Triadic Transformation and Parsimonious Voice Leading in Some Interesting Passages by Gavin Bryars

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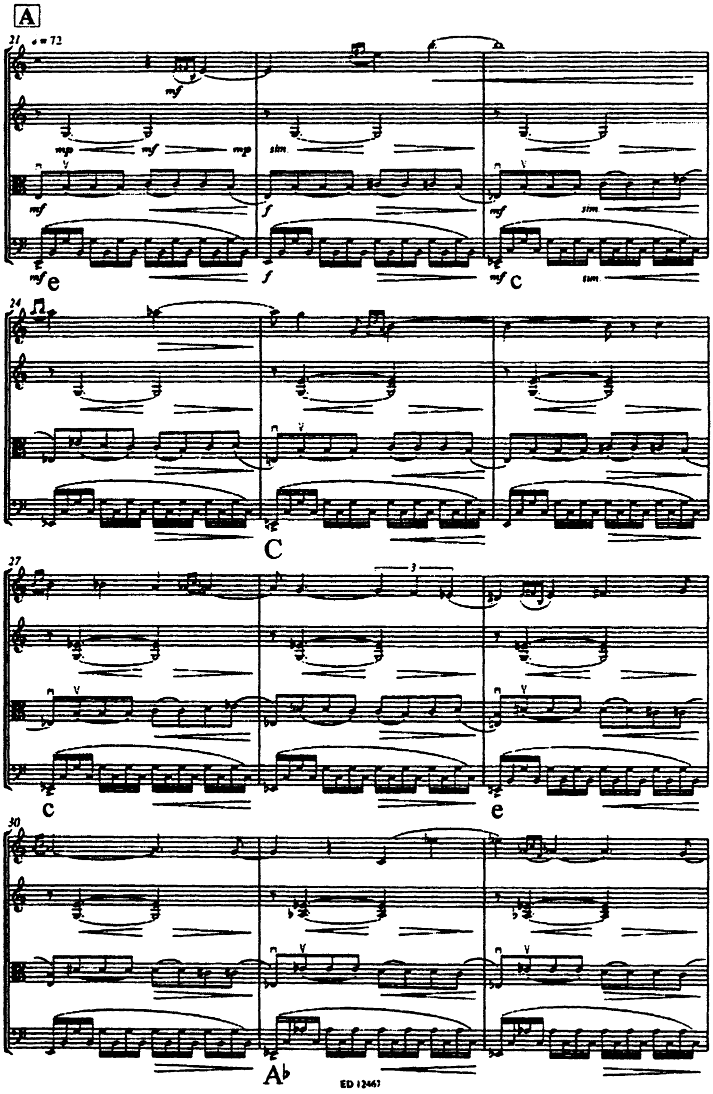
Recent theoretical developments have opened up new perspectives on music in which the principal harmonic structures are major and minor triads. David Lewin (1982-83; 1986), Bryan Hyer (1989) and others showed how certain triadic relations, suggested by the dualist theories of Riemann, can be gathered into a family of transformations that has an elegant structure distinct from that of dominant-tonic tonality. Theorists have also considered special types of voice leading that are associated with these transformations. Naturally, as this neo-Riemannian theory has developed, some inconsistencies have arisen. Different theorists understand different operations as fundamental to their systems (Hook 2002). The voice leadings of interest vary, from a "maximally smooth" variety between triads (Cohn 1996), in which two voices remain fixed and the other moves by semitone, to more generally "parsimonious" types (Douthett and Steinbach 1998), in which any of the voices moves by common tone, semitone, or whole tone. There are also questions about the analytical application of these theories. Analysts have pointed to many instances in the chromatic music of the nineteenth century that can be heard to manifest some of the neo-Riemannian transformations, but these passages tend to be brief and exceptional—they are striking in context (Cohn 2004) but they often lack the "structuring force" one expects of supposedly characteristic gestures (Lewin 1982-83). Scholars are therefore beginning to explore the relevance of the theory to other repertoires. Pop-rock music (Capuzzo 2004), music of the early Baroque, and early twentieth-century works (Lewin 1986, 227-231) look promising, as does some recent art music.

Consider, for instance, Example 1, taken from rehearsal A of the Second String Quartet of the prominent contemporary British

Example 1. Gavin Bryars, Second String Quartet, mm. 21-44.



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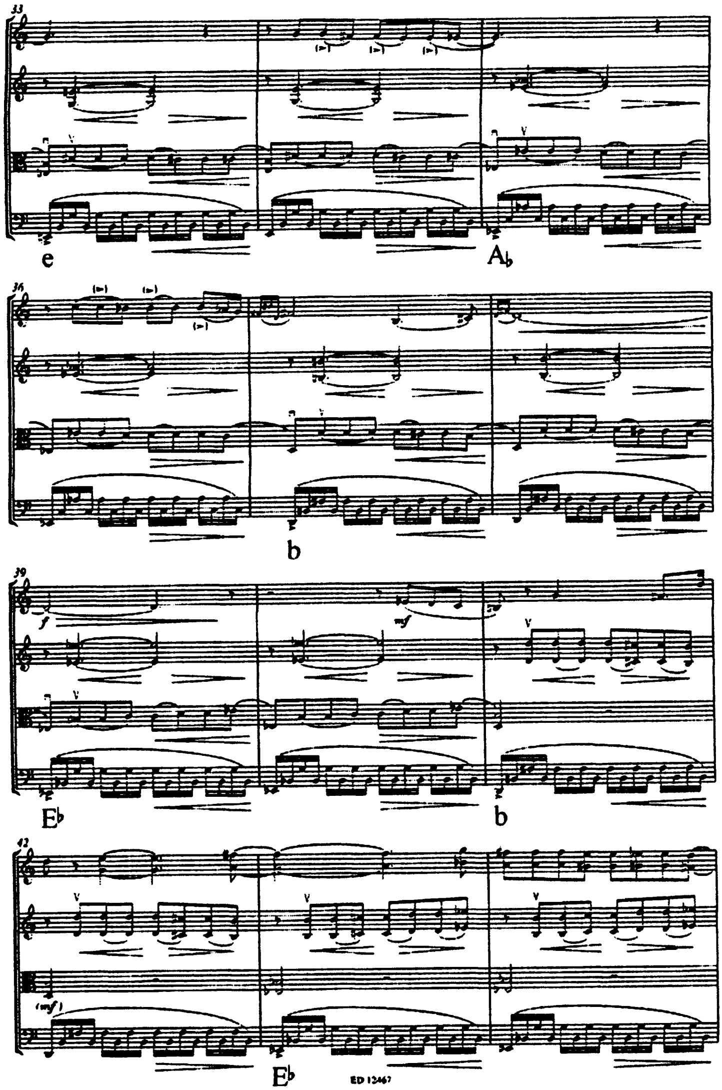
Example 1, contd.



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composer Gavin Bryars (1943-). The cello arpeggiates a series of triads, changing every two measures. This music appears promising for a neo-Riemannian analysis because, although it is consistently triadic, it lacks fifth progressions, and because the chords always connect parsimoniously. Indeed, one survey of Bryars's music describes "progression from one chord ... to the next by ...way of an enharmonic pivot" as a "veritable fingerprint" of the composer's mature style (Thomson 1989, 725). Few of the chord changes, however, directly manifest any of the operations standard to the neo-Riemannian system proposed by Richard Cohn (1996), which change triads from major to minor, or vice versa. For example, the first change of this passage, from E minor to C minor, does not alter the mode (it's not a common tonal progression either). We could understand the change as a *Terzschritt* in the *Schritt*/*Wechsel*-group formulation of Riemannian theory, but that and other *Schritt* operations do not appear in the rest of the passage. Even when mode does change, the standard neo-Riemannian operations provide too complicated an account. For example, the relation of E minor to A♭ major at the bottom of the first score page (mm. 30-31) can be expressed as a "hexatonic pole" relation (Cohn 1996), but it is the product of three basic transformations (PLP), and the progression has none of the "uncanny" connotations that Cohn (2004) attributes to it in the context of nineteenth-century music.

Julian Hook (2002) suggests a way of reconciling the diverse formulations of neo-Riemannian theory and of addressing the problems of its application in musical analysis. He proposes a theory of "uniform triadic transformations" (UTTs) that recasts and subsumes neo-Riemannian transformations within a more general mathematical structure. A UTT is a function that affects all major triads the same way, and all minor triads the same way (but possibly in a different way than major triads). It is represented, as shown in Example 2a, as an operation of the form $<+, n, m>$ or $<-, n, m>$, where the "+" or "–" indicates that the operation preserves or reverses mode, respectively, and the integers n and m indicate the interval of transposition of the root if the triad is major or minor, respectively. UTTs include familiar and less familiar triadic transformations, some of which are listed in Example 2b. (Henceforth in the examples, as shown here, we will use upper case

Example 2a. Julian's Hook's theory of Uniform Triadic Transformations (JMT *46: 57-126).*

A UTT is <u>represented</u> as:

< + , *n*, *m*> or < – , *n*, *m*>

The first entry, + or –, signifies that the UTT preserves or reverses the mode of the triad, respectively.	The second entry signifies the (mod 12 pc) interval by which the UTT transposes the root of a *major* triad to which it is applied.	The third entry signifies the (mod 12 pc) interval by which the UTT transposes the root of a *minor* triad to which it is applied.

Example 2b. Examples of UTTs.

(major triads are symbolized in upper case, minor triads in lower case)

< – , 9, 3>	transforms **C** to **a** and **c** to **E**$^\flat$	(just as does the neo-Riemannian *Relativ* operation).
< – , 1, 11>	transforms **C** to **c**$^\sharp$ and **c**$^\sharp$ to **C**	(just as does the neo-Riemannian "Slide" operation).
<+, 7, 7>	transforms **C** to **G** and **c** to **g**	(just as does transposition by 7).
<+, 1, 6>	transforms **C** to **C**$^\sharp$ and **c** to **f**$^\sharp$	(there is no equivalent neo-Riemannian operation).

to signify major triads and lower case to signify minor triads.)

There are 288 UTTs, and they form a mathematical group: every UTT has an inverse, and the result of combining any two UTTs is another UTT. Certain subsets of them have special properties. Hook defines the Riemannian UTTs as those for which $n = -m$, e.g., $<-, 1, 11>$ (the Slide operation) and $<-, 9, 3>$ (the *Relativ* operation); together they form a group of size 24 that is isomorphic to the 12 *Schritts* and 12 *Wechsels*. Besides them, Hook discovers many other interesting subgroups of the UTT group.

Consider, for instance, the family of UTTs specified in Example 2c. The mode-preserving members of this family are of the form $<+, n, n>$ as the integer n ranges from 0 to 11; they are the twelve transpositions that preserve mode and transpose the roots of major and minor triads identically. The mode-reversing members of the family are of the form $<-, n, n + 11>$ as n ranges from 0 to 11; they include the "mediant-of" transformation (that changes, for example, C major to A minor and A minor to F major) and its inverse the "submediant-of" transformation (that changes, for example, F major to A minor and A minor to C major), but also other less familiar transformations, such as $<-, 6, 5>$, which changes C major to F♯ minor and F♯ minor to B major.

This family has several group-theoretic properties that make it especially suitable for modeling music. It is commutative, because the result of applying two of its transformations is the same regardless of the order in which they are applied. It is simply transitive, because there is only one member of the family that will transform any given triad to another; for instance, only one member of this family, $<-, 2, 1>$ will transform C major to D minor. From a group that is simply transitive, it is possible to construct generalized intervals to measure and compare distances between triads, which usefully constrain analysis. Lastly, it is cyclically generable, in the sense that all the UTTs in the family can be expressed as the repeated application of any one of the mode-reversing operations whose indices sum to 1, 5, 7 or 11. Take, for example, $<-, 9, 8>$, the "mediant-of" transformation that belongs to this group, for which $9+8 = 5$. By applying it repeatedly, one can obtain all twenty-four triads, following the pattern of the chord series shown at the bottom of Example 2c, which appears in mm.

Example 2c. The K(1, 11) subgroup.

The K(1, 11) subgroup consists of all UTTs of the form
<+, *n*, 1**n*> and <–, *n*, 1**n* + 11> as *n* ranges from 0 to 11.

The mode-preserving UTTs in K(1, 11), of the form <+, *n*, 1**n*> = <+, *n*, *n*>, are simply the twelve transpositions:

<+, 0, 0>	<+, 4, 4>	<+, 8, 8>
<+, 1, 1>	<+, 5, 5>	<+, 9, 9>
<+, 2, 2>	<+, 6, 6>	<+, 10, 10>
<+, 3, 3>	<+, 7, 7>	<+, 11, 11>

The mode-reversing UTTs in K(1, 11), of the form <–, *n*, 1**n* + 11> = <–, *n*, *n* + 11>, are:

<–, 1, 0>	<–, 5, 4>	<–, 9, 8>
<–, 2, 1>	<–, 6, 5>	<–, 10, 9>
<–, 3, 2>	<–, 7, 6>	<–, 11, 10>
<–, 4, 3>	<–, 8, 7>	<–, 0, 11>

A 19-chord series generated by < – , 9, 8> (Beethoven, Symphony No. 9, Scherzo):

$\mathbf{C \rightarrow a \rightarrow F \rightarrow d \rightarrow B^{\flat} \rightarrow g \rightarrow E^{\flat} \rightarrow c \rightarrow A^{\flat} \rightarrow f \rightarrow D^{\flat} \rightarrow b^{\flat} \rightarrow G^{\flat} \rightarrow e^{\flat} \rightarrow B \rightarrow g^{\sharp} \rightarrow E \rightarrow c^{\sharp} \rightarrow A}$

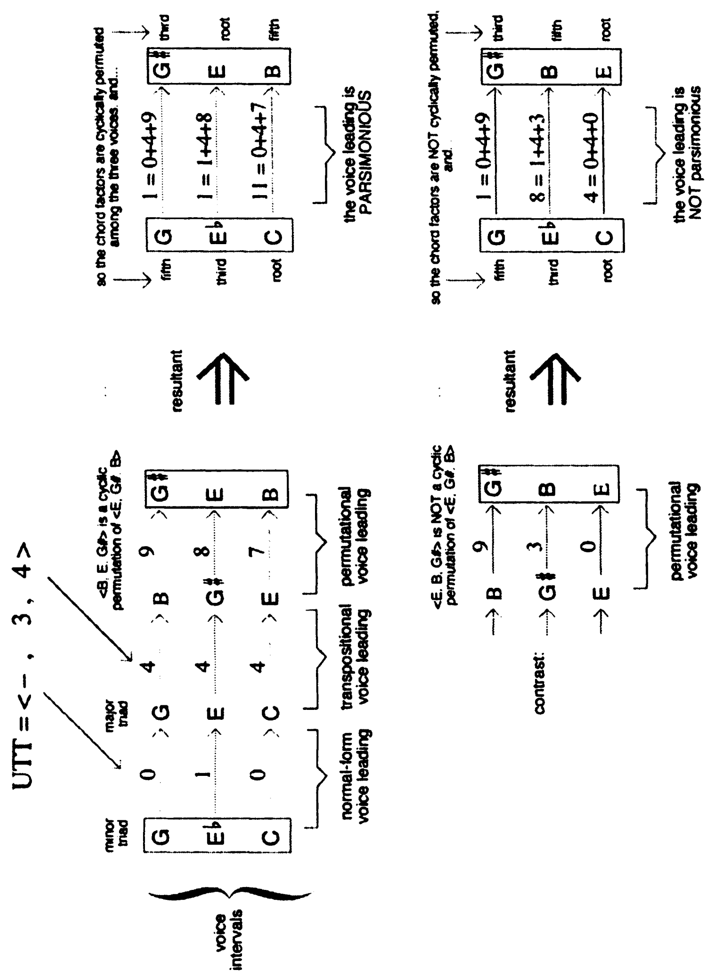
143-171 in the scherzo of Beethoven's Ninth Symphony (first cited in Cohn 1997). Hook shows that only a few families of non-Riemannian UTTs have all these special properties. Each of them contains UTTs of the form < +, *n*, *n*> or < – , *n*, *n* + *b* >, for *b* some odd mod 12 integer, as *n* ranges from 0 to 11, and so Hook refers to them collectively as the cyclic K(1, *b*) subgroups.

Hook's theory brilliantly synthesizes diverse accounts of triadic transformation, folding them into a more general structure. Thus, it has opened up many interesting questions, including the following: Can other UTTs (aside from the neo-Riemannian ones) generate parsimonious voice leading? Are there compositions in which such transformations and their associated voice leading play a prominent, extended role? This paper answers both questions in the affirmative. We will first treat the theoretical question, and then demonstrate how a special K(1, *b*) subgroup accounts for chord progression and voice leading in passages from Bryars's music.

To understand which UTTs can produce parsimonious voice leading, we draw upon an algebraic model of voice leading displayed at the top of Example 3 (Roeder 1984 and 1994). Chords are represented as series of pcs ordered in register. The voice leading between any two chords is analyzed into three components: the "normal-form" voice leading that arises from the fundamental difference of interval structures (if any) between the T_n classes of the chords; the "transpositional" voice leading that reflects the transpositional relation of the actual chords to their normal forms; and the "permutational" voice leading that accounts for how the pcs are redistributed in register with respect to their order in the normal form (Tymoczko 2005a and 2005b consider the relation of chord structure to voice leading in the context of a more powerful and general mathematical space). Hook's representation of a UTT correlates directly to two of these components: the mode-change sign determines the normal-form voice leading, and the transposition numbers determine the transpositional voice leading.

Whether the total voice leading is parsimonious depends on the permutations that are used, and how they combine with the other components. Observe the permutational voice leading component at the top of Example 3. Its intervals derive exclusively from the interval content of the E triad, because each of the voice

Example 3. UTTs and voice leading.



leading intervals connects a pair of pcs that are both members of that pc set. By restricting the total voice leading to the ics 0, 1 or 2, the chord can only be permuted in such a way that the permutational voice leading intervals are nearly the same size. This is only possible when the permutation rotates the pcs through the voices.[1] In the example, the chord <E, G♯, B> (reading from bottom to top) is rotated to become <B, E, G♯>, producing permutational voice leading intervals <7, 8, 9> that are nearly the same size. When they are added (as shown to the right of the example) to the transpositional voice leading intervals <4, 4, 4> and to the voice leading arising from the change from minor to major mode, the result is parsimonious. The cyclic permutation of pcs in the model can readily be heard as the cyclic permutation of chord factors in the progression. In the first chord the root is in the bass, but in the second chord the root is in the next voice higher; in the first chord the highest voice has the fifth of the triad, but in the second chord the fifth has been rotated around, in the same direction as the root, into the bass.

To clarify how the type of permutation affects the possibility of parsimonious voice leading (for major and minor triads), consider another version of the progression at the bottom of Example 3. Let us assume that the normal-form and transpositional voice leading are the same as in the first instance, and examine what happens when the permutational component arises from a reordering that is not a rotation. The example shows that under such a reordering the permutational voice leading intervals vary widely, so there is no way that they can be modified by the other components to create voice leading intervals which are nearly the same.

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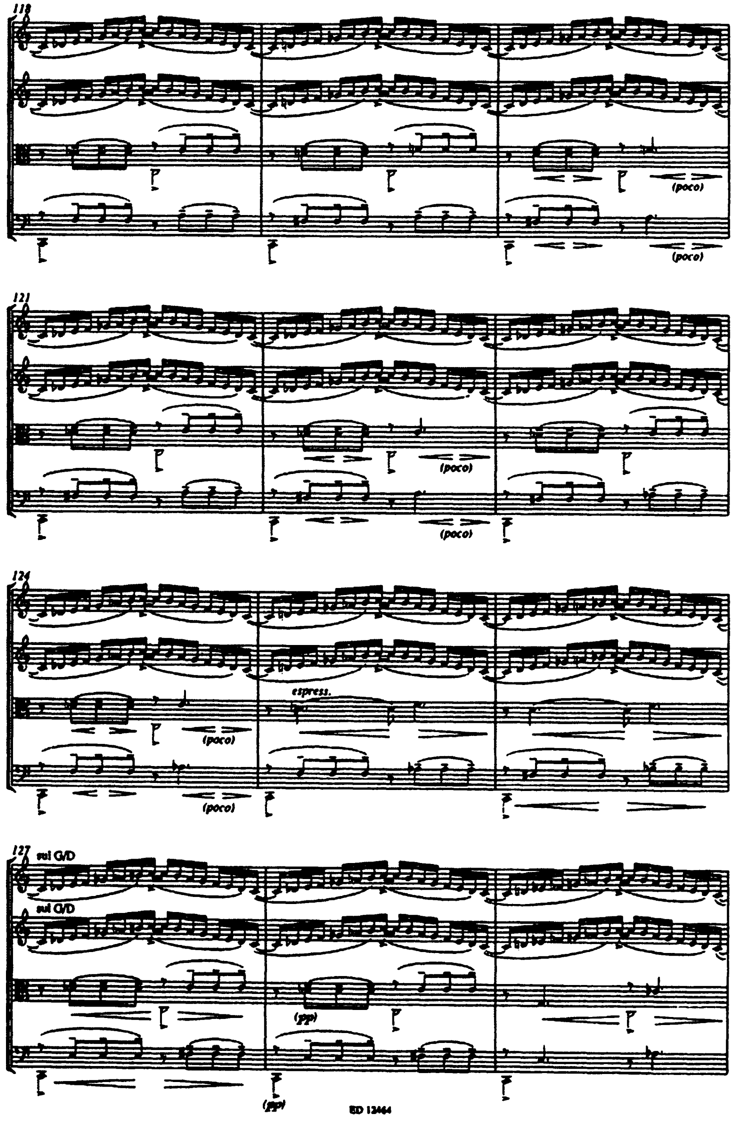
[1] Tymoczko 2005a and 2005b show that, for a very wide range of methods of measuring voice leading size, there is always minimal voice leading between any two pcsets that have no "voice crossings" in pc space. In the model presented in Example 3, neither the normal-form nor the transpositional component will introduce voice crossings into the voice leading. It follows that there is a minimal voice leading between any two chords whose permutational components correspond to rotations. Since the notes of the consonant triad are relatively evenly distributed throughout pc space, the minimal voice leading between any two triads is the only potentially parsimonious voice leading between them.

Carrying on this analysis yields the following results, some of which reformulate familiar facts, and some of which are new:

- All UTTs can support parsimonious voice leading except <+, 6, *n*>, <+, *n*, 6>, <-, *n*, 2>, and <-, 10, *n*>, for any *n* (this is the point of entry into neo-Riemannian transformations for Cohn and others);
- The UTTs involving root change by ics 0, 1, 3, 4, or 5 can support voice leading that involves only ic 0 or 1 melodic motion, including maximally smooth voice leading;
- Only half of the possible permutations can produce parsimonious voice leading, and such voice leading can arise only if the factors of the chords are cyclically permuted among the ordered voices.

These theoretical investigations into UTTs and their voice leading possibilities suggest an analytical application to Bryars's music. Although critics have examined the social, cultural, and political aspects of Bryars's work (Barrett 1995), they have so far given little attention to his compositional procedures. One survey mentions that Bryars's harmonic progressions are "accomplished by way of an enharmonic pivot" (Thomson 1989, 725). This interpretation requires hearing the chords in the context of keys, where one tonal area is "pivoting" to another. We find such prolongational tonality difficult to hear even locally in the Second Quartet (Example 1). More detailed analysis conducted by Richard Bernas goes to the other extreme. He asserts that much of the "harmony" found in the recent works of Bryars is the result of "polyphonic rather than harmonic relationships" (Bernas 1987, 34). Citing Bryars's experience as a jazz double-bass player and improviser, Bernas claims that Bryars's music consists of simpler chord progressions that are "obscured or enriched" by non-harmonic tones (Bernas 1987, 35). We agree that this conception could be used to analyze Bryars's melodies and, more specifically, those tones that seem to stand "outside" of any given harmonic/triadic context. Consider Example 4, a passage from Bryars's First String Quartet (1985). Bernas calls attention to the C-to-C scales played by the violins. They are constantly being inflected with different accidentals, beginning with a flattened 2nd, *Example 4. Gavin Bryars, First String Quartet, mm. 118-129.*



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followed by a flattened 5th, then a flattened 2nd and flattened 5th together, and so on. Bernas says, "the permutation of these scales, winding slowly up and down over a fairly static ground of pedal Cs and harmonized in blissfully non-functional ways, creates the most bewildering and hypnotic experience in Bryars's recent music" (Bernas 1987, 40). Although we find the scalar analysis plausible, we seek a more systematic basis for these "blissful" progressions, a basis in which they could be heard as functional.

There are many passages in Bryars's music where at least one of the instruments provides harmonic support which is almost exclusively triadic (for example, the Cello Concerto and the String Quartets 2 and 3). Furthermore, the chord-sequences that are developed within these sections often demonstrate voice leading that is exclusively parsimonious. The combination of these two factors strongly suggests the possibility of an analysis that involves UTTs.

To explore this possibility, let us now examine the Second String Quartet (1990) in more detail. The first and fourth sections present very similar textures and chords. Each section begins with the same three-note chord {E♭, B♭, F} (the chord that also ends the work) which then proceeds into a harmonic progression that is untraditional but that changes root and mode in a way that can be described elegantly in terms of UTTs.

In the first section, shown in Example 5, a repeated rhythm of an eighth-note followed by a longer duration announces the change from one triad to the next. The first triad presented in this way is F♯ minor (m. 3), and the root of the chord that follows (B♭ minor) is 4 semitones above it. If we read the opening chord as E♭ minor, as suggested by the resolution of the F to G♭ between violin II and violin I, then we can hear an ascending-fifth root-progression between the first and third chords with no change of mode. This hearing is confirmed by the subsequent music: two chords after the B♭ minor triad there is an F minor triad, followed two chords later by a C minor triad that is followed two chords later by a G minor triad. The same ascending-fifth progression of minor triads is demonstrated briefly between the fourth and sixth chords of the section (F♯ minor and C♯ minor). Beginning on the seventh chord of the section (C minor), another progression becomes apparent, in which the roots of the chords change alternately by major and

Example 5. The first section (mm. 1-20) of Bryars's Second String Quartet.

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minor thirds (+4 semitones, +3 semitones), and the modes of the chords alternate between major and minor. Since this second progression maintains the transposition by ascending-fifth that is apparent in the earlier part of this passage, we are inclined to regard all these triadic changes as part of a single, coherent transformational system.

Such a system is evident in one of the special groups of UTTs that Hook labels K(1, *b*) described earlier. The ascending-fifth relationship that occurs between every second chord can be labeled <+, 7, 7>, a mode-preserving transformation that transposes the roots of both major and minor triads by 7 semitones. The mode reversals and root changes by alternating major and minor third that occur between the final four chords of the section can all be labeled <–, 3, 4>, a mode-reversing transformation that transposes the roots of major triads by 3 semitones, and the roots of minor triads by 4 semitones. Of the K(1, *b*) subgroups of the UTT group, we find that only one, K(1, 1), contains both <+, 7, 7> and <–, 3, 4>. Example 6 lists all of the members of this subgroup. The mode-preserving members are the twelve transpositions, and each mode-reversing member transposes the roots of all major triads by *n* and the roots of all minor triads by *n* + 1.

Example 6. Members of the simply transitive K(1, 1) group.

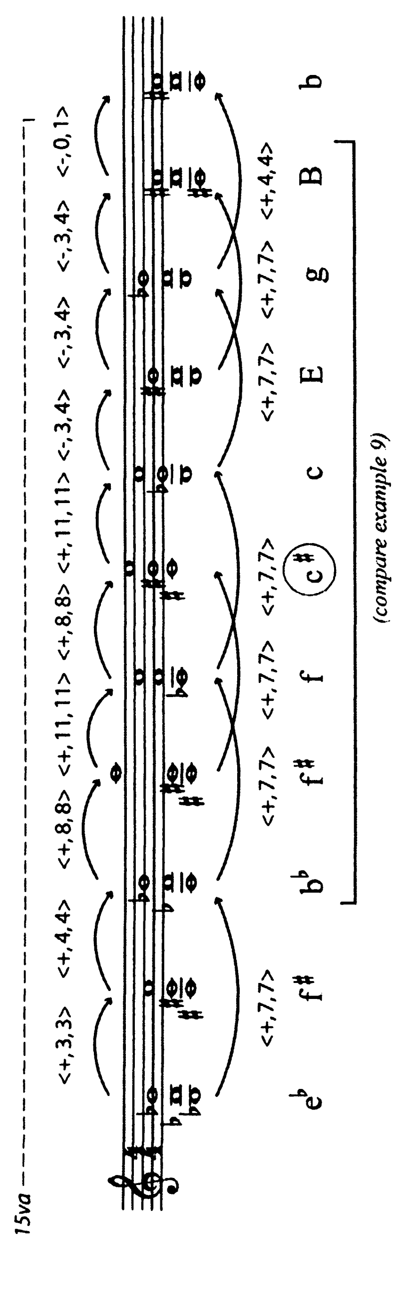
<+,0,0>	<-,0,1>
<+,1,1>	<-,1,2>
<+,2,2>	<-,2,3>
<+,3,3>	<-,3,4>
<+,4,4>	<-,4,5>
<+,5,5>	<-,5,6>
<+,6,6>	<-,6,7>
<+,7,7>	<-,7,8>
<+,8,8>	<-,8,9>
<+,9,9>	<-,9,10>
<+,10,10>	<-,10,11>
<+,11,11>	<-,11,0>

It is easy to see that these operations include an identity element and inverses. The identity operation is <+, 0, 0>. Every mode-preserving operation has an inverse (for example, the inverse of <+, 7, 7> is <+, 5, 5>), and every mode-reversing member also has an inverse (for example, the inverse of <–, 3, 4> is <–, 8, 9>). The set of operations is also closed, as can be observed in Example 7, which analyzes the entire first section using only members of K(1, 1). The product of any two transpositions results in another transposition; here, for instance, <+, 8, 8> and <+, 11, 11> compose to <+, 7, 7>. Similarly, the product of any two mode-reversing operations makes a transposition. For example, between the last three chords of this section, the composition of <–, 3, 4> with <–, 0, 1> results in <+, 4, 4>, the inverse of the <+, 8, 8> that transforms the third chord to the fourth chord. More generally, Example 7 asserts that during this passage there is a characteristic transformation, <+, 7, 7>, that is articulated into two successive transpositions during the first half of the passage, and into two successive mode-reversing operations during the second half of the passage, such that all operations belong to K(1, 1).

With this analysis in mind let us now return to the passage we introduced in Example 1. Example 8 provides a reduction of the progression as it occurs between measures 21 and 76. It begins on an E minor triad that is arpeggiated in the cello. This harmony lasts for two measures, as does each of the following harmonies. We hear this passage as an exposition of the generative power of the UTT <–, 3, 4> that was introduced towards the end of the first section. The analysis below the score shows that essentially all the chords of the passage are produced by the repeated application of this UTT. In effect, the reiteration is now asserting <–, 3, 4>, instead of <+, 7, 7>, as the characteristic gesture of the piece.

There are only two anomalies, indicated by asterisks above the score. Before the opening E minor triad proceeds by <–, 3, 4> to A♭ major, there appear C minor and C major triads. Example 9 shows how this succession can be analyzed transformationally using operations in the K(1, 1) group that were exposed in the first section. E minor proceeds to C minor by the same transposition, <+, 8, 8>, that changed B♭ minor to F♯ minor near the beginning of the first section. The following alternation of C minor and C

Example 7. *Analysis of the first section using UTTs from K(1, 1).*



Example 8. Analysis of mm. 21-76 of Bryars's Second String Quartet.

e c C c e A♭ b E♭ f♯ B♭ c♯ F a♭ C e♭ G b♭ f♯ f A c E g B

(D)

PARSIMONIOUS voice leading within the registral voices

PARSIMONIOUS voice leading, but mostly implicitly, between registral voices

PARSIMONIOUS voice leading again within the registral voices between chord pairs

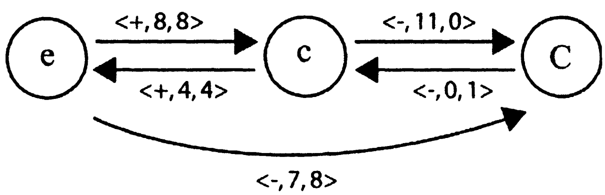
Triads generated by reiteration of the UTT <-, 3, 4> alone:

f♯

sub for

e A♭ b E♭ f♯ B♭ c♯ F a♭ C e♭ G b♭ D f A c E g B major involves the UTT <–, 0, 1> that changed B major to B minor at the end of the first section. We also hear the UTT <–, 7, 8>, which implicitly connects E minor to C major, as a preparation for subsequent events.

Example 9. Transformational analysis, using K(1, 1) operations, of mm. 21-30.

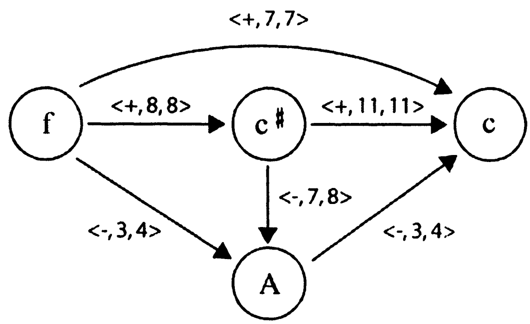


After E minor returns, as shown in Example 8, the reiteration of <–, 3, 4> generates successive chords in the section up through B♭ minor, and from F minor to the end of the passage. The <–, 3, 4> chain is broken by F♯ minor, which follows B♭ minor, and which is highlighted with an asterisk on the example. That chord also initiates a nearly exact repetition of the chord-series that appeared in the first section, as shown by brackets above the example. We did not hear the first section as generated by <–, 3, 4>, but its repetition in this context suggests that a <–, 3, 4> chain underlies it. This possibility is strengthened by the one difference between the two passages, which is circled on Examples 7 and 8: the substitution of A major for C♯ minor. (Chord-substitution is identified by Bernas 1987 [35] as characteristic of Bryars's harmonic writing.) As shown in Example 10a, A major relates by <–, 3, 4> to the preceding F minor and succeeding C minor, and it relates to the original F♯ minor by the same K(1, 1) UTT, <–, 7, 8>, that transformed E minor to C major at the beginning of this section.

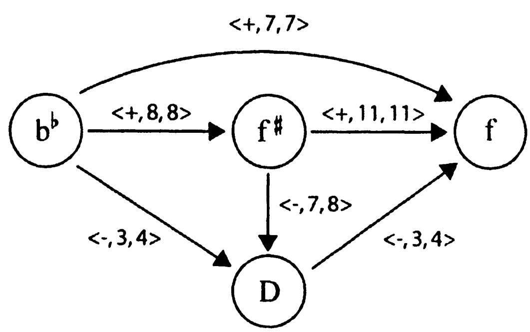
This interpretation suggests a way of understanding the F♯ minor chord that interrupts the otherwise unbroken <–, 3, 4> chain. Example 10b gives a transformational network with the same graph as Example 10a, but with different triads as the contents of the nodes. It asserts that F♯ minor can be heard, via a

K(1, 1) transformation, to stand for a D major triad that would continue the <–, 3, 4> chain, exactly analogous to the relation of C♯ minor and A major in Example 10a.

Example 10a. The substitution of A major for c♯ minor during Reh. B restarts the <-,3, 4> chain.



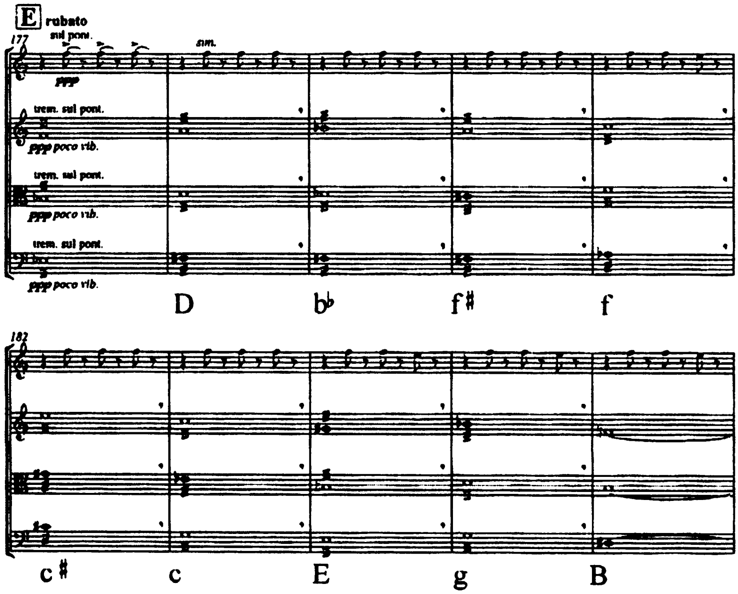
Example 10b. The f♯ minor stands for D major in a <-,3, 4> chain.



Considering this substitution, then, we can hear the reiteration of the UTT <–, 3, 4> throughout Example 8, strongly confirming our reading of its presence during the first section. The series exposes 20 out of the 24 possible triads in the complete cycle, one chord more than the mediant cycle in the Beethoven passage that Hook and Cohn cite. The comparison is worth considering further. Although <–, 3, 4> does not produce familiar tonal successions, it is a cognate of the Scherzo's mediant transformation, <–, 9, 8>, in three senses: it changes mode while alternating root transpositions of minor and major thirds; its square is transposition by ic 5; and it is ideally suited for parsimonious voice leading, as demonstrated formally by the first half of this paper. Indeed, Example 8 shows that a tripartite formal structure can be discerned in this passage by attending to how the parsimonious voice leading associated with these UTTs is manifested in register. During rehearsal A, small intervals are evident between the registral voices of the chords. As the texture changes at rehearsal B, interval classes 0, 1, and 2 are manifested mostly across the registral voices, not within them. For example, moving from the F♯ minor 6/3 triad to the B♭ major 6/4 triad, we can hear the pc C♯ changing by ic 1 to the pc D, but those pcs occupy different registral positions in their respective chords. Toward the end of the passage, however, the parsimonious voice leading reappears within the registral voices of chord pairs, while between pairs the leaps in registral voice leading call attention to the <+, 7, 7> transformations, with the parsimony only implied. The passage shuns the three K(1, 1) transformations, <-, 1, 2>, <-, 10, 11>, and <+, 6, 6>, that do not permit parsimonious voice leading.

Finally, let us consider the fourth section of the Second Quartet. The score is shown in Example 11 and our analysis in Example 12. This section, too, nearly replicates the chord progression from the first section. The difference is the second chord, which is D major rather than F♯ minor. This is precisely the substitution we intuited for the F♯ minor during rehearsal B, as analyzed in Example 10b. The remainder of the fourth section repeats the corresponding chords of the first section. But keeping in mind the substitutions just confirmed, we can now hear F♯ minor and C♯ minor as substituting for D major and A major, respectively. Accordingly we can now understand the passage as generated entirely by a repeated <–, 3, 4>, the same UTT that generated the chord succession in mm. 21-76.

Example 11. The beginning of the fourth section (mm. 177-186) of Bryars's Second String Quartet.



Bryars STRING QUARTET #2
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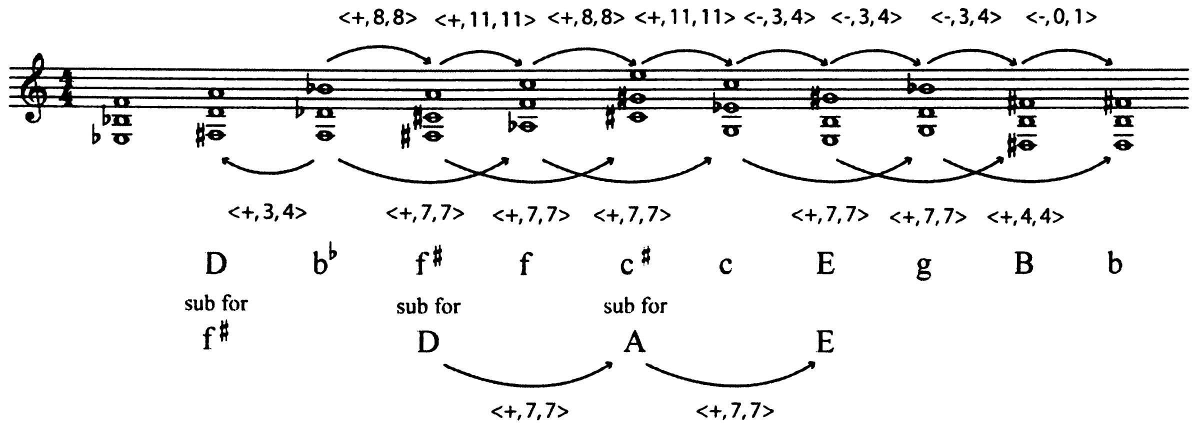
Example 12. Analysis of the fourth section using UTTs from K(1, 1).



<-, 3, 4> path created by chord substitutions in fourth section:

b♭ D f A c E g B

(compare examples 8 & 9)

This analysis demonstrates that Bryars's harmonies are not to be dismissed simply as non-functional sonorities. Supported by Hook's theory, it shows that their "blissfulness" can instead be conceived as the result of a coherent, simply transitive transformational system. One particular transformation is established as a characteristic gesture, and all chord changes in the music result from the action of the operations in this system, which thus provides a context to hear them as functional. The parsimonious voice leading apparent in the music is a systematic, not arbitrary, consequence of the transformational system Bryars employs.

References

Barrett, Richard. 1995. "Avant-Garde and Ideology in the United Kingdom Since Cardew," in *New Music: Aesthetics and Ideology/Neue Musik: Ästhetik und Ideologie*, ed. Mark Delaere, 170-81. Wilhelmshaven: Noetzel.

Bernas, Richard. 1987. "Three Works by Gavin Bryars," in *New Music* 87, ed. Michael Finnissy and Roger Wright, 34-42. New York: Oxford University Press.

Capuzzo, Guy. 2004. "Neo-Riemannian Theory and the Analysis of Pop-Rock Music." *Music Theory Spectrum* 26/2: 177-200.

Cohn, Richard. 1996. "Maximally Smooth Cycles, Hexatonic Systems, and the Analysis of Late Nineteenth-Century Triadic Progressions." *Music Analysis* 15: 9-40.

———. 1997. "Neo-Riemannian Operations, Parsimonious Trichords, and Their *Tonnetz* Representations." *Journal of Music Theory* 41: 1-66.

———. 2004. "Uncanny Resemblances: Tonal Signification in the Freudian Age." *Journal of the American Musicological Society* 57/2: 285-323.

Douthett, Jack and Peter Steinbach. 1998. "Parsimonious Graphs: A Study in Parsimony, Contextual Transformations, and Modes of Limited Transposition." *Journal of Music Theory* 42/2: 241-263.

Hook, Julian. 2002. "Uniform Triadic Transformations." *Journal of Music Theory* 46: 57-126.

Hyer, Brian. 1989. "Tonal Intuitions in 'Tristan and Isolde'." Ph.D. diss., Yale University.

Lewin, David. 1982. "A Formal Theory of Generalized Tonal Functions." *Journal of Music Theory* 26: 23-60.

———. 1982-1983. "Transformational Techniques in Atonal and Other Music Theories." *Perspectives of New Music* 21: 312-71.

———. 1987. *Generalized Musical Intervals and Transformations.* New Haven: Yale University Press.

Roeder, John. 1984. "A Theory of Voice Leading for Atonal Music." Ph.D. diss., Yale University.

———. 1994. "Voice Leading as Transformation." In *Musical Transformation and Musical Intuition: Essays in Honor of David Lewin*, ed. Raphael Atlas and Michael Cherlin, 41-58. Roxbury, MA: Ovenbird Press.

Thomson, Andrew. 1989. "The Apprentice in the Sun: An Introduction to the Music of Gavin Bryars." *The Musical Times* 130/1762: 724-728.

Tymoczko, Dmitri. 2005a. "Voice Leadings as Generalized Key Signatures." *Music Theory Online* 11/4. Retrieved 24 November 2005 from http://societymusictheory.org:16080/mto/issues/mto.05.11.4/mto.05.11.4.tymoczko.pdf.

———. 2005b. "The Geometry of Musical Chords." Retrieved 24 November 2005 from http://music.princeton.edu/~dmitri/voiceleading.pdf.