

PROLONGATIONAL SIGNALING IN SEMANTIC AND SYNTACTIC CONTEXT:

THREE MOD7 ANALYSES

by

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Prolongational Signaling in Semantic and Syntactic Context:

Three Mod7 Analyses

Introduction

In this paper, a new system of notation for ordered and unordered mod7 step-class sets will be presented and applied to Chopin's Prelude No. 4 in E Minor, Op. 28; Bach's Prelude No. 1 in C Major from *The Well-Tempered Clavier*, Book I, BWV 846; and Shostakovich's Prelude XIV in E-flat Minor from *24 Preljudii*, Op. 34. This analysis will also show how linear progression can be expressed through the use of both ordered and unordered mod7 sets.

Modulo 7 Set Theory

In his article "Analysing Post-Tonal Diatonic Music: A Modulo 7 Perspective,"¹ Matthew Santa reviews a system of set theory in which there are only seven numbers (0 to 6), with each number corresponding to a note letter (a "step-class") rather than to a specific pitch. Sets are derived from expanded diatonic collections and consist of scale degrees. For example, the same number would represent C-flat, C-natural, and C-sharp. There is still an orientation around a tonic pitch; however, the relationships between step-classes or sonorities are not necessarily established by traditional means (i.e., tertian chords or functional

¹ Matthew Santa, "Analysing Post-Tonal Diatonic Music: A Modulo 7 Perspective," *Music Analysis* 19 (2000): 167-201.

harmonic progressions). In mod7 set theory, patterns that occur within a diatonic framework are recognized more easily than they might be in a mod12 system.

The mod12 analysis shows Figure 1i as (0257), while Figure 1ii is a (0156) set. Although the two examples are clearly transpositions of the same pattern within a scale, their relationship and similarities are not apparent in mod12.

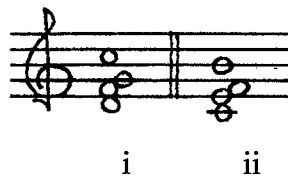


Figure 1

In mod7, however, both are (0134) sets.

Equivalence of step-classes might simplify some collections to such an extent that their aural differences are not recognized, however. This is done to indicate the step-class similarities between sets. There are only eighteen possible mod7 sets to represent all music that might be analyzed utilizing this system. Mod7 interval vectors potentially become more misleading in terms of color and true intervallic content, because there are only three interval classes (2nds/7ths; 3rds/6ths; and 4ths/5ths). The same mod7 set can represent two groups of pitches that are starkly contrasting – aurally, functionally, or both.

A hybrid system of mod12 and mod7 would help reconcile these issues by incorporating the desirable qualities of each into its symbology and, therefore, its analysis. Rather than being based on several norms that vary between analyses and works, the system

which will be presented in this paper utilizes simple symbols to indicate intervals between adjacent step-classes within a set.

Interval Symbols

Step-class sets are derived by expressing spatial relationships between adjacent step-classes within a set through the inclusion of what will be called “interval symbols.” The step-classes are still represented by the numbers 0 to 6, where 0 is the base pitch of the set.

The interval symbols are as follows:

- 1.) If the interval between two step-classes x and y is a major or perfect interval, a dash will be placed between the step-classes, as $(x-y)$.
- 2.) If this interval is decreased by one half-step, then the dash will be omitted, and the step-classes will not be separated by any symbol, as (xy) .
- 3.) If this interval is decreased by yet another half-step (lowered by one whole-step), a slash will be placed between the step-classes, as (x/y) .
- 4.) If the interval represented by $(x-y)$ is increased by one half-step, an additional parallel dash will be added, as $(x=y)$.
- 5.) Any further half-step increase or decrease will be indicated by an additional slash or parallel dash (a major or perfect interval lowered by three half-steps, then, is $(x//y)$).

For instance, Figure 2 would be represented as (0-2), as the interval between C and E is a major 3rd,



Figure 2

whereas Figure 3 is a (02) set: a minor 3rd.

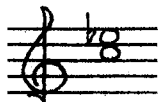


Figure 3

A diminished 3rd, Figure 4, is (0/2):

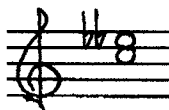


Figure 4

And Figure 5, an augmented 3rd, (0=2):

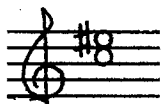


Figure 5

The interval symbols within sets express the distance between adjacent step-classes within a set, not the distance of each step-class from the base pitch. Figures 1i and 1ii are shown again:

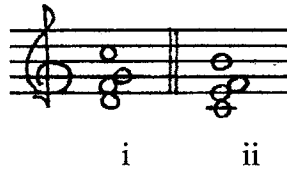


Figure 1

In the new system, both are still generic [0134] mod7 sets. However, with the inclusion of interval symbols, Figure 1i is a (0-13-4) set, while Figure 1ii is a (01-34) set.

Through the use of interval symbols, the exact intervallic content of a set is shown, along with its step-class content. The most significant aspect of this hybrid system of mod7 is that two sets can be recognized as similar, but not the same.

The new system does still offer a means to directly compare step-class content alone. This is done by generic sets, indicated by brackets instead of parentheses. Generic sets correspond to traditional mod7 sets in that no interval symbols are used. For example, (0-13-4) and (01-34) are different specific sets, but are both [0134] generic sets.

Transpositional Degrees

A diatonic collection, unlike a chromatic one, inherently lends structural importance to one pitch over the others, even if this orienting pitch is not reinforced through the same hierarchies enjoyed by its tonal counterpart. It is therefore necessary to show each set's relationship to the work's orienting pitch in some manner. This relationship will be represented by "transpositional degrees," superscript or subscript numbers which are written after the closing parenthesis of each set. The number of the transpositional degree is the scale degree number of the set's base pitch.

For example, the transpositional degree for Figure 6i in a work in C Major is 1, because the base pitch is C. Example 6ii has transpositional degree 7, as the base pitch is B.



i ii

$(0-13)^1$ $(01-3)^7$

Figure 6

The transpositional degree is superscript if the set's best normal order is prime form; it is subscript if the set must be inverted. In this way, sets can be translated into actual pitches, instead of only their intervallic patterns. Transpositional degrees will also be given any necessary accidentals to show chromatic inflection of the set's pitch base.

This system of mod7 is based on the idea that true intervallic content is as important to a clear analysis as are step-class patterns. Therefore, mod12's six specific interval-classes are more desirable than mod7's three generic interval-classes.

Unordered Sets

Unordered sets also utilize interval symbols; the step-class numbers in unordered sets are the scale degrees. When a vertical sonority is analyzed, the set begins with the lowest sounding pitch. The unordered mod7 set for the first chord in Chopin's Prelude No. 4 in E Minor, Op. 28, is expressed as (3-5-1-5):



Figure 7: Unordered set of opening sonority, Chopin Prelude No. 4, Op. 28

Linear progression can be expressed easily through unordered mod7 sets. The proposed system for unordered sets works much like figured bass, but is more specific because it reflects voicing and exact intervals, and because it does not imply Common Practice Era functionality. An unordered mod7 analysis of the opening measures of the Prelude shows the linear progression from an E minor chord on the first beat to the A minor

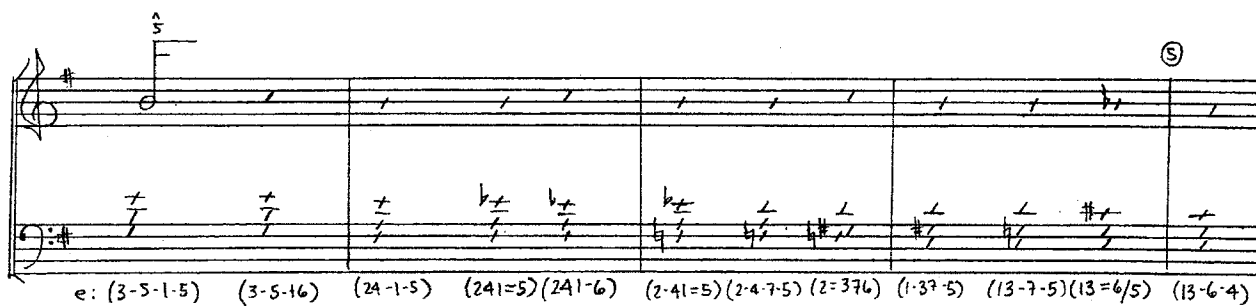


Figure 8: Unordered sets, mm. 1-5, Chopin Prelude No. 4, Op. 28

One can see the linear movement throughout the excerpt, along with what voices change in each chord, and if any pitches are doubled.

From the first to the second sonority, the melodic line moves up one step-class; specifically, from a perfect 5th with the second highest voice to a minor 6th, which indicates

half-step motion. The entire melody is shown to move between the dominant and submediant pitches, followed by a descent to the subdominant.

The tonic pitch is a common tone for seven consecutive sonorities, and is always in the second highest voice. It is interrupted in the third measure and then is held in the lowest voice from measure 4 to measure 5. The directed linear motion in the lowest voice is also apparent, descending from the 3rd scale degree to the 2nd, and ending on the 1st. Also, the two lowest voices are shown to maintain the interval of a major or minor 3rd (or an enharmonic equivalent) throughout the excerpt.

Further linear and voicing observations can be made for any piece. Voicing, doubling, and reinforcing intervals, indicated through unordered mod7 sets, could potentially help to determine a possible root for a sonority as well.

If there is an octave gap between two pitches, this compound interval is expressed by a comma before any applicable interval symbols. Multiple octave gaps are indicated by the number of commas corresponding to the number of gaps.

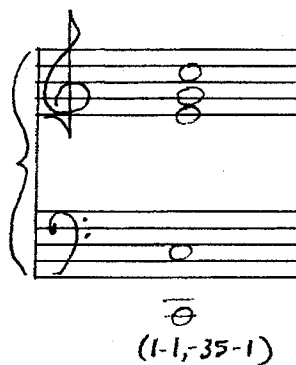


Figure 9

“Identical,” “Same,” “Altered,” and “Elaborated”

In certain occasions, musical context implies that a set is related to another. There must be appropriate terminology to distinguish different possible relationships between sets. Two sets are **identical** if the second contains the same transpositional degree and possesses the same unordered set:

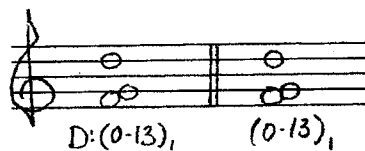


Figure 10

If two collections have the same ordered set but not the same voicing and/or transpositional degree, the sets are the **same**:

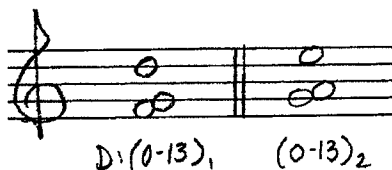


Figure 11

If a set is related to another by context but contains one variant pitch, the new set is an **altered** version of the earlier set:

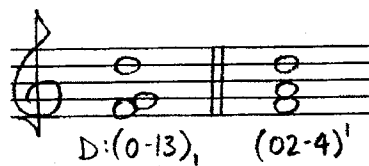


Figure 12

If a new set is related to a previous set but contains additional pitch-classes, the new set is an **elaborated** version:

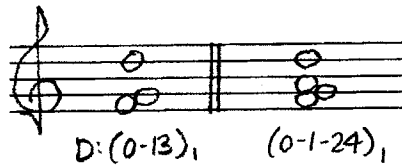


Figure 13

Obviously, any specific changes (transpositions, alterations, and/or additions) should be noted in the discussion of the analysis.

Chopin – Prelude No. 4 in E Minor, Op. 28

In “Musical Genre and Schenkerian Analysis,” London and Rodman discuss the arguments for both 3- and 5-line analyses of Op. 28, No. 4, and explore the possibility that the lack of clarity in supported pitches is caused by the implied incompleteness of a prelude.² A mod7 analysis in combination with a Schenkerian graph will show how the placement of specific sets can be seen and/or heard as signaling initial changes in the prolonged scale degrees of the Urlinie. Often, these new sonorities defy Roman Numerals, while a mod12 analysis would not indicate a tonal orientation, nor would it indicate the quality of a triad. The graph of the background descent, Example 9, is given on the next page.

A Hybrid Urlinie

The choices for pitches of the background descent in this paper do not correspond completely with those of Schachter and Forte/Gilbert presented by London and Rodman. Rather, it is a combination of Schachter and Forte/Gilbert, with amendments proposed by London and Rodman. In their paper, London and Rodman question both graphs with respect to the movement to the 3rd and 2nd scale degrees. Both the Schachter and the Forte/Gilbert analyses place scale degree 3 in measure 21, but London and Rodman cite the strong influence of and support for the 2nd scale degree by measure 18.³ To support this

² Justin London and Ronald Rodman, “Musical Genre and Schenkerian Analysis,” *Journal of Music Theory*, 24 (1998): 101-124. *JSTOR*, 2006, 5 Nov. 2006, <<http://www.jstor.org.ezproxy.tcu.edu/search>>.

³ London and Rodman, 105 & 109.

interpretation, they present Schenker's own sketches of Prelude No. 4, in which he uses open note-heads (presumably indicating prolongation) for the F#s in measures 16 and 18; the latter being in the obligatory register.⁴

If the 2nd scale degree is in force in measure 18, then obviously scale degrees 4 and 3 must be articulated before then. The hybrid analysis presented in this paper shows the 4th scale degree articulated on the downbeat of measure 17 in an inner voice (but in the obligatory register). Scale degree 3 is articulated within the second beat of the same measure, but an octave higher than expected.

Unordered Sets as Indicators of Prolongation

The unordered sets for the articulations of the Urlinie pitches reinforce the new interpretation. Each set shows the prolonged pitch in the top voice. The fact that all Urlinie pitches are initially stated without covering is significant, and easily visible through unordered mod7 sets:

	m. 1	m. 9	m. 17	m. 18	m. 25
Prolonged Pitch	$\hat{5}$	$\hat{4}$	$\hat{3}$	$\hat{2}$	$\hat{1}$
Unordered Set	(3-5-1-5)	(6-1-4-4)	(3-5-1-3)	(5-1-5-2)	(1-1-13-5-1)

Table 1: Unordered sets of initial articulations of the Urlinie

The second prolongation of $\hat{4}$ in measure 17 is also interesting from an unordered set perspective. The texture increases to nine pitches per unit time; this is the first time in the

⁴ London and Rodman, 118.

prelude where more than four voices are present. Such a drastic change in texture can indicate an important moment in the music.



Figure 14: Second articulation of the 4th scale degree

The final two measures once again exhibit a thicker texture, which now helps to signal the movement to closure. This further unifies measures 24 and 25 with the rest of the prelude, now from a syntactic perspective through the similar texture. Semantic sensibility is also expressed in the use of texture as an agent of change to the Uralinie.

■ PRELUDE 4 IN E MINOR

Largo

espress.

5

9

13

17

21

stratto

dim. *P*

smorz.

pp

coll.

Example 1: Chopin, Prelude No. 4 in E Minor, Op. 28 (annotated score)

Ordered Sets

The 5th scale degree is engaged with the first sonority, an E minor chord in first inversion: a (02-4)¹ set. The next sonority occurs on the upbeat of the second half of measure 1, and is a (01-35)⁵ set. Interestingly enough, the transpositional degrees of these two sets implies a tonic-dominant relationship. Although in a strictly “tonal” analysis this sonority would be considered a simultaneity resulting from a non-chord tone in the melody over a sustained tonic triad, it is the aim of this paper to show that Chopin’s placement of such “nonfunctional” chords actually provides functional insight into the background descent within the prelude.

After the 5th scale degree, each initial engagement of the prolonged pitches of the Urlinie is either directly preceded or followed by an entirely new specific mod7 set. (Scale degree 5 is not introduced or followed by a familiar set, as the first sonority of a piece cannot be considered familiar, and because the second sonority is not a transposition of the first.)

The 4th scale degree is most strongly supported in measure 9, before the interruption, although it begins to be prolonged a few measures earlier. In measure 9, the preceding set is also a generic [0135] set, but the species (013-5) has never occurred before. The A is then articulated in a (02-4)⁴ set: a first inversion A minor triad. Of course, this is not the chord that harmonically supports the prolongation; the B7 with a 4-3 suspension comes along in the next measure. However, the actual prolonged pitch is stated with the (02-4) set (which does still function as local support). This is the same specific set which originally supported the 5th scale degree. Furthermore, the unordered sets for both the articulation of scale degrees 5 and 4 are similar (both are triads in first inversion).

The re-engagement of the 5th scale degree in measure 13 and the 4th scale degree in measure 17 are not examined in terms of a new mod7 set announcing their prolongations, as they have already been heard before the interruption. Since the prolongation is not new, it does not require a new heralding set.

Like $\hat{4}$, the G in measure 17 is preceded by a [0135], but one which is a new specific set that has not appeared before: (01-3-5). The G is then engaged above a (02-4)¹ set. Although this is a first inversion tonic triad, which is not considered as an adequate support in strict Schenkerian analysis, the situation can either be considered an exception to the rule, or an E can be implied in the bass, as has often been done to show the support for the 5th scale degree at the beginning of the prelude.

Conversely, in measure 18, the F# is actually engaged in a new set: (0-1-4)¹_{or5}, which is immediately followed by two familiar sets: first, a (0-135)¹, which moves quickly to a (02-4)⁴ (another A minor triad in first inversion). These three sets are the only sonorities from measure 18 to measure 20, and each of the remaining five measures of the prelude contain at least one of these specific sets. It is during the prolongation of the F# (measure 20) that the first (0-24) of the piece, the major triad, occurs, which interrupts the repetition of the three aforementioned sets.

The final descent to tonic, engaged by the final sonority, is a synthesis of the most significant sets of the piece. The last four sets are:

$$(0-135)^1 \quad (0-1-4)^1_{or5} \quad (0-24)^5 \quad (02-4)^1$$

Here, there is a recollection of the generic set associated with scale degrees 5, 4, and 3, which is also part of the prolongation of the 2nd scale degree. This [0135] set is then followed by the specific set which was first introduced with scale degree 2 as well, (0-1-4)¹_{ors}.

The final two chords not only provide the necessary dominant-to-tonic movement for closure, but are also the two most common species of [024] in the prelude. The (02-4) set, the minor triad, occurs throughout the piece, while the (0-24), the major triad, only appears in the final six measures. The combination of these sets begins to take shape in those final six bars, where (0-24) and (02-4) are articulated one after the other for the first time in measure 22. Those two sets, however, have the same transpositional degrees (the same root, in this case), which signals a kind of split in the [024], where (0-24) starts to assert itself. It is once again subordinated by the (02-4) set in the final measure, the only other instance in which (0-24) precedes (02-4). This is brought about by a dominant-tonic relationship between their respective transpositional degrees.

The engagement of scale degree 2, then, heralds the beginning of the movement to closure by its set ordering; the only set missing from the final four sets is the (0-24), which is introduced in its proper place, after the (0-1-4). However, instead of moving to (02-4), the major triad progresses to another (0-135) set and closure is postponed for another few measures.

Figure 15: Ursatz and ordered set pairings

Syntactic and Semantic Context

In “Concepts of Closure and Chopin’s Op. 28,” Agawu states that the global closure of the Prelude makes syntactic sense, but that it disregards the semantic meaning of the rest of the work.⁵ He writes:

Measures 24 – 25 are therefore “added on” to fulfill a syntactic function. What has happened in this closing section, then, is that by introducing a stock cadential figure in the last two measures, Chopin creates a gestural discontinuity on the surface of the piece while maintaining a syntactic continuity in the background.⁶

⁵ V. Kofi Agawu, “Concepts of Closure and Chopin’s Opus 28,” *Music Theory Spectrum*, 9 (1987): 1-17. *JSTOR*, 2006, 5 Nov. 2006, <<http://www.jstor.org.ezproxy.tcu.edu/search>>.

⁶ Agawu, 14.

Agawu's assertion of semantic inconsistency in the final two measures is based on those measures' contrast with the rest of the piece with respect to rate of articulation and duration of both sound and silence, rather than to pitch content in and of itself. Examination of the mod7 sets as related to the engagement of Urlinie pitches, however, reveals semantic cohesiveness in the entire prelude. The movement to tonic completes the idea of the movement from unfamiliar to familiar sonorities.

It has been shown that the three sets that precede the final chord are associated with the previous pitches of the Urlinie. This is not only an act of synthesis, but a completion of an idea in a very conventional way. The mod7 analysis shows that semantic sensibility is established by the pattern of new and familiar sounds which herald and prolong the background descent:

Measure:	1		9		17		18		23	24		25
Prolonged scale degree	$\hat{5}$		$\hat{4}$		$\hat{3}$		$\hat{2}$		$\hat{1}$			
Specific mod7 set:	$(02-4)^1$	$(01-35)^5$	$(013-5)_1$	$(02-4)^4$	$(01-3-5)^2$	$(02-4)^1$	$(0-1-4)^1_{\text{or5}}$	$(02-4)^4$	$(0-135)_1$	$(0-1-4)^1_{\text{or5}}$	$(0-24)^5$	$(02-4)^1$
Generic mod7 set:	[024]	[0135]	[0135]	[024]	[0135]	[024]	[014]	[024]	[0135]	[014]	[024]	[024]
	☆	☆	☆	★	☆	★	☆	★	★	★	★	★

☆ = new sound

★ = familiar sound

Table 2: Ordered set pairings of the Urlinie

The piece begins with unfamiliar sounds with the statement of the 5th scale degree, then moves from a new sonority to a familiar one for the engagement of the 4th and 3rd.

Then, scale degree 2 is stated with a new sonority, followed by two familiar sets. The movement to tonic at the end of the piece is semantically cohesive with the rest of the Prelude because it completes the idea of the movement from unfamiliar to familiar sounds. The tonic pitch is preceded by all familiar sets, which are associated with the other pitches of the Urlinie; only the sets' order of presentation is new. The movement from major to minor triad is also a final reiteration of the two predominant [024] sets that occur within the work.

Bach – Prelude No. 1 in C Major, BWV 846

J.S. Bach's Prelude No. 1 in C Major from *The Well-Tempered Clavier*, Book I, BWV 846 was chosen for its harmonic language, idiomatic of the Common Practice Era. It will test mod7's possible usefulness within the period's repertoire. The Prelude is also ideal as a piece for discussion as it is one of the works charted in *Five Graphic Analyses*.

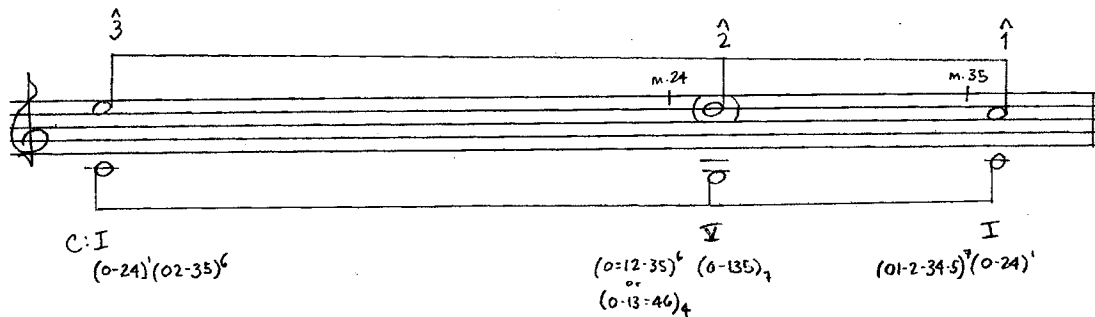


Figure 16: Ursatz and ordered set pairings

In this prelude, a different kind of semantic meaning is apparent from that of the Chopin prelude. This is due largely to the 3-line structure. There are fewer prolonged scale degrees, and therefore syntactic and semantic pattern establishment is less evident. In Schenker's Urfonie Tafel, the kopftone is articulated and followed by two different and new sonorities. $\hat{2}$ is preceded by a new sonority and immediately articulated above a familiar one. The articulation of tonic, on the other hand, is preceded by an entirely new sonority, presented as the penultimate sonority, which then moves to a familiar set (the tonic triad).

$\hat{3}$ $\hat{2}$ $\hat{1}$
 m. 24 m. 35
 C:I
 (0-24)'(02-35)'
 ☆ ☆
 (0-12-35)' (0-135)'
 (0-13-46)'
 ☆ ☆
 (01-2-34-5)'(0-24)'
 ☆ ☆

☆ = new sound
 ★ = familiar sound

Figure 17: Ursatz and ordered set pairings (annotated)

The brevity of the descent is not the only reason for a different type of pattern: unlike the former prelude, there is no change in rate of articulation or duration of sound and silence at the point of closure. The significant difference in the final measures is a change in harmonic rhythm (as applied to sets): measures 33 and 34 contain two sets each, as the measures introduce different pitches in their second halves. Because of the lack of rhythmic variation, it is left to the sonorities to create progression and meaning. Wason writes:

Such “figural preludes” [as Prelude No. 1] might be characterized as “non-narrative”: there are no musical “characters” participating in a “drama” delineated by rhythmic “motives.” Instead, the rhythmic surface is deceptively placid,

and the musical teleology determined purely by resources of
pitch organization – or “harmony.”⁷

In addition to set contrasts, Chopin manipulates texture to mark structural changes. Bach, on the other hand, creates structure primarily through set changes.

The opening 19 measures bring the kopfton to the lower octave, which then introduces the 2nd scale degree an octave below the obligatory register. The return to the obligatory register actually occurs in the penultimate measure, with the articulation of $\hat{2}$ (D) on the second beat. Measures 24 through 34 prolong D, and are concerned primarily with traversing the octave.

The articulations of the scale degrees, including those displaced by an octave, are:

The diagram shows a musical staff with a treble clef and a key signature of one flat. It illustrates the articulation of scale degrees 3, 2, and 1 across several measures. Above the staff, the scale degrees are marked with hats and numbers: $\hat{3}$, $\hat{2}$, and $\hat{1}$. Below the staff, specific measures are labeled: m. 19, m. 24, m. 34, and m. 35. The diagram also includes set pairings and Roman numerals: C:I (0-24)(01-35)⁶, (0-135)₂(0-24)¹, (0-12-35)⁶(0-135)₇ or (0-13-46)₄, and (01-24-5)⁹(01-24-5)⁷(0-24)_I.

Figure 18: Deeper middleground and ordered set pairings

⁷ Robert W. Wason, “Two Bach Preludes/Two Chopin Etudes, or Toujours travailler Bach – ce sera votre meilleur moyen de progresser,” *Music Theory Spectrum*, Vol. 24, No. 1 (Spring 2002), U of California Press, 104. *JSTOR*, 2007, 23 Mar. 2007 <<http://www.jstor.org.ezproxy.tcu.edu/search>>.

Here, the pattern of new and familiar sets becomes more complex:

The figure shows a musical staff with a treble clef and a common time signature. A large bracket above the staff spans from the first measure to the end. Above the staff, there are three scale degrees marked with hats: $\hat{3}$, $\hat{2}$, and $\hat{1}$. Below the staff, there are four measures of music. The first measure contains a C note with a 'C: I' label and the set pairing $(0-24)(02-35)^6$. The second measure contains a G note with an 'm. 19' label and the set pairing $(0-135)_2(0-24)^1$. The third measure contains a G note with an 'm. 24' label and the set pairing $(0-12-35)^6(0-135)_7$ or $(0-13-46)_4$. The fourth measure contains a C note with an 'm. 34' label and the set pairing $(01-24-5)^7(01-234-5)^7(0-24)$. Below the staff, there are three groups of stars: two stars under the first measure, four stars (two familiar, two new) under the second measure, and three stars (two familiar, one new) under the fourth measure.

☆ = new sound

★ = familiar sound

Figure 19: Deeper middleground and ordered set pairings (annotated)

When the 2nd scale degree is articulated in the obligatory register, it is stated above a new sonority; its proximity to $\hat{1}$ does not allow it to be followed by a familiar chord, however. Rather, the sonority that follows $\hat{2}$ also announces the tonic pitch. This elision of $\hat{2}$ and $\hat{1}$ sonority pairings is incredibly elucidating with regard to the Uralinie, because it indicates that $\hat{2}$ must have been prolonged before measure 34. Two unique and new sonorities cannot possibly be the only supporting harmonies for the prolongation of the dominant pitch; there needs to be an antithetical sound (like a V chord), something else to be established as a contrast.

In this situation, mod7 sets can indicate the relative strength of, and possibilities for prolongational support. The chord that is articulated with 2 is a G^7 chord, but with a C pedal. Such a compromised dominant triad would hopefully appear to the analyst as a strange choice for the dominant support, but the sonority looks even stranger and more complex

expressed as a $(01-24-5)^7$ set. This helps make syntactic sense because one can see how that particular chord functions, or rather, how it does not function (i.e. it cannot be the strong V of the piece).

In fact, the familiar set which precedes the $\hat{2}$ in measure 34, $(02-35)^6$, is the same set that follows the initiation of the kopfton; it is the second set of the prelude. Besides its occurrence in measure 33, it only appears within the prolongation of the kopfton.

The voicing of $(02-35)^6$ in measure 33 is very similar to the first statement in measure $\hat{2}$. The variations in these two unordered sets give meaning to the arrival to tonic. The sets are shown below:

The image shows two measures of music, m. 2 and m. 33, on a grand staff. Measure 2 (m. 2) shows a treble clef with a slash and a bass clef with a slash. Measure 33 (m. 33) shows a treble clef with a chord symbol \overline{F} and a bass clef with a chord symbol \overline{F} . Below the notation, the set analysis for measure 2 is given as $C: (1-2-6-24)$ and for measure 33 as $(1-1-24-6)$.

Figure 20: Unordered analysis of $(02-35)^6$, m. 2 & m. 33

Measure 33 is similar to measure 2, but stated an octave lower. The C is also doubled in the lowest voices. The F is an octave lower than its original voicing, and the D is omitted from the right hand grouping. These changes in voicing facilitate the unfolding of the minor 3rd, from D to F, which then moves to the unfolding of the minor 6th, from E to C. This final unfolding produces the arrival to tonic. In order to reach tonic, E must unfold from the lower octave and D must find its way to the obligatory register.

25 30 35

(Kapp. aufw.)

1- 2- 3- 4, 1- 2- 3- 4, 1- 2- 3- 4

5- (5) 6 7 (8) 7 3 4 4 3 8

3 4 4 3 4 4 3 b7 6 5 8

V I

Example 2: Urlinie Tafel of mm. 24–35 from *Five Graphic Analyses*

The voicing in measure 33 makes this possible because it leaves the obligatory register open. This is the top voice, which moves to D as its dominant. Instead of moving directly to D, the A skips up to F (another minor 6th). The F, rather than resolving to E, arpeggiates the same collection and moves down to D (the minor 3rd). D is now finally stated in the obligatory register, and moves to C.

Within the unfolding, there is also an uncharted voice exchange between F and D. Beginning in measures 23–24, the F and D exchange in measure 30 and are held through measure 31. There is a smaller exchange in measure 26. Unordered set analysis is elucidating because the step-class numbers are easily traced. In his graph, Schenker hints at the exchange through figured bass, where 7 moves to 5 and 5 moves to 7. Mod7 sets not

only imply the exchange, but also show in which voices the exchange takes place:

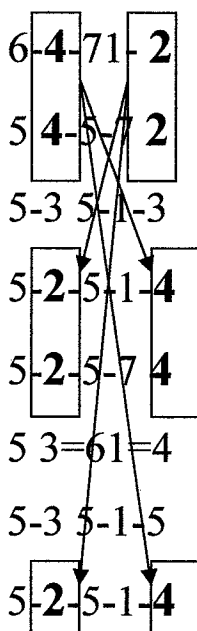


Figure 21: Unordered set progression, mm. 23–30

The Sonority Ternion⁸: (0-24), (02-35), and (0-135)

C: (0-24)¹ (02-35)⁶ (0-135)₇

Figure 22: Sonority ternion, mm. 1–3

⁸ Ternion: A group of three. The term was chosen because it does not carry any musical connotations (unlike “trio,” or “triad”).

The first three sets of Prelude No. 1 serve important syntactic and semantic functions throughout the work. This ternion's ordering and placement in the prelude help to signal changes in prolonged scale degrees. For example, it occurs with the articulation of $\hat{3}$ (measures 1-3), right before the initial prolongation of $\hat{2}$ (measures 9-11), and before $\hat{2}$ is stated in the obligatory register (measures 32-33). The only other instance in which these three sets are stated in succession will be discussed later.

(0-24) is a major triad; (02-35), a minor seventh chord; and (0-135) (inverted) is a dominant seventh chord. The three are hallmarks of the Common Practice harmonic language, of course. A mod7 analysis is beneficial here not because a traditional tertian label cannot be given to the sets; rather, it places more visual emphasis on the intervallic content of the sonorities. This is opposed to Roman numeral analysis, which emphasizes relationships to tonic (the actual Roman numerals) most strongly in its symbology.

In measures 1-3, the sets are ordered as $(0-24)^1 (02-35)^6 (0-135)_7$.

The image shows a musical score for three measures. The top staff is in treble clef with a 3/4 time signature. A triplet of eighth notes is marked with a '3' above it. The bottom staff is in bass clef. The notes in the first measure are C4, E4, G4, B3, and C4. The second measure has C4, E4, G4, B3, and C4. The third measure has C4, E4, G4, B3, and C4. Below the staff, the sets are labeled as follows:

Measure 1: C: (0-24)¹ A

Measure 2: (02-35)⁶ B

Measure 3: (0-135)₇ C

Figure 23: Sonority ternion, mm. 1-3 (annotated)

For their next occurrence, $(0-24)^1$ moves to the back, and the ordering becomes $(02-35)^6 (0-135)_7 (0-24)^1$.

Figure 24: Sonority ternion, mm. 17–19

In measures 32-33, the new first set moves to the back, and the sets are stated as $(0-135)_3 (0-24)^4 (02-35)^6$. This final statement is also interesting because the first two sets are transposed up a perfect fourth, while the final set is still at its original pitch level. This synthesizes the de-tonicization of C (which becomes the dominant of F) with one of its hallmark prolongational, tonicizing sets. It is the final gasp of destabilization before the arrival to 1 and the end of the prelude.

Figure 25: Sonority ternion, mm. 32–33

This sonority ternion also occurs three times where the middle set is altered. In measures 25-27 and 29-31, the sets are $(0-24)^1 (0-13-4)^1 (0-135)_7$. $(0-13-4)^1$ has replaced $(02-35)^6$, and is a new set.

The image shows two musical staves, each with four measures. The top staff is labeled with a circled '24' at the beginning. Below the first three measures of the top staff are the handwritten labels: $(0-24)^1$ A, $(0-13-4)^1$ B', and $(0-135)_7$ C. The bottom staff is labeled with a circled '28' at the beginning. Below the first three measures of the bottom staff are the handwritten labels: $(0-24)^1$ A, $(0-13-4)^1$ B', and $(0-135)_7$ C. The musical notation consists of a treble and bass clef with various notes and rests.

Figure 26: Two sonority ternions, mm. 25–27 & 29–31

There is only one variant pitch between these two sets: $(02-35)^6$ contains an A, which becomes a G in $(0-13-4)^1$. The change helps to reinforce the dominant prolongation, as $(0-13-4)^1$ is the suspension of the 4th over the V^7 chord. The set is only one pitch away from the dominant chord and actually includes the dominant pitch, whereas $(02-35)^6$ only possesses the 5th and 7th of the dominant chord. Since $(0-13-4)^1$ is followed by $(0-135)_7$, the V^7 chord, measures 26-27 and 30-31 comprise a V^7 with a 4-3 suspension. The ordering of the three sets in these measures is the same as their original statement in measures 1-3, which makes the resemblance to the ternion more easily recognizable.

The other alteration of the ternion is in measures 33-35. Here, the ordering is $(02-35)^6$ $(01-24-5)^7$ $(01-2-34-5)^7$ $(0-24)^1$:

Figure 27 shows a musical score for measures 32-35. The score is written for piano, with a treble clef and a bass clef. The music consists of a series of chords and melodic lines. Below the notes, there are handwritten labels for sonority ternions: $(0-135)_3$, $(0-24)_4$, $(02-35)_6$, $(01-24-5)_7$, $(01-2-34-5)_7$, and $(0-24)_1$. These labels are grouped into sections labeled C, A, B, C', and A.

Figure 27: Sonority ternion overlap, mm. 32–35

The two middle sets are the $(0-135)_7$ set with elaboration (in the first set, C is added, and in the second, C and E). The inclusion of tonic pitches helps to weaken the stability of V7 for the final descent to $\hat{1}$ in measure 35. This also reinforces Schenker's indication that tonic has already begun to be prolonged. The ordering of the sets (BCA) is the same as that which ends the prolongation of $\hat{3}$: it is the order of prolongational change, and now signals the movement to tonic.

The only other occurrence of the ternion is in measures 9-11. Here, the sets are transposed to the dominant level, and are in the ordering previously mentioned, BCA:

Figure 28 shows a musical score for measures 9-11. The score is written for piano, with a treble clef and a bass clef. The music consists of a series of chords and melodic lines. Below the notes, there are handwritten labels for sonority ternions: $(02-35)_3$, $(0-135)_4$, and $(0-24)_5$. These labels are grouped into sections labeled B, C, and A.

Figure 28: Sonority ternion, mm. 9–11

This time, the sets immediately precede the covering of the kopfton, indicated by Schenker with flagged pitches within the 1 Schicht. The only other flagged notes are in measures 4-7, and are preceded by the ternion as well.

The ternion statements in measures 1-3, 9-11, and 17-20 actually replicate the harmonic movement within the Ursatz: the first and third occurrences are in the tonic key, while the middle ternion is in the dominant.

Examination of the Ternion Sets: (02-35)

(02-35) only occurs within the ternion; in the original statement, it is the second sonority (set B). When it is the initial set, it is preceded in both instances by (01-35), the major 7th chord (IV^{M7} in the tonicized key). It performs a dual role in the ternion, sometimes emphasizing tonic, while other times belonging to the dominant.

In measure 9, the first time (02-35) opens the ternion, it is stated in the dominant key. Later, in measures 26 and 30, it is altered to a $(0-13-4)^1$ set, the V^7 chord with a suspended 4th. In these instances, (02-35) becomes more of a dominant-reinforcing sonority than a tonic one.

The ternion in measure 17 is stated in the same order as that of measure 9, where (02-35) is first. This time, the ternion is stated in the tonic key, which provides synthesis and marks local closure by way of the end of the prolongation of the kopfton.

Below is a chart of the ordering of (02-35) within the statements of the ternion, and its emphasis on tonic or dominant:

	m. 2	m. 9	m. 17	m. 26	m. 30	m. 33
Position:	2 nd	1 st	1 st	2 nd	2 nd	3 rd / 1 st
Emphasis:	Tonic	Dominant	Tonic	Dominant	Dominant	Dominant/ Tonic

Table 3: Position and Function of (02-35)

The unordered (02-35)⁶ sets in measures 26 and 30 have very similar unordered sets to (0-135)₇ in measures 27 and 31, the V⁷ chord. This heightens the altered sets' emphasis on dominant.

In measure 33, (02-35) serves a dual purpose. As the third set of the ternion which began in measure 32, it emphasizes the dominant side (or rather, the anti-tonic side, as the transpositions of the first two sets tonicize the subdominant); this is also the only instance in which (02-35) is the final set of the ternion. This new position within the statement lends a sense of structural and syntactic ambiguity, which is heightened by the overlapping of the next ternion. This second group, beginning in measure 33 with (02-35), relates the set to tonic: it is the same synthetic ordering and transposition of the ternion as in measure 17, at the end of the kopfton's prolongation. Measure 17 was also the last time the (02-35) set was stated without any alteration.

Examination of the Ternion Sets: (02-4)

Although (0-24) (Set A) is stated within and outside of the ternion, it only occurs with a transpositional degree of 1 or 5 (the tonic and dominant triad, respectively). (0-24)⁵ is only stated twice in the prelude. Most of the statements of (0-24) do occur within the ternion,

however: there are two instances in which (0-24)¹ is stated on its own, and (0-24)⁵ only occurs once (of the two occasions it appears) outside the ternion.

(0-24) is one of the most stable sonorities of the prelude: it is the support for prolongations of the Urlinie. It is also the most common set, occurring eleven times out of the thirty-six sets that comprise the work. It is significant, then, that there are only two non-tonic (and in both cases, dominant) statements. Because the dominant transpositional degree is the only other applied to (0-24), the dominant pitch, G, is also given some importance.

The (0-24) set begins and ends the prolongation of $\hat{3}$, and in both instances it occurs within the ternion (as previously shown). It is the opening set of the ternion in measures 25 and 29, during the prolongation of $\hat{2}$, but the heightened emphasis on V through the alteration of the (02-35) set relegates this ternion's "tonic-ness."

Unordered set analysis of the occurrences of (0-24), within the ternion, show Bach's choice of voicing throughout the prelude. The first statement (measure 1) is (1-35-1-3). This is then repeated in measure 4, following the initial ternion. In both instances, $\hat{3}$, the kopfton, is in the top voice.

The three ternion statements of (0-24) in the prolongation of the kopfton all possess the same unordered mod7 set. The (0-24) in measures 1 and 19, the initiation and close of the kopfton, are (1-35-1-3) sets. Measure 19, however, is transposed down by an octave. In measure 11, the ternion is transposed down a perfect 4th. The unordered set of (0-24) is then (5-72-5-7), a transposition of measure 1.

Within the prolongation of $\hat{2}$, the voicing of (0-24), as illustrated by unordered set analysis, undergoes change. In measure 25, the unordered set is (5-35-1-3). This is similar

to measure 1 with respect to the right hand. Measure 25 has transposed the top four pitches down one octave. The left hand expands its range, moving from a third to a sixth.

Figure 29 shows musical notation for measures 1 and 25. The right hand part shows a chord in measure 1 (m.1) and its transposition in measure 25 (m.25) down one octave, indicated by a bracket labeled "8vb". The left hand part shows a chord in measure 1 and its expansion in measure 25. Below the notation are two ternions: $(1-35-1-3)$ for m.1 and $(5-35-1-3)$ for m.25.

Figure 29: (0-24) transformation, m. 1 to m. 25

The unordered set in measure 25 is also closely related to that in measure 29, (5-35-1-5); the top voice has moved to a G. The bass voice is the 5th scale degree, which is doubled in measure 25 and tripled in measure 29. This creates a strong emphasis on G, the dominant pitch. The ternions containing measures 25 and 29 also have been shown to reinforce dominant through the alteration of set B, $(02-35)^6$, to $(0-13-4)^1$. The tonic pitch is further subdued in the $(0-24)^1$ sets by their placement in an inner voice. The left hand also contains a larger interval, the major 6th.

Figure 30 shows musical notation for measures 25 and 29. The right hand part shows a chord in measure 25 (m.25) and its transformation in measure 29 (m.29). The left hand part shows a chord in measure 25 and its transformation in measure 29. Below the notation are two ternions: $(5-35-1-3)$ for m.25 and $(5-35-1-5)$ for m.29.

Figure 30: (0-24) transformation, m. 25 to m. 29

In measure 33, (0-24) is transposed to the subdominant and has the most different unordered set, (1-1-4-64). The doubling of the tonic in the two lowest voices emphasizes the scale degree, but the 4th and 6th scale degrees, rather than the 3rd and 5th, do not support the tonic triad. The voicing of the left hand introduced in measures 25 and 29, is carried further with octave C's in the bass. This doubling, along with the minor 6th between the top voices, greatly contrasts the voicing with the previous statements of (0-24).

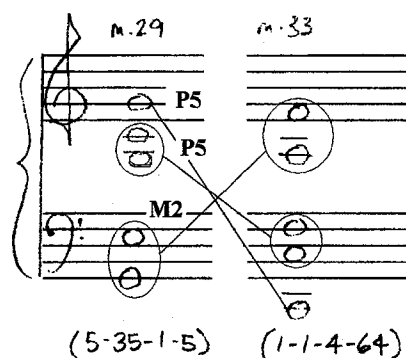


Figure 31: (0-24) transformation, m. 29 to m. 33

The final (0-24) is in measure 35, at the articulation of the tonic and close of the prelude. The octave C's are maintained, while the top two pitches for measure 29 move up a perfect 5th to the first and third voices.

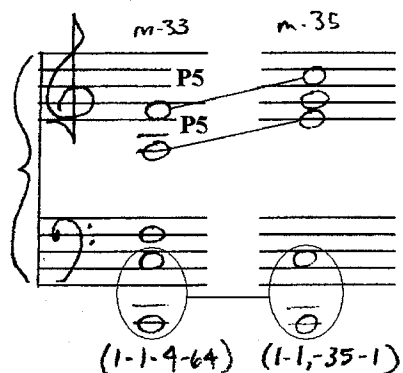


Figure 32: (0-24) transformation, m. 33 to m. 35

The final statement of (0-24) in measure 35 synthesizes the previous voicings which prolonged the 3rd and 2nd scale degrees. The unordered set is (1-1,-35-1). The octave C's in the left hand, introduced in measure 33, are combined with the tripling of the emphasized pitch in measure 29. This time, however, the tonic pitch and chord are both supported, and the top voice states $\hat{1}$ in the obligatory register. The upper voices are placed closer together, which the E and G in the same position as in measure 25. The tonic is in the same octave as it was in the original statement (measure 1), but is now the topmost voice.

The figure shows a musical score with two staves. The top staff is in treble clef and the bottom staff is in bass clef. The score is divided into five measures. Below the staves, five handwritten set representations are listed: (1-35-1-3), (5-35-1-3), (5-35-1-5), (1-1-4-64), and (1-1-35-1). Arrows point from these sets to the corresponding measures in the score. The first set (1-35-1-3) is associated with measure 1. The second set (5-35-1-3) is associated with measure 25. The third set (5-35-1-5) is associated with measure 29. The fourth set (1-1-4-64) is associated with measure 33. The fifth set (1-1-35-1) is associated with measure 35. The score shows various voicings of these sets, with notes and chords in both hands. Some notes are circled, and some are underlined. The final measure (35) shows a complex voicing that synthesizes the previous ones.

Figure 33: (0-24) transformations, mm. 1, 25, 29, and 33 to m. 35

Examination of the Ternion Sets: (0-135)

The most common transposition of (0-135) (Set C) is on G, transpositional degree 5, although there are two statements on D as well as on C. Like (0-24), (0-135) occurs both on its own and within the ternion, it also is more often stated within (out of nine statements, only

three are outside a ternion). Only one (0-135) is not even adjacent to a ternion. The two ternion-adjacent (0-135) sets (shown in parentheses) begin and articulate the prolongation of $\hat{2}$, as shown in the chart below:

	m. 2	m. 10	m. 18	m. 20	m. 24	m. 27	m. 31	m. 32	m. 34
Prolonged Pitch	$\hat{3}$			($\hat{2}$)	$\hat{2}$		($\hat{1}$)	($\hat{2}$)	$\hat{1}$
Position	3 rd	2 nd	2 nd	(4 th)	(1 st)	3 rd	3 rd	1 st	2 nd

Table 4: Prolonged pitch and ternion position of (0-135)

There are two statements of (0-135) with transpositional degree 2 (D) and 1 (C). (0-135) obviously is a dominant-reinforcing set. The only time in which (0-135) is the first set of the ternion, it is the C^7 chord (the V^7/IV) in measure 32. This supports (0-135)'s role as a dominant set, but simultaneously breaks down its emphasis on the actual dominant pitch of the piece, just as the prolongation of tonic begins.

Other Sets

As stated in the examination of (02-35), (01-35), the major 7th chord, precedes the ternion when (02-35) is the initial sonority (measures 9 and 16). The only other occurrence of (01-35) is in measure 21. Perhaps in this final statement, (01-35) attempts to substitute for (02-35), suggesting an overlapping of two ternions in measures 17-19 and 19-21. This is further reinforced by the concept of altered sets. If the (01-35) set were altered so the E were a D, it would become the original (02-35) set of the ternion.

The (02-4) set, the minor triad, only occurs twice in the prelude, both times during the prolongation of the kopfton (measures 5 and 13). In measure 5, it substitutes for (02-35) as well, but is more convincing as a substitute because it occurs between (0-24) and (0-135), as the original ordering of the ternion. Between (02-35)⁶ and (02-4)⁶, there are two invariant pitches; the two sets are closely related. The substitution of (02-4) for (02-35) begins to break down the ternion and move the piece forward. This moment begins the new covering line based around the dominant pitch. The ternion's dissolution within the first seven measures is therefore:

A B C; A X C; A X X

Figure 34: Dissolution of the ternion, mm. 1–7

The symmetrical set (0=135)/(02=35)/(0246) is the fully diminished 7th chord. It serves a transitional function in measures 12, 14, 22, and 28. In measures 12 and 14, it separates repetitions or sequences; it is extremely unstable, and resolves to measures 13 and 15, a minor and a major triad, respectively. In measure 28, the sonority separates two ternions of the same ordering.

The only other time the symmetrical set occurs, in measure 22, it precedes the new sonority that announces the articulation of $\hat{2}$. This heralding sonority is a new set which is in fact the (0=135)/(02=35)/(0246) with an elaboration (C). The symmetrical set, then, is the only non-ternion set of the piece which is manipulated.

With regard to interpretation of certain sets as altered ternion (or non-ternion) sets, the argument might be made that all of the sets of the piece are altered (0-24) sets. This would mean that the ternion is of less import, because all the sets are merely slightly changed (0-24)s. Of course, this is a work based on tertian norms, and therefore triads can be seen as the core sonority off of which others are based. However, this argument is weakened by the almost equal amount of statements of (0-24) and (0-135) sets, compared to the commonly single instances of an altered or elaborated ternion set.

Shostakovich – Prelude XIV in E-flat Minor, Op. 34

Shostakovich's Prelude XIV in E-flat minor from *24 Preljudii*, Op. 34 is also a 3-line. It was chosen for its chordal texture, which is similar to the previous two preludes. However, this prelude does not conform so strictly to the tonal and harmonic norms of the Common Practice Era as do the Chopin and Bach works. For example, out of the little more than one hundred sets that comprise the piece, there are only thirteen [024] sets, eight of which are the tonic triad. This piece clearly would not work very well in a traditional Roman numeral analysis. Since it has not been previously charted, a Schenkerian graph is presented on the following pages.

The prelude begins with the initiation of the kopfton, G-flat, although it is covered by the B-flat line. Once again, the first two sets are new. The prolongation of $\hat{2}$ begins in measure 11, on the third beat, and the strongly supported $\hat{2}$ is articulated at the end of measure 15. From measures 16-22, this F traverses three octaves. When $\hat{1}$ is articulated in measure 26, it is also three octaves above the obligatory register; the ten remaining measures of the piece are concerned with bringing the tonic pitch back into the proper octave.

Schiel 1

3 2 1 (1)

e: i v i

Figure 35: Deeper middleground

Ursatz

3 2 1 (1)

e: i v i

Figure 36: Ursatz

The prolongation of $\hat{3}$, the beginning and articulation of $\hat{2}$, and the octave displacement of and arrival to $\hat{1}$ are given below:

The musical score consists of three measures. The first measure is in the bass clef, showing notes E^b and G. Below the staff are the set pairings $(02-4)'(0)^5$. The second measure is also in the bass clef, showing notes A and C. Below the staff are the set pairings $(0-1-34)'(0)^{32}$ and $(0-3)^2'(0)^5$. The third measure is in the treble clef, showing notes E and G. Below the staff are the set pairings $(02-4)'(0)^1$. Above the staff, a horizontal line connects the notes, with labels $\hat{3}$, $\hat{2}$, and $\hat{1}$ above it. Measure numbers m.11, m.15, m.26, and m.35 are marked above the staff.

Figure 37: Ursatz and ordered set pairings

Although the final tonic pitch is preceded and articulated with familiar sets, the actual arrival to the prolonged tonic in measure 26 is preceded by a new sonority. This makes very good semantic sense with respect to the Uraline: Shostakovich does not give the final $\hat{1}$ the same signal as the one in measure 26 because it does not contain the true movement to tonic, just the arrival in the obligatory register. The Ursatz set pairings are given on the following page:

$e^b: i$
 $(02-4)' (0)^5$
 ☆ ☆

$(0-1-34)' (0)^{*2}$
 $(0-3)^2 (0)^5$
 ☆ ★ ☆★

i
 $(02-4)' (0)^1$
 ★ ★

☆ = new sound
 ★ = familiar sound

Figure 38: Ursatz and ordered set pairings (annotated)

The articulation of $\hat{2}$ occurs above a new set and is followed by a familiar one.

In measure 11, the beginning of the prolongation of $\hat{2}$, and measure 15, the articulation of $\hat{2}$, the familiar set of the pairing is (0) (which can represent a single pitch or octaves). This is also the second set of the $\hat{3}$ pairing. (0), then, becomes the contrasting sonority throughout the work. Unordered set analysis shows that the first $\hat{2}$ is followed by a single pitch, while the actual supported $\hat{2}$ is followed by three octave B-flats. This indicates stronger support for the F in measure 15 than in measure 11.

When $\hat{3}$ is initiated, the first set is $(02-4)^1$, the tonic triad; this is the familiar set in the pairing for $\hat{1}$ in measure 26, as well as in measure 35. After the statement of the tonic chord in measure 35, however, (0) returns in the tonic key. This is a synthesis of the prolongational set of $\hat{2}$ with the tonic pitch. It is stated in three octave E-flats, as it was in measure 16 with the dominant pitch.

The unordered sets show that E-flat does not occur in the highest voice until measures 36-37; it is even covered in measure 26 by the G-flat line.

Without the use of ordered mod7 signaling sets, one might be tempted to see measure 25 as an interruption, and measure 26 as a reiteration of the uncovered kopfton, or even to analyze the prelude as a 5-line. Mod7 set pairings help to indicate the relative strength of a pitch with regard to its prolongation within the Urlinie.

The voice exchange from measure 1 to measures 6 and 7 is a middleground aspect that is also interesting from a mod7 perspective:

☆ = new sound
 ★ = familiar sound

Figure 39: Voice exchange, mm. 1-7

In the exchange, the B-flat line in the highest voice exchanges with the E-flat line in the bass: the two lines that are not the Urlinie trade places, so both cover the G-flat line. The exchange is preceded by a new set, and both pitches are articulated within familiar ones. This is the same type of pairing and articulation associated with the arrival to 1 in measure 26. In this prelude then, prolongational phenomena occurring within the pitches supported by the tonic chord are accompanied by the same set pairing.

There are more unique sets in the Shostakovich than in the Chopin or Bach preludes. The following sections group the main sonorities into being either related to tonic pitches of the Urlinie or to dominant pitches. The only set that is very common in all prolongations is (0), the single pitch.

Sets Prolonging the Kopfton and Tonic

(02-4), the minor triad, occurs eight times in the prelude, and only during the prolongations of $\hat{3}$ and $\hat{1}$.

(0-1-23-4)⁵ is stated only once, in measure 8. This is accompanied by a change in texture along with a change in linear ordering. Here, the E-flat line, having been the covering line, moves back to the bass voice.

(0-12-4)¹ appears once in the middle of the prolongation of the kopfton (measure 9) and only once again, in measure 26 following the articulation of $\hat{1}$.

(0-13-4)^{#7} is the set that announces $\hat{1}$; it is singular to the prelude.

All sets prolonging $\hat{3}$ and $\hat{1}$ contain interval class III.

Sets Prolonging the Supertonic

While the minor triad only appears in the prolongation of tonic, (0-24), the major triad, is only stated within the prolongation of $\hat{2}$. Both occurrences are in measure 14. Interestingly enough, neither (0-24) is the dominant triad.

(0-1-34)¹ is the set above which $\hat{2}$ is articulated and is unique to the prelude.

(0-3) does not appear until after the articulation of $\hat{2}$ (measure 15). It is struck along with the movement of $\hat{2}$ up the octaves (measures 16, 18, 23). This set always has a

transpositional degree of 2, except for its final statement in measure 30, when it is #7. This weakens the set's dominant associations, although it still is not closely related to tonic either.

$(0-1-4)_{or5}^1$ occurs only during the prolongation of $\hat{2}$ (as it did in the Chopin). It is also stated once in transposition in measure 25, when tonic has just begun to be prolonged (but has not yet been articulated).

Interval class III is only contained in the major triad, (0-2-4), where voicing minimizes its importance. It is not included in any other set that exclusively prolongs $\hat{2}$.

Sets in Every Prolongation

(02) and (0-2) are introduced in the prolongation of $\hat{2}$. They facilitate synthesis later by being included throughout the prolongation of tonic. Here, the contrast between sets containing interval class III and those without is even more dramatic. (02) is a minor 3rd or a major 6th, interval class III, while (0-2) is interval class IV.

The other set included in all prolongations is (0), a single pitch or octave(s).

Another Sonority Ternion

The first three sets of the Shostakovich prelude also serve a functional purpose with respect to prolongational signaling. Those sets are $(02-4)^1 (0)^5 (0)^1$; they begin the piece with the kopfton.

Adagio (♩ = 63)

Red. *
 $E_b: (02-4)^1 \quad (0)^5 (0)^1$

Figure 40: Sonority ternion, mm. 1-2

Unlike the Bach ternion, their ordering is not changed throughout the piece. Instead, the transpositions, positioning, and complete statements of the ternion are of structural importance.

The beginning of the prolongation of $\hat{2}$ (measure 11) is preceded by the first two sets of the ternion in their original transpositions: $(02-4)^1 (0)^5$. However, instead of progressing to $(0)^1$, the articulation of $\hat{2}$ is stated over a $(0-1-34)^1$ set.

Red. * Red. *
 $(02-4)^1 \quad (0)^5 \quad (0-1-34)^1$
 (New)

Figure 41: Sonority ternion, mm. 10-11

The announcing set of $\hat{1}$ is preceded in the same way, but this time the final set is $(0-1-4)^{\#3}_{\text{or}\#7}$. It then progresses to $(02-4)^1$, the set that articulates the tonic. The prolongation of $\hat{2}$, therefore, is also initiated and ended with the ternion.

The final three sets of the piece are a synthesized version of the ternion: $(0)^5$ is replaced by $(0)^1$; the dominant-functioning sonority within the ternion finally has given way to tonic. The last ternion is $(02-4)^1 (0)^1 (0)^1$:

$(02-4)^1$ $(0)^5$ $(0-1-4)^{\#3}_{\text{or}\#7}$
 (New)

Figure 42: Sonority ternion, mm. 24–25

There is also a middleground movement to closure through the manipulation of the ternion. In measures 30-31, the sets are $(02-4)^{\#3} (0)^5 (0-2)^5$: a different version of the ternion, as the transposition of $(02-4)$ is different, as is the final set. In measures 32-33, the attempt to arrive at tonic begins again: $(02-4)^1 (0)^2 (0-1-2)^3$.

Musical score for two sonority ternions, mm. 30-31 & 32-33. The score consists of three staves. The top staff is a treble clef with a circled '31' above it. The middle staff is a bass clef. The bottom staff contains mathematical notation for sonority ternions. Dynamics 'dim.' and 'mf' are indicated. The notation includes 'Red.' and asterisks.

Figure 43: Two sonority ternions, mm. 30-31 & 32-33

Here, the first set is unaltered, while the second set is the same as the original, but transposed; the third sonority is different. This prepares the piece for its final, synthesized statement of the ternion, and the close of the prelude.

Conclusions

A chart of the sonority pairings of Urlinie prolongations within the three preludes is given below. The set which is articulated with the prolonged pitch is in bold.

Chopin	$\hat{5}$	$\hat{4}$	$\hat{3}$	$\hat{2}$	$\hat{1}$	
	☆ ☆	☆ ★	☆ ★	☆ ★	★ ★	
Bach	$\hat{3}$			$\hat{2}$	$\hat{1}$	
	☆ ☆			☆ ★	☆ ★	
Shostakovich	$\hat{3}$			$\hat{2}$	$\hat{1}$	$\hat{1}$ (obligatory register)
	☆ ☆			☆ ★	☆ ★	★ ★

☆ = new sound

★ = familiar sound

Table 5: Ordered set pairings of each Urlinie

All prolongations of the kopfton are flanked by new sonorities. The next scale degree ($\hat{4}$ in the Chopin, $\hat{2}$ in Bach and Shostakovich examples) are therefore announced by a new sonority. All tonic prolongations are articulated with familiar sonorities (in each case, the tonic triad), and all pieces end with a familiar sonority as well. In the Chopin and Shostakovich preludes, $\hat{2}$ is articulated above a new sonority.

Except for the kopfton, the composers support changes in the Urlinie with familiar sets. Conversely, prolongations themselves are supported with new sonorities.

In both 3-line descents, tonic is announced by a new set. As previously stated, this is most likely done to associate the new change in prolongation with the only other one within the piece.

The Bach and Shostakovich preludes both employ sonority ternions that are associated with prolongational changes. This may be more necessary for 3-line structures because there are not enough scale degrees within the descent to create a noticeable pattern of new-familiar pairings. Such pairings are still good signals for changes in the Urlinie, but are of secondary importance to the ternion.

In the Bach prelude, changes in the ternion signal structural changes. The ternion in the Shostakovich prelude, on the other hand, is a static entity. Since the ordering of sets within the ternion is not variable, the placement of the ternion itself is more important to the structure and prolongations within it.

The concept that new mod7 sets can function as signals of change in the Urlinie is provocative because the sets themselves are very foreground phenomena. A traditional Schenkerian analysis shows them to be diminutive, because by and large, they are unstable sonorities in Common Practice Era harmony. In the three analyses presented in this paper, localized, sometimes even singular, sounds are associated with fundamental long-term linear implications. Sonorities do not exist solely for the sake of color nor for the sake of function; the two aspects are inseparable in music. Mod7 weds color and function without relying on any Common Practice Era norms.

Mod7 is a useful bridge between functionality and simple intervallic content, because the function of a sonority and its relationship to tonic is determinable, as is the exact color of

any set. The use of unordered sets is also very applicable to Schenkerian analysis, because it is even more specific than traditional figured bass with regard to voice leading.

Further exploration of mod7 sets as structural markers for changes in prolonged pitches of the Urlinie might also identify unifying elements within tonal works that are not made apparent by traditional Roman Numeral analysis. This research will be best facilitated by examining Schenkerian graphs of standard repertoire, in the hope that trends in specific sonority choices coincide with the descent of the Urlinie. Charts of tonal works written outside the Common Practice Era harmonic tradition may also be used where expanded diatonicism might require the analyst to determine the harmonic norms of individual pieces before finding the sonorities that signal prolongational changes. It is possible the study of mod7 set manipulation might serve as a priori signal of prolongation in cases where Schenkerian norms are in doubt or absent.

The three analyses utilizing the hybrid system of mod7 give insight into the music not only from a Schenkerian or semantic viewpoint. A composer's intentional choice of entirely new sonorities and their placement in the piece function as structural markers; this aural phenomenon clearly affects both interpretation and analysis of a work itself. Mod7 can identify similarities between sonorities, which maintain the tertian standard of the Common Practice Era, but also makes apparent the striking changes in intervallic content of those sets. This can then indicate relative stability, and therefore inherent function, of collections within a diatonic system, without necessarily relying on the presuppositions of traditional tonality.

APPENDIX A: SCORES WITH ORDERED SET ANALYSES

Chopin – Prelude No. 4 in E Minor, Op.28

Largo
espress.

⑤
 (0-13-4)¹ (0-135)³ (0-1-3-4)¹ (0-13-4)⁴ (0-135)⁴ (0-1-3-4)⁴ (0-135)⁴ (0-13-4)⁴ (0-135)⁴ (0-13-5)⁷ (0-135)³ (0-2-35)³ (0-246)⁴

⑨
 (0-13-5)² (0-135)¹ (0-1-3-4)⁵ (0-135)¹ (0-135)⁶ (0-1-35)⁵ (0-135)² (0-1-2-4)⁵ (0-13-5)⁶ (0-135)⁴ (0-135)⁵ (0-2-35)³ (0-246)⁴

⑬
 (0-12-4)⁴ (0-135)³ (0-13-4)⁴ (0-135)⁴ (0-135)⁴ (0-13-4)⁴ (0-135)⁴ (0-13-4)⁴ (0-135)⁴ (0-1-2-4)⁴ (0-2-35)² (0-135)² (0-135)⁴ (0-2-35)³ (0-246)⁴

⑰
 (0-13-5)² (0-135)¹ (0-2-4)⁴ (0-135)⁴ (0-1-3-4)⁴ (0-135)⁴ (0-13-4)⁴ (0-135)⁴ (0-135)⁴ (0-135)⁴ (0-1-2-4)⁴ (0-2-35)² (0-135)² (0-2-35)³ (0-246)⁴

⑳
 (0-12-34-5)⁴ (0-135)⁴ (0-1-4)⁴ (0-135)⁴ (0-1-4)⁴ (0-135)⁴ (0-2-4)⁴ (0-1-4)⁴ (0-135)⁴ (0-2-4)⁴ (0-1-4)⁴ (0-2-4)⁴ (0-135)⁴ (0-1-34)⁴

stretto
dim. p
mor.
pp
callo

(0-24)⁶ (0-1-3)⁶ (0-135)¹ (0-1-4)⁴ (0-24)⁴ (0-2-4)⁴ (0-12-4)⁴ (0-135)⁴ (0-1-4)⁴ (0-24)⁴ (0-24)⁴ (0-2-4)¹

Bach – Prelude No. 1 in C Major from *The Well-Tempered Clavier*, BWV 846

3

C · (0-2A)¹ (02-35)⁶ (0-135)₇

4

(0-24)¹ (02-4)⁶ (0-135)_{#4} (0-24)⁵

8

(01-35)₃² (02-35)³ (0-135)_{A4} (0-24)⁵

12

(0-135)₂¹⁷
 (02-35)⁵
 (0246)^{*1}

(02 4)² (0-135)₂¹⁶
 (02-35)₄⁴
 (0246)₇⁷

(0-24)¹

16

(01-35)³ (02-35)⁶ (0-135)₇ (0-24)¹

20

(6-135)³ (01-35)³ (0-135)⁶³ (02-35)¹ (0246)⁴ (0-12-35)⁶ (0-13-44)⁴

24

(0-135)₂ (0-24)¹ (0-13-4)¹ (0-135)₂

28

(0-135)⁶³ (02-35)¹ (0246)⁴ (0-24)¹ (0-13-4)¹ (0-135)₂

32

(0-135)₃ (0-24)⁴ (02-35)⁶ (01-24-5)³ (01-2-34-5)⁷ (0-24)¹

APPENDIX B: ADDITIONAL AND COMPLETE SCHENKERIAN GRAPHS

Chopin – Prelude No. 4 in E Minor, Op.28

Schachter's 1994 Graph

(Rpt. in London & Rodman, "Musical Genre and Schenkerian Analysis," 106)

The image displays two Schenkerian graphs for Chopin's Prelude No. 4 in E Minor, Op. 28. The top graph covers the first system of music, featuring a '3rd-progression b1 - a1 - g' indicated above the staff. The bottom graph covers the second system, with annotations including circled numbers 17, 18, 19, 20, and 21, and Roman numerals iv, V, NN (VI). Both graphs use dashed lines to indicate structural groupings and solid lines for specific harmonic or melodic paths.

Example 2a. Schachter's graph (1994a)
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Bach – Prelude No. 1 in C Major from *The Well-Tempered Clavier*, BWV 846

From Schenker's *Five Graphic Analyses*, 36–37

J. S. BACH PRELUDE No. 1 IN C MAJOR

Ursatz $\frac{3}{8}$

I

1. Schicht

(Kopp. abw.)

(3)

I

Takte: $\hat{3}$

Ursinie
Tafel

(1) (2) (3)

(Oberdezimen) (Kopp. abw.)

(1) (2) (3) (4)

1- (Dehnung) 2- 3- 4, 1- 2- 3- 4, 1- 2- 3- 4, 1- 2- 3- 4,

10 (Quartzug) 10 (Koppelung c'-c) 10 (Quintzug)

[5] [10] [15]

Mtg. I $\frac{3}{8}$ I $\frac{3}{8}$

Vdg. I I $\frac{5}{8}$ I $\frac{5}{8}$

47 I I

Musical notation for the first system of the bass line. It features a five-line staff with notes and rests. Fingerings are indicated by numbers 1-5. There are two slanted lines above the staff, each with a circled '2' and an arrow pointing to the right. Below the staff, there are two dashed lines with circled '2's and arrows. The first line is labeled '(Brech. V⁵⁻⁷)' and the second is labeled '(Kopp. aufw.)'. The system ends with a first ending bracket labeled 'I'.

Musical notation for the second system of the bass line, spanning measures 25 to 35. Measure numbers are boxed: 25, 30, and 35. The notation includes notes, rests, and fingerings. Performance instructions include '(chrom. 3g)' above measure 25, '(Kopp. aufw.)' above measure 30, and '(sol.)' above measure 35. There are also slanted lines with circled '2's and arrows. The system ends with first ending brackets labeled 'I'.

NB
 (S. Bach's Notierung des Basses in c
 N.B. Bach's original notation of the bass in the or
 Takte: 20 21 22 23)

A small musical notation snippet showing a few notes and rests on a staff, corresponding to measures 20-23 mentioned in the text above.

Shostakovich – Prelude XIV in E-flat Minor, Op. 34

Urlinie Tafel

Urlinie Tafel

Adagio (J = 55)

ppresantissimo *espr.*

p *mf* *cresc.* *dim.* *espr.* *cresc.*

3 Aug. 3 Aug.

The image displays a musical score for piano, consisting of two systems of staves. The first system features a grand staff with a treble clef on the upper staff and a bass clef on the lower staff. The music is written in a key signature of one flat (B-flat major or D minor) and a 3/4 time signature. The upper staff contains a melodic line with various note values, including quarter and eighth notes, and rests. The lower staff provides a harmonic accompaniment with chords and single notes. The second system continues the piece, showing more complex textures with multiple voices in both hands. It includes dynamic markings such as *dim.* (diminuendo), *mf* (mezzo-forte), and *p* (piano). There are also performance instructions like *rit.* (ritardando) and *ppp* (pianissimo). The score concludes with a double bar line and a final chord.

Schiel 1

Handwritten musical score for 'Schiel 1'. The score is written on a grand staff with treble and bass clefs. The key signature has two flats (B-flat and E-flat). The time signature is common time (C). The piece consists of four measures. The first measure has a treble clef and contains a quarter note G4, a quarter note A4, and a quarter note B4. The second measure has a bass clef and contains a half note G3. The third measure has a treble clef and contains a quarter note G4, a quarter note A4, and a quarter note B4. The fourth measure has a bass clef and contains a half note G3. Above the treble staff, there are fingerings: '3' above the first measure, '2' above the second measure, '1' above the third measure, and '(1)' above the fourth measure. A large 'X' is drawn over the first two measures. Below the bass staff, there are Roman numerals: 'I' below the first measure, 'V' below the second measure, and 'I' below the fourth measure. There are also some handwritten annotations, including a '1' with a downward arrow in the first measure and a '4+' in the second measure.

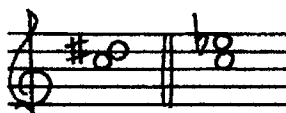
Ursatz

Handwritten musical score for 'Ursatz'. The score is written on a grand staff with treble and bass clefs. The key signature has two flats (B-flat and E-flat). The time signature is common time (C). The piece consists of four measures. The first measure has a treble clef and contains a quarter note G4, a quarter note A4, and a quarter note B4. The second measure has a bass clef and contains a half note G3. The third measure has a treble clef and contains a quarter note G4, a quarter note A4, and a quarter note B4. The fourth measure has a bass clef and contains a half note G3. Above the treble staff, there are fingerings: '3' above the first measure, '2' above the second measure, '1' above the third measure, and '(1)' above the fourth measure. Below the bass staff, there are Roman numerals: 'I' below the first measure, 'V' below the second measure, and 'I' below the fourth measure. There are also some handwritten annotations, including a '1' with a downward arrow in the first measure and a '4+' in the second measure.

APPENDIX C: MORE ON MOD7: E-RELATED SETS

In mod12 set theory, sets with differing pc numbers possess the same intervallic content, and therefore have identical interval vectors. These sets are known as z-related sets. Z-relationships are important to a mod12 analysis because intervallic content might be preserved even if pitch content is altered. In a chromatic environment, there are a limited number of z-related sets. In a diatonic environment, however, the number of possible z-related sets is staggering. With mod7, step-class content determines z-relationships between sets. This creates the possibility that sets that are technically z-related may not only possess identical intervallic content, but identical pitch content as well. This is due to enharmonic spellings. For example, the interval vector 010000 (one major 2nd or minor 7th) represents the sets (0-1), (0/2), (0=5), and (06). For larger sets, there are even more possibilities for z-relations.

A more accurate term for these sets' correlation is "e-related," as they are enharmonic equivalents. They have the same pitches in terms of actual frequency, but they possess different step-classes. For example:



(0=1)⁰ (02)⁰

Interestingly enough, z-related mod12 sets can actually be identical generic evolved mod7 sets. For example, the mod12 set (0146) is z-related to (0137); both have the interval

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ABSTRACT

In this paper, a new system of notation for ordered and unordered mod7 step-class sets will be presented and applied to Chopin's Prelude No. 4 in E Minor, Op. 28; Bach's Prelude No. 1 in C Major from *The Well-Tempered Clavier*, Book I, BWV 846; and Shostakovich's Prelude XIV in E-flat Minor from *24 Preljudii*, Op. 34. This analysis will also show how linear progression can be expressed through the use of both ordered and unordered mod7 sets.

The preludes will be analyzed with ordered and unordered mod7 sets. The sets will then be compared to Schenkerian graphs, where significant sonorities will become associated with changes in the prolongations in the Urlinie. These sets are meaningful structural markers within the preludes, and carry not only syntactic, but also semantic implications.

The three mod7 analyses will give insight into the music not only from a Schenkerian or semantic viewpoint. A composer's intentional choice of entirely new sonorities and their placement in the piece function as structural markers; this aural phenomenon clearly affects both interpretation and analysis of a work itself. Mod7 can identify similarities between sonorities, which maintain the tertian standard of the Common Practice Era, but also makes apparent the striking changes in intervallic content of those sets. This can then indicate relative stability, and therefore inherent function, of collections within a diatonic system, without necessarily relying on the presuppositions of traditional tonality.