rock and contemporary film music is in fact a good one, theorists may come to view the theory as unbound to a particular repertory. Simply put, different aspects of the theory will be seen to ad-

53 See Cohn 1996, 1997, and 1998a; Hyer 1995; Klumpenhouwer 1994; Lewin 1987 and 1992.

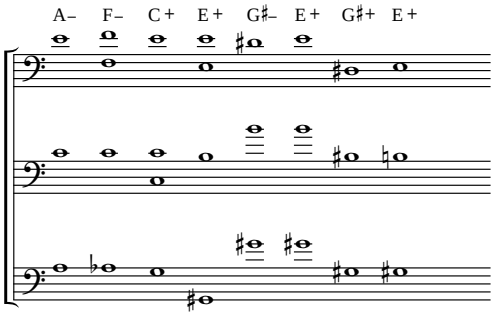
54 Cohn 1998a, 167–8.

55 Various 2001.

56 Cohn 2000, 99–100, uses this format to study the "abstract voice leading" (viz., pc parsimony) of a passage in Liszt's *Faust* Symphony.




*(a) Enya, "The Council of Elrond."*




*(b) P parsimony in "The Council of Elrond."*

example 11

dress different styles. Complete hexatonic cycles, for example, occur in Brahms but not Beck;[57] strategic deployment of the three retrograde-related pairings of L, P and R occurs in Soundgarden but not Schubert; LPR loops occur in Depeche Mode but not Dvořák. Viewed in this light, neo-Riemannian theory becomes an even more useful and powerful tool—one that can model a wide range of harmonic and contrapuntal techniques found in many styles of music.

57 A hexatonic analysis of a passage from Brahms's Double Concerto, op. 102, appears in Cohn 1996, 13–17.

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