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A Theory Of Set-class Salience For Post-tonal Music, With Analyses Of Selected Lieder By Anton Webern (austria)

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ABSTRACT

In the course of the past three decades pitch-class (pc) set theory has become the predominant instrument in analytic approaches to post-tonal music; many theorists have demonstrated its analytic efficacy and fruitfulness for a broad spectrum of music. But, despite its remarkable analytic capacity, set theory does not itself offer a means whereby to assess the relative significance of the musical events that it identifies. In the present study I propose a theory of post-tonal musical structure whose basis for interpreting the weight of a musical event engages to a large extent the operations of set theory itself. This theory, which I call the *salience theory*, engages three of the four classical set-theoretic relations—equivalence, complementarity, and inclusion—together with considerations of form, in its assessment of set-class salience.

The salience theory, of which Allen Forte's genera theory and a rather regimented segmentation strategy form two integral aspects, purports to model post-tonal compositions as series of *events*. Many *events* share structural and contextual properties, some of which I identify and specify as *event-classes*. Each pc set within a composition, through its association with *event-classes*, achieves a numerical ranking that reflects its relative salience—the more times a

pc set instantiates an *event-class*, and the broader the range of *event-classes* it instantiates, the greater its structural role.

While the salience theory has generalizability as its ultimate goal, the purview of the present study is limited to selected atonal *Lieder* of Anton Webern. Analysis of the *Lieder* posits the especial salience of a small collection of set-classes and also establishes a correlation between many members of this collection and Forte's "atonal" Genus 8 and "chromatic" Genus 5. The predominance of these two genera also underscores a homogeneity of pitch resources among the five *Lieder* under consideration.

The salience theory proffers another vantage from which to explore post-tonal musical structure. In the conclusion to this study I suggest that the theory is amenable to extension, and that one might usefully restructure it to study the structural impact of musical parameters other than pitch.

To Bren, Lisa, and Jennifer

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With appreciation I acknowledge the support of the Social Sciences and Humanities Research Council of Canada, which awarded me a Doctoral Fellowship. I also wish to thank the European American Music Distributors

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LIST OF ABBREVIATIONS

BV — Event-class *Base Value*, which ensures recognition by the salience theory of each pc set in a composition

Difquo — Forte's *difference quotient*, which measures similarities among genera

EC — *Event-class*, the basic analytic unit of the salience theory

EC group — *Event-class group*, a collection of related event-classes

EI — *Exclusivity Index*, which reflects genus uniqueness

EMB — Event-class *Embedded* within EC group *Complementarity*

ESI — *Event-class Salience Index*, which measures the compositional prominence of an event-class

FS — Event-class *Formally Significant* within EC group *Complementarity*

G[x] — *Genus [x]*, one of Forte's twelve genera

GPR — *Gestural Preference Rule*, one of the two classes of segmentation rules

GSI — *Genus Salience Index*, the revised Squo (see below) that incorporates EIs and SSIs (see below)

GWFR — *Gestural Well-Formedness Rule*, one of the two classes of segmentation rules

ic — *Interval-class*

INC	Event-class *Inclusion*
LC	Event-class *Literal Complement* within EC group *Complementarity*
LR	Event-class *Literal Repetition* within EC group *Repetition*
OVL	Event-class *Overlapping* within EC group *Complementarity*
pc	*Pitch-class*
PCS	Event-class *Pitch-class Set* within EC group *Repetition*
PCSC	Event-class *Pitch-class Set-class* within EC group *Repetition*
PCX	Event-class *Pitch-class Exchange* within EC group *Repetition*
PHR	Event-class *Phrase* within EC group *Form*
PS	Event-class *Pitch Set* within EC group *Repetition*
SEC	Event-class *Section* within EC group *Form*
Squo	Forte's *Status Quotient*, which measures genus salience within a composition
SSI	*Set-class Salience Index*, which measures the compositional prominence of a given set-class
W-Difquo	*Weighted Difference Quotient*, which reflects the influence of EIs (see EI and Difquo above)
WHL	Event-class *Whole* within EC group *Form*
[x,x,x]	Prime Form
(x,x,x)	Normal Order

Chapter 1

INTRODUCTION

Since its early formulations in the 1960s, pitch-class set theory has become increasingly sophisticated and effective in both its systemic and operational aspects. The multifarious relations that it specifies, including the domains of equivalence, similarity, complementarity, and inclusion, help to clarify interesting and important aspects of post-tonal music. But set theory does not itself supply a framework for determining the *structural significance* of the musical events that its measuring instruments classify. It permits one to determine whether pitch-class (pc) sets representing two events satisfy the conditions of complementarity, for example, but offers no mechanism for systematically assessing their structural import. In the present study I propose a theory of post-tonal musical structure whose basis for interpreting the weight of a musical event is informed by several operations of set theory itself. My theory of set-class salience, the principal invention of this dissertation, engages three of the four classical set-theoretic relations—equivalence, complementarity, and inclusion—together with considerations of form, to model set-class hierarchy in post-tonal music.

The analytic purview of this study is limited to selected atonal *Lieder* of Anton Webern. Webern's compositional style yields a music that is abundantly rich in harmonic content and amenable to the analytic approach developed here. By restricting the study to *Lieder* I am also able to benefit analytically from the form-shaping role of text. My interest in Webern's *Lieder* is one of curiosity about the analytic challenges they present. Theories have quite effectively explained salient aspects of structure for music of the eighteenth and nineteenth centuries, but in a sense they have become mired in the musical morass of the early twentieth century. The transitional and, indeed, some would argue, the atonal music of the Second Viennese School and other composers is rooted in the tonal tradition, but how are its innovations to be explained? Pitch-class set theory has built many avenues of exploration, but dead ends remain. And Webern's *Lieder*, with their rhythmic intricacies, contrapuntal complexities, and harmonic richness, continue to try the theory's boundaries. It is my purpose in this dissertation to fashion an approach capable of surmounting a few of the many analytic hurdles that remain for post-tonal music generally, and Webern's *Lieder* in particular, but I shall not be so bold as to claim that in reaching for this goal I will not erect a few new ones.

factor a numerical value to suggest its relative strength: 3 = strong; 2 = intermediate; 1 = weak.[5]

Lerdahl identifies three types of prolongation: strong, where an event is repeated; weak, where an event is repeated in an altered form; and progression, where an event is different from what precedes it. He then establishes principles for determining which event is the most important within a prolongational region, and how events within a region should connect.

To render his atonal theory reductive in a analogous sense to his tonal theory, Lerdahl has to simplify the atonal compositional context. By using the pitch event as the unit of analysis, his theory "idealizes away from the perception of polyphonic sequences (streams)" (1989, 73); that is to say, sonority takes priority over line. Such a simplification is reasonable, believes Lerdahl. He acknowledges, however, that another aspect of his theory, the reduction of a pitch event itself, is not without problems:

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[5]Following are the salience conditions and their ranking (1989, 73-74):

(a) attacked within the region [3];
(b) in a relatively strong metrical position [1];
(c) relatively loud [2];
(d) relatively prominent timbrally [2];
(e) in an extreme (high or low) registral position [3];
(f) relatively dense [2];
(g) relatively long in duration [2];
(h) relatively important motivically [2];
(i) next to a relatively large grouping boundary [2];
(j) parallel to a choice made elsewhere in the analysis [3].

attempts to model musical structure hierarchically.[1] Before turning to that task, however, let us consider for a moment the analysis of music that is neither wholly tonal nor wholly post-tonal, namely, the "transitional" repertoire of the early twentieth century, music by Schoenberg, Berg, Webern, Bartók, Scriabin, Stravinsky, and others. More than a fleeting marriage of convenience, the conjugation of Schenkerian theory and set theory has proven to be an efficacious and fruitful analytic tool, and has indeed become something of an orthodoxy for transitional music. Schenkerian theory accounts for tonal aspects of a composition, set theory for aspects that exhibit innovative means of organization. In analyses of this kind, however, set theory often accounts for little more than surface features of the music; it seldom figures into a multileveled account of a composition's structure. Where the role of pc sets is thus constrained, the relation of structural levels and prolongation to set theory neither demands nor generally receives more than cursory examination. Where, in either transitional or wholly post-tonal music, hierarchical models posit a

[1]There are, of course, many scholars who have proposed hierarchical models of post-tonal music that either do not engage pc sets at all or that do not differentiate the structural weight of pc sets. David Beach (1985) and James Baker (1983) provide useful summaries of many of these approaches. Work in this field has continued unabated in recent years. A contribution by Charles Morrison (1991) is a compelling case in point. In the lydian-phrygian polymode which, he believes, underlies Bartók's *Fourth String Quartet*, Morrison finds a suitable external basis for prolongational functions that effect the systematic differentiation of structural weight among pitches.

differentiation of structural weight for pc sets. however. the nature and treatment of structural levels and prolongation become central set-theoretic concerns.

And that returns us to our main task. Rather than proceed entirely chronologically, I shall occasionally juxtapose discussions of works that share a particular conceptual affinity. To begin, let us consider the contributions of James Baker, a strong proponent of the dual Schenkerian/set-theoretic analytic approach. Where Baker deals with transitional music, and that comprises the greatest part of his published work, pc sets generally figure only superficially in his analysis. In his book on Scriabin (1986) he uses a strict Schenkerian approach to compositions that manifest extended tonal procedures:

> The Schenkerian method is employed here in accordance with the following premise: If one is to discover the extent to which a structure is determined by tonal procedures, one must begin as a strict constructionist, examining every possibility for interpreting the structure in conventional terms. In the absence of any such possibility, the analyst must nevertheless compare the structure of the problematic piece to those found in conventional tonality. He may then ascertain whether it is a derivation or extension of a normal tonal structure, or whether it projects a conventional structure implicitly. If no relation to traditional tonality is discovered, then the composition may not be considered tonal (1986, x).

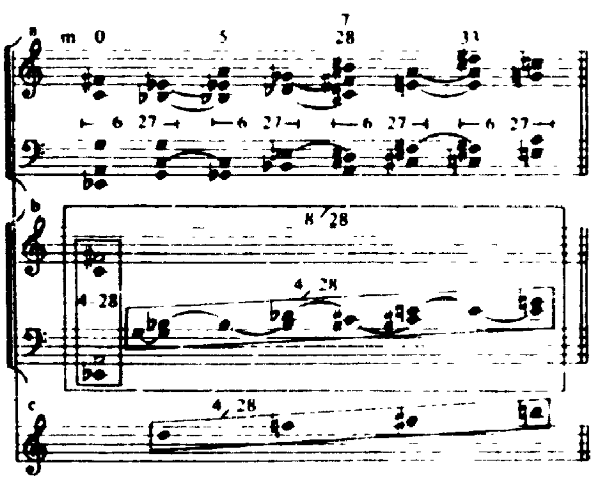
Any differentiation of structural weight that might accrue to pc sets in the transitional repertoire is dependent upon tonal structures. Baker writes:

> There are no hierarchical relationships between sets in Scriabin's late tonal music, other than those between sets associated with particular tonal functions. Significant sets are frequent at various levels of structure, but the elements which these sets comprise depend on tonal functions, which determine the stratification (1986, 98).

More typical of Baker's transitional analyses, however, are instances where pc sets describe only surface phenomena.

For compositions he deems wholly atonal, Baker occasionally does employ a multileveled set-theoretic approach, although he supplies no systematic exposition of principles underlying his analytic decisions. The most extended and complete example is his analysis of Scriabin's Prelude Op. 59/2. His analytic sketch showing aspects of high-level structure in the piece appears in my example 1.1.

Example 1.1. Baker's analysis of Scriabin, Prelude Op.59/2



Baker notes that, although set-class 4-28 [0,3,6,9] rarely appears as a surface feature of the prelude, successive transpositions of significant passages at t=3 confirm its importance at a higher structural level. Moreover, its complement, set-class 8-28, appears prominently. He concludes that "4-28 and 8-28 may well be the main matrix of the composition, in that the structure originates in the exploitation of these sets" (1986, 139).

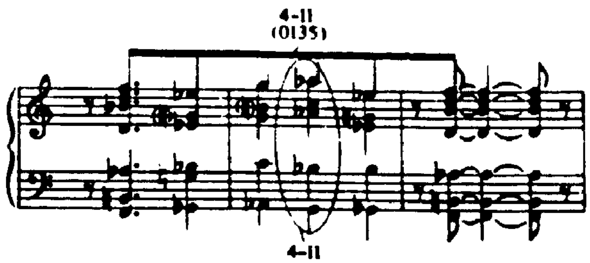
As compelling as Baker's analytic observations are, important theoretical issues regarding the structural differentiation of pc sets remain unexamined, both in this particular analysis and in the book as a whole. Given his Schenkerian stance, does he see analytic sketches such as the one excerpted in my example 1.2 (a more extended sketch of Op. 59/2) as prolongational? If so, what prolongational functions and operations are presumed? What, beyond the coincidence of events, correlates low with high level structures? These sorts of questions go unaddressed in Baker's Scriabin book.

In 1990 Baker published another study dealing with extensions to Schenker's theory in which he analyzes the first of Schoenberg's *Six Little Piano Pieces*, Op. 19. As with most of his Scriabin work, he approaches the Schoenberg composition from an essentially tonal perspective. Pc set relations, though interesting, are not coordinated in a comprehensive, multileveled exposition of pitch structure. The occasional pc sets that receive beams in Baker's analytic sketches do so by virtue of set-class or specific pitch identity.

Example 1.2. Baker's detailed analysis of Scriabin, Prelude 59/2

Example 1.4. Straus's analysis of Stravinsky's *Symphonies of Wind Instruments*

a)



Principal melodic fragment in Stravinsky, *Symphonies of Wind Instruments*

b)

Associational background of Stravinsky, *Symphonies of Wind Instruments*

uninterpreted. Straus implicitly correlates the relative structural weight of an event with its temporal span.

In the introduction to his own theory of hierarchical structure, Paul Wilson (1992) establishes three desiderata for hierarchical models and evaluates Straus's associational model in light of them. The three desiderata are as follows:

> First, the music must display, and a theory of it must recognize, a differentiation in the structural weight of events within a given musical context. Second, we must be able to discern within such a context some consistent organization of such differentiations, and that organization must involve more than one span of time. The context, that is, must display greater complexity of structural differentiation than simply possessing a single most weighty event. Third, we must be able to

Van den Toorn holds that each of the four pitch-classes which symmetrically partition the octatonic collection (i.e., instantiations of [0,3,6,9]) possesses an equal potential for priority. Only compositional context can establish the priority of one or more pitches among the four. In actual analysis, he finds the assertion of pitch or pitch-group priority secondary to other concerns:

> Even when a pitch class or complex does appear to assert priority, it will still be the sense of deadlock that is immediately striking and hence deserving of our analytic attention. Consequently, with the symmetrical nature of the scale in mind, we might feel inclined to attach special significance to (0,3,6,9) "background" partitioning when examining a particular passage, or to consider a recognition of the pitches or complexes that delineate a two-, three-, or four-part partitioning far more critical than any designation of the most likely candidate for priority status . . . (1983, 52-53).

Should the compositional context assert the priority of a single pitch-class, in van den Toorn's scheme of structural levels, that pitch class would comprise the first or least determinate level. The second and more determinate structural level describes a background pitch-group that may contain two, three, or four of the symmetrically partitioned pitch-classes [0,3,6,9]. At the third structural level referential pc sets are generally displayed; at this level one may designate Model A or Model B as primary. The fourth structural level comprises the foreground. Finally, the fifth level, which is generally detached from the other levels in analytic graphs, renders the referential collection. Where diatonic materials interact with referential octatonic collections, the number of structural levels may increase to account for them. Reproduced in my example 1.3 is van den Toorn's example 72a, a typical graph exemplifying his conception of structural levels. Note that the number of levels has been expanded to accommodate diatonic materials in the excerpt.

Example 1.3. Van den Toorn's analysis of the Variation theme from Stravinsky's *Octet*

Example 72a: *Octet* (Variation theme)

Of the several theories of pc set hierarchy that we examine in the present chapter, Van den Toorn's is perhaps the simplest and the most elegant. He makes of the scalar disposition and symmetrical properties of the octatonic set, and indeed of the limited field of referential pitch materials, a hierarchical model capable of systematically differentiating between materials of greater and lesser structural weight. Once it has been determined that a given Collection and a given Model govern a musical passage, pitches that do not belong to the Collection and that do not characterize the Model may be interpreted as structurally subordinate. And for the most part the structural levels flow logically and perspicaciously from aspects of the *a priori* octatonic structure.[2] Van den Toorn exhibits a cautious view of relations among structural levels. He writes:

> Thus each level of the structural-level format constitutes a (re)interpretation of the passage or piece in terms of the proposed entity, grouping, or partitioning, a (re)interpretation added to or superimposed on preceding (or succeeding) levels of interpretation (rather than replacing or superseding them) . . . (1983, 55).

He is not prepared to make assertions about reduction or prolongation.

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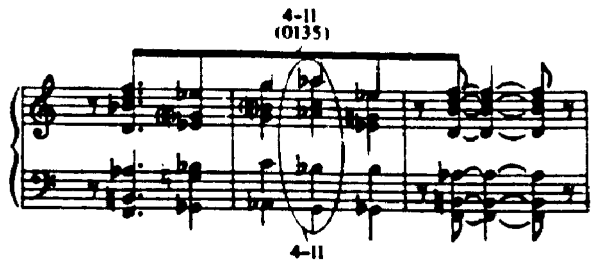
[2]Level 5 stands outside the flow from background to foreground in van den Toorn's organization of levels, its content being less determinant than the foreground described by Level 4. Perhaps he does this to emphasize his view that levels should superpose rather than supersede interpretations (see subsequent quotation).

In the oft-cited article in which he investigates necessary conditions of prolongation, Joseph Straus also proposes "a less ambitious, but theoretically more defensible approach to the middleground organization of post-tonal music" (1987, 1), which he calls the *associational model.* Straus describes the model thus: "Given three musical events, X, Y, and Z, an associational model is content merely to assert some kind of connection between X and Z without commenting one way or another about Y" (1987, 13). He contends that such associations "create coherence at the middleground" (1987, 13). Perhaps the most compelling example of association and its cohesive function is Straus's analysis of Stravinsky's *Symphonies of Wind Instruments,* two analytic sketches of which are reprinted as example 1.4a and 1.4b. He demonstrates how a principal melodic motive appearing at the surface also forms the background structure of the piece. (In example 1.4b I have added set-class labels describing the nested 4-11s). While space is not given to a detailed analysis, he assures the reader that non-adjacent pitches of the background are associated thematically and registrally. He notes that these background pitches are not prolonged by a lower structural level. Although the numerous examples of association Straus cites are brief and perhaps not sufficiently representative of his model's analytic power, the model appears to engage only repeated set-classes that manifest motivic significance; much of the musical surface remains

Example 1.4. Straus's analysis of Stravinsky's *Symphonies of Wind Instruments*

a)



Principal melodic fragment in Stravinsky, *Symphonies of Wind Instruments*

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> specify the musical conditions that give rise both to those differentiations of structural weight and to the organization that encompasses them. The theory must make possible the naming and recognition of the conditions sufficient for the presence of such a hierarchical structure (1992, 42).

Although he recognizes and acknowledges the influence of Straus's associational model on his own theory, Wilson believes that Bartók's music is amenable to an approach of more precise specification. Wilson suggests that, perhaps as a consequence of the generality of the associational model, Straus meets only the second of his three desiderata, failing to meet the first and the third.

To meet his first desideratum, Wilson identifies seven functions that will effect the differentiation of structural weight. Grouped in pairs of decreasing structural significance, they are: initiating and goal events; local dominant and secondary tonal centre; tonic extensions and substitutes, and finally, local dominant preparation. He notes that "we have no way to predict, in advance of analysis, what musical events will perform what functions in a given piece" (1992, 47).

In answer to the second requirement, Wilson proposes four designs that may shape any or all of the seven functions. They are: the projected set-class; the privileged pattern, which may recur in a regular cycle or stepwise; symmetry; and the departure and return model, which assigns a lesser structural weight to the middle occurrence of three events. While the nature of the designs themselves is quite clear from their titles, it is perhaps useful to add that

Wilson sees the first three as being dependent upon the functions in the assessment of structural weight. Only the departure and return model "makes its own clear contribution to the differentiation of structural weight among individual events, entirely indenendently of the functions of those events" (1987, 49). The third desideratum lies in the music itself: musical events become the instantiations of the specified hierarchical functions and designs.

Wilson notes that the nature of multileveled structures in Bartók's music differs from such structures within the tonal system. Indeed, whereas tonal music evinces a singular integrated structure, Bartók's will often display a multi-structure design, where structures distinct with respect to design and rate of unfolding proceed simultaneously to produce what Wilson terms an *overlay of structures.* Musical integration is achieved by motivic repetition, inclusion relations, and by the directionality of structures at various levels.

Catherine Nolan, in her dissertation entitled "Hierarchic Linear Structures in Webern's Twelve-Tone Music" (1989), presents an innovative analytic approach to serial pieces that goes beyond the investigation of row structure. Unity and coherence in Webern's twelve-tone works, she argues, stem not only from the underlying framework of row structure and deployment, but also from the presence of structural levels. Nolan derives a collection of set classes, which she calls *Five-Six-Affiliates* (or *FSA*), using interval cycles and related procedures. The FSA, together with related collections termed 3-5PAIRS and 3-

9PAIRS, comprises the referential collection of set-classes for middleground structures in selected Webern compositions. She writes: "These two cycles [which form the FSA] . . . form the core of a collection of set-classes that, as we will see in due course, shapes middleground formations in the music in question" (1989, 77).

Nolan's conception of structural levels shares an affinity with the Schenkerian idea. She expresses it as follows:

> I use the Schenkerian term middleground to mean any level of structure beneath the surface features of adjacent or contiguous pitches. Analogous to Schenkerian usage of the term, the middleground is not a single level, but consists of an indeterminate number of levels of increasing depth. I will use the corresponding term *foreground* in reference to the surface of the music, but will eschew any application of the term or concept of *background* (1989, 95).

The relative structural level of an event implicitly correlates with its time span.

For Nolan, both pre-analytic constructs and contextual states contribute to the differentiation of structural weight among musical events. Set-classes of the referential collections bear a special structural significance, as do structural motives, which she identifies as interval classes 3, 4, 5, and 6. (Interval classes 1 and 2 have essentially foreground roles.) With respect to contextual states, she notes that "pitches preceded or followed by rests often take structural priority over pitches situated between initial and terminal points of the gesture" (1989, 100). In cases where there is no middle event, "the pitch of greater weight is most often determined by registral proximity to other structural pitches" (1989, 102). Another important contextual event is pitch repetition, especially in palindromic works: "recurrence of pitches in close temporal proximity plays a fundamental role in delineating the onset and completion of important structural segments" (1989, 104).

A theorist whose interest in the multileveled structure of post-tonal music has spanned decades is Allen Forte. He deals most explicitly with the issue in a recent article entitled "New Approaches to the Linear Analysis of Music" (1988a). By *linear analysis* Forte means

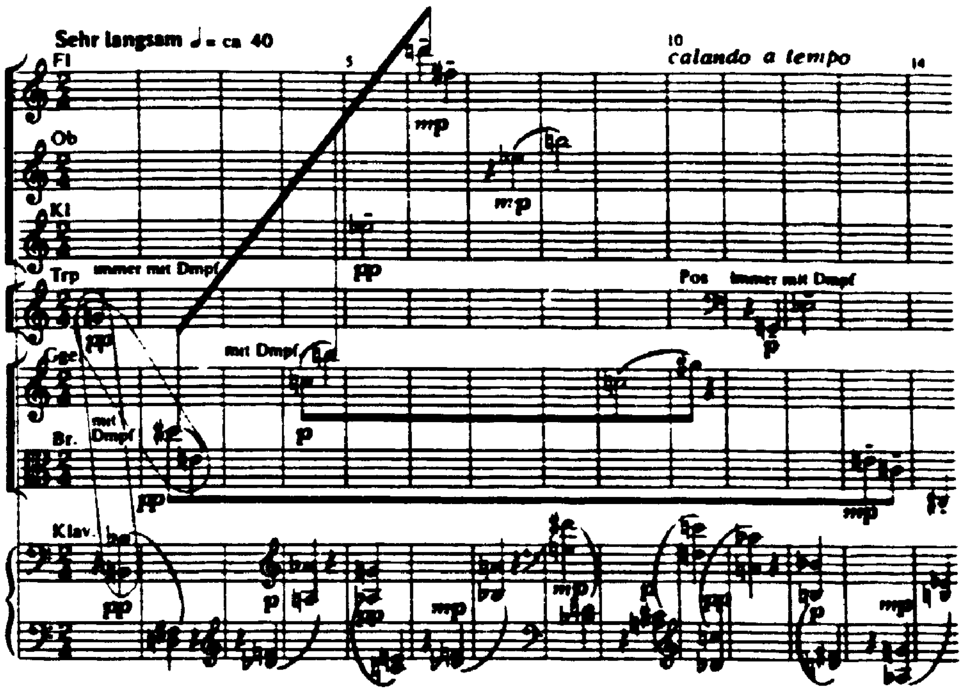
> . . . the broad spectrum of approaches to the study of music . . . which emphasize the contribution of large-scale horizontal configurations to musical form and structure and which may place local harmonic succession, diminutions, and other musical components of smaller scale in a subsidiary category" (1988a, 315).

While Forte believes the Schenkerian concept of structural levels to be valid, perhaps even necessary, for post-tonal music (1988a, 316), he is careful to note that the wholesale appropriation of Schenkerian constructs may actually obscure rather than elucidate important analytical issues that need to be addressed.

Although he does not attempt a systematic theory of post-tonal multileveled structure, Forte does offer three guidelines for analysis. The first is that large-scale structures should bear a specific relation to the motivic structure of the piece. Second, if referential collections are operative in the music, their role should be investigated. Finally, the onset and closure of a linear structure should be taken into account (1988a, 346). Rather than making prolongational claims, Forte opts for the more neutral term, *projection*. Motives or referential collections are projected at a middleground level, that is, they comprise non-adjacent pitches.

While each analytic approach discussed thus far is unique in some respects, each also shares certain characteristics with at least one other. Typical of all approaches are claims of a determinant number of *categories* of structural levels, even though the precise number of levels within each category may be indeterminant. Van den Toorn's approach provides a good example. He proposes five distinct structural levels, each of which may be expanded to account for diatonic embellishments of the octatonic referential collection. Van den Toorn is the only theorist to precisely define each category of structural levels; other theorists prefer to use the less restrictive Schenkerian notions of foreground, middleground, and in some cases, background. Many of the theorists strive to coordinate and integrate the structural levels; most are able to posit nested structures that bear a resemblance to Schenker's model. As noted previously, Wilson proposes a multi-structured design in the music of Bartók, where distinct structures proceed simultaneously. Straus (1987) appears less concerned than the others about demonstrating structural integration. In his example 7, reproduced as example 1.5 below, he is satisfied to show motivic associations without attempting to build an integrated structural model. There the structural motives involving viola, flute, and violin overlap, making it

Example 1.5. Straus's analysis of an excerpt from Webern's *Concerto for Nine Instruments*, second movement



impossible to assign structural priority to either one or the other, or to posit a unified structure.

The six theorists' positions on prolongation range from making no claims to arguing for weak prolongations. Surprisingly, it is van den Toorn who make no prolongational claims whatever. His construal of octatonicism, which includes scale and order, provides analogies to diatonic tonality's consonance-dissonance, scale-step, and voice-leading conditions. Of all the theories, his seems the best suited to a relatively detailed model of prolongation. The other theorists fall in the range of Straus's associational model to Wilson's weak prolongation, which he believes can be effected by his departure-return model. Related to prolongation is syntax, and only Wilson develops a comprehensive list of syntactical functions and requirements. Again, I believe van den Toorn's theory has considerable syntactical potential, but the possibility seems not to have interested him.

Another thread running through most of the analytic approaches is the role of motives and referential collections. In the case of referential collections, they are generally derived from the relevant literature, but are then elevated to become pre-analytic constructs whose identities are independent of one specific composition.[3] The importance of motives as structural constructs is limited to the particular composition with which they are identified. "Middleground" structures assume their importance partly as a result of holding membership in referential collections or by correlating with structural motives. Such structures also often require less contextual justification when demonstrating their existence beneath the musical surface.

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[3]Catherine Nolan's work is distinct from the others in the sense that her referential collections are generated by systematic theoretical procedures.

A final characteristic of the six analytic approaches is their emphasis on line.[4] What I mean by emphasis on line is that generally one pitch is isolated from a sonority in its elevation to the status of a middleground event. And very often this pitch will be at one of the registral extremities of its sonority; it will be an "outer voice." One consequence of this emphasis on line for many theories is that much of the musical surface remains uninterpreted. When discussing hierarchical theories that predominantly feature the characteristics of the approaches examined above, I shall use Forte's term *linear approaches* (1988a), which I believe is especially apt.

Fred Lerdahl (1989) also proposes a hierarchical theory of post-tonal music, but assumes a posture radically different from the preceding approaches. An extension of his and Jackendoff's *A Generative Theory of Tonal Music* (1983), Lerdahl's theory of atonal structure distinguishes itself in numerous ways from its counterparts.

In his review of problematic aspects of set theory, Lerdahl touches on two aspects that render the theory unsuitable to hierarchical analysis. First, set theory does not account for the differentiation of structural weight of pitches within the pc set. Second, relations among pc sets are associational, not

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[4]The line need not be stepwise; indeed, in Nolan's theory, middleground structures specifically do not proceed in stepwise motion. This, she points out, is one aspect of her theory that departs dramatically from the Schenkerian model (1989, 99).

hierarchical. He demonstrates how these two problems might be overcome by bringing salience conditions to bear on pc sets:

> Generally, less salient pitches are removed so that only one pitch remains per set. In other words, the most important pitches are those in the outer voices, those that are relatively long or loud in their context, those that create motivic relations with other sets, and so forth. This step creates a hierarchy not only among sets but among pitches within a set (1989, 70).

Another problem arises, however, which is not so easily solved and which has important ramifications for pc sets in a hierarchical theory. Pc sets do not supply the well-formed regions of analysis required for reduction, and so Lerdahl concludes that "an atonal reductional theory must discard pitch sets as the unit of analysis" (1989, 70).

The unit of analysis becomes instead the pitch *event*, defined as "any pitch or pitches that have the same attack point" (1989, 73). With this more contextual definition of pc sets, Lerdahl is able to establish sufficient conditions for structural hierarchy. Much of the theoretical machinery is taken over from his and Jackendoff's tonal theory, although it is reoriented in one crucial aspect. Whereas tonal music exhibits stability conditions, atonal music primarily exhibits salience conditions. In the atonal reductional theory, then, salience conditions take the place of stability conditions, which have priority in the tonal theory. Lerdahl offers a list of factors that contribute to salience, giving each factor a numerical value to suggest its relative strength: 3 = strong; 2 = intermediate; 1 = weak.[5]

Lerdahl identifies three types of prolongation: strong, where an event is repeated; weak, where an event is repeated in an altered form; and progression, where an event is different from what precedes it. He then establishes principles for determining which event is the most important within a prolongational region, and how events within a region should connect.

To render his atonal theory reductive in a analogous sense to his tonal theory, Lerdahl has to simplify the atonal compositional context. By using the pitch event as the unit of analysis, his theory "idealizes away from the perception of polyphonic sequences (streams)" (1989, 73); that is to say, sonority takes priority over line. Such a simplification is reasonable, believes Lerdahl. He acknowledges, however, that another aspect of his theory, the reduction of a pitch event itself, is not without problems:

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[5]Following are the salience conditions and their ranking (1989, 73-74):

(a) attacked within the region [3];
(b) in a relatively strong metrical position [1];
(c) relatively loud [2];
(d) relatively prominent timbrally [2];
(e) in an extreme (high or low) registral position [3];
(f) relatively dense [2];
(g) relatively long in duration [2];
(h) relatively important motivically [2];
(i) next to a relatively large grouping boundary [2];
(j) parallel to a choice made elsewhere in the analysis [3].

> . . . there is often a greater difference in deleting inner voices in atonal music than in tonal music. There are two reasons for this, one normative and the other psychoacoustic. In tonal music the vertical norm is always the triad, which consequently is understood even when the inner voices are not present. This understanding is reinforced by the greater tendency of verticalities to fuse . . . if they possess a high degree of sensory consonance. Atonal chords, by contrast, are distinctive and, due to their sensory dissonance, tend to be heard out in their details. Thus the deletion of less salient pitches at underlying levels is a less convincing operation for atonal than for tonal music (1989, 76).

Lerdahl's theory of atonal musical structure raises several issues that are especially pertinent to the theory I propose in the present study.

The Salience Theory: Introduction and Context

The theory developed in this study, which I shall call the salience theory, purports to model post-tonal compositions as series of *events*. Many events share structural and contextual properties, some of which I identify and specify as *event-classes*. Each pc set within a composition, through its association with *event-classes*, achieves a numerical ranking that reflects its relative salience—the more times a pc set instantiates an *event-class*, and the broader the range of *event-classes* it instantiates, the greater its structural role.

Of the several assumptions that underlie the salience theory, perhaps none is more essential than the equation of contextual salience with structural significance. Were it directed at tonal music, such an assumption would be misplaced. The appoggiatura in tonal music, for instance, has contextual salience on its side, but we understand its resolution to exceed it in structural significance. Post-tonal music, however, does not generally exhibit the systemic conditions of tonal music that allow us to interpret the resolution of the tonal appoggiatura as structurally more important than the appoggiatura itself. This equation of contextual salience with structural weight lies at the root of Lerdahl's theory as well. He describes it as follows:

> The crux of the theory outlined above is the decision to regard contextual salience in atonal music as analogous to stability in tonal music. This step amounts to an acknowledgement that atonal music is not very grammatical. I think this is an accurate conclusion. Listeners to atonal music do not have at their disposal a consistent, psychologically relevant set of principles by which to organize pitches at the musical surface. As a result, they grab on to what they can: relative salience becomes structurally important, and within that framework the best linear connections are made (1989, 84).

In a markedly different connection, Christopher Hasty (1981) also makes an implicit connection between contextual salience and structural significance. He writes in his discussion of segmentation principles that "we can consider stronger those segmentations which are supported by the greater number of domains" (1981, 59). That is to say, context as well as set-class type may inform the segmentation process.

My salience theory employs pc sets, but attempts to integrate contextual features into their identity. The "unit of analysis" in the salience theory is simply the musical *event*. (My use of the term is more fully defined in Chapter 3.) Although similar in some respects to Lerdahl's notion of pitch event, my *event* is not limited to simultaneities and hence does not preclude the presence of "polyphonic streams" in atonal music as analytic units. In this sense my use of the term differs from its use in the cognitive sciences, where generally it is linked to temporal sequence. Unlike Lerdahl, I do not attempt to differentiate the structural weight of pitches within an *event* or to reduce the *event* to one representative pitch. I believe that, for such a reduction to be compelling, one would have to identify and specify the transformational operators that effect the reduction and possibly demonstrate their relevance to perception.

Certain other characteristics also set the salience theory apart from Lerdahl's and from the linear approaches. Like some of the theories previously discussed, the salience theory supplies a systematic basis for the differentiation of structural weight among *events*. It does not, however, propose an *a priori*, determinant number of levels or categories of levels. The number of levels may indeed be limited only by the number of *events* that comprise a composition; the *events* themselves and their interconnections determine the number of levels. As in the other theories, the salience theory posits connections between non-adjacent elements. In contrast to some of the other theories, however, it is primarily interested in connections formed by *events*, not lines.

The salience theory employs referential collections of pc sets, but in a different way from many of the linear theories. The referential collections of pc sets that it uses are Allen Forte's twelve pc set genera (1988b), which are theoretically rather than compositionally derived. What distinguishes my use of these referential collections from the theories surveyed above is that the collections themselves have no influence on the determination of structural weight. I treat the integration of Forte's genera theory and my salience theory in extensive detail in Chapter 3. For now it will suffice to survey Forte's genera theory and to comment briefly on its implications for the structure of the salience theory.

Allen Forte's theory of pitch-class set genera has the capacity not only to individuate compositions but also to identify commonalities of harmonic resources among them. His genera theory supplies "an objective frame of reference for harmonic materials" by positing fixed groups of set-classes that are "constructed entirely on a logical basis from a few primitives" (1988b, 187-88); it establishes an *a priori* network of set-class relations in light of which to interpret compositional data.[6] Beyond defining fixed groups of set-classes (which he calls *genera*), Forte also introduces indices to assess set-class

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[6]Two other theorists have also proposed fixed groups of set-classes: Richard S. Parks (1989) defines five genera in relation to Debussy's music, and Catherine Nolan (1989) generates fixed set-class collections using intervallic cycles. Forte's genera theory distinguishes itself from these two approaches in the following ways: it exhausts the pc set universe (within the classical boundaries of trichords through nonachords); it supplies indices that quantify genera relations; and it is generalizable—its scope of application is essentially unrestricted.

relations among the genera themselves, and between each genus and the set-class structure of a given composition.

Forte's genera theory derives from two postulates about set-class relations: the first establishes the interval-class contents of set-classes as markers of distinctness, the second asserts the primacy of inclusion relations for associating set-classes of differing cardinalities. The first assumption identifies twelve unique trichords or trichordal pairs that become the progenitors of the genera; the second provides a rationale for the logical expansion of these progenitors into full-fledged set-class genera. Forte's twelve genera are reproduced in Appendix 1.[7]

The *difference quotient* (or *Difquo*) measures commonalities among genera or groups of genera (supragenera). Its value may range from -1 (the given genera are identical) to +1 (the intersection of the given genera is nil). While Forte uses the *Difquo* to intimate qualitative connections among genera and particularly among supragenera,[8] its implications for analysis appear tangential.

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[7]Forte combines selected genera into what he calls *supragenera*. Although they are not especially relevant to the present study, I include them in my list.

[8]See especially Forte's discussion (pp. 227-29) of supragenera and the analysis (p. 247) of Webern's Op. 10, No. 5.

The *status quotient* (or *Squo*) is crucial to the instantiation of the theory: it determines the relatedness of a particular genus to any given vocabulary of set-classes (such as those that serve as resources for an actual composition). I shall call this vocabulary the *set-class inventory*. Forte's expression is as follows:

$$\text{Squo(GA)} = ((X / Y) / Z) \times 10,$$

where GA denotes Genus A, X the cardinality of the intersection of GA and the set-class inventory, Y the cardinality of the set-class inventory, and Z the cardinality of GA (1988b, 232). The expression ranks the relative strength of genera vis-à-vis a particular set-class inventory: the higher the Squo of a genus, the closer its connection to the inventory. This index receives the lion's share of our attention because of its critical role in assessing the generic structure of the set-class inventory.

The results of a generic analysis are displayed in a table, which Forte calls the *genera matrix*. The x-axis of the matrix lists the twelve genera, the y-axis the set-class inventory. An "o" marks each intersection of a set-class inventory member and a genus. Five "Rules of Interpretation" eliminate from the complete matrix genera that do not contribute substantively to the structure of the set-class inventory.[9] In this winnowing process, the Squo's function is

[9]The five rules are reproduced in Appendix 2.

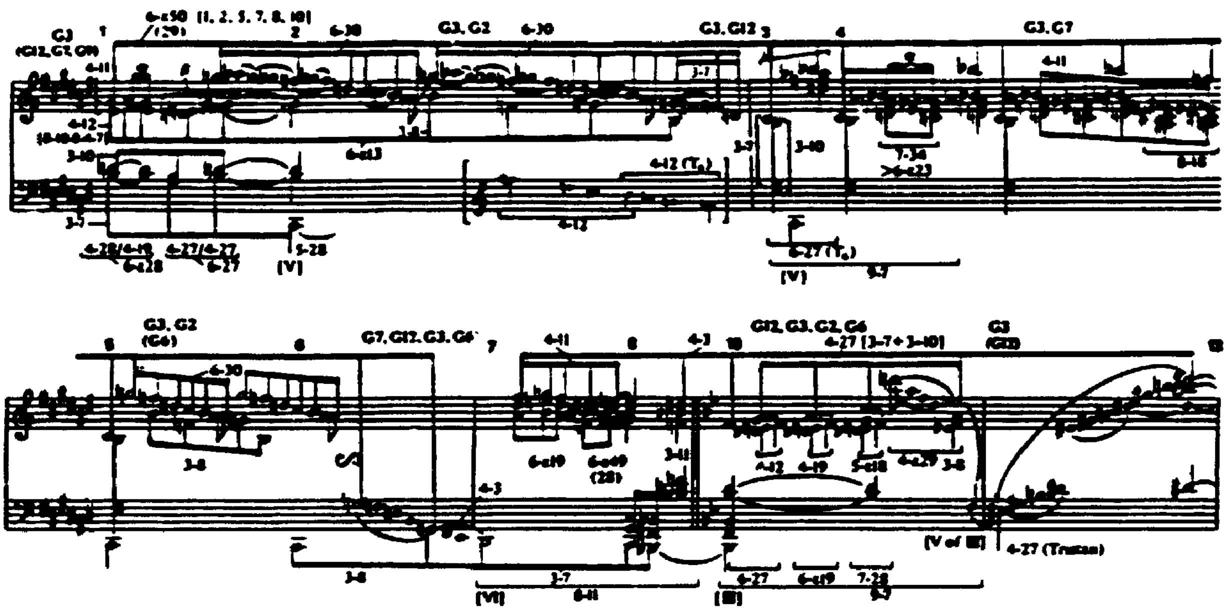
paramount. The possibility of genera with lower Squos overtaking those with higher Squos appears only under special conditions spelled out by the "Rule of Completion," which provides for the engagement of more than one genus, and the "Rule of Singleton Extension," which engages any genus in which an inventory set-class holds sole membership. In each case a genus engaged by either of these two rules will overtake one with a higher Squo only if the latter has been eliminated by the "Rule of Intersection," which reduces out of the matrix any genus that is a proper subset of another genus with a higher Squo. Matrices thus reduced encapsulate the generic essence of the set-class inventory.

Later I shall attempt to demonstrate that the indices Forte employs in his theory do not represent the genera with sufficient precision, and I shall suggest a way to recalibrate them to render them more representative. That is the subject of Chapter 2. For now it will suffice to note one important implication of the genera theory for the salience theory. Given the centrality of inclusion relations in the derivation of the genera, large set-classes—septachords through nonachords—are represented by their smaller complements in the genera theory. To remain consistent with this practice, the salience theory also employs this manner of representing set-classes larger than hexachords. The analytic implications of this aspect of the genera theory will become clear in subsequent chapters.

Perhaps it is useful to consider not just the implications of the genera theory for the salience theory, but vice versa. How does the salience theory restructure the genera theory? One might note that Forte's genera theory does not systemically differentiate set-classes with respect to compositional import. That such an extension is not a logical necessity hardly requires stating; Forte's theory did not set out to achieve such an objective and is in no way obligated to meet it. And yet, such a development might find new uses for the genera theory.

Consider for a moment the notion of compositional import in the context of the genera theory. A set-class of negligible significance and a set-class of consequence will both bear equally upon the Squo. To allege that the genera theory in its *application* precludes the structural differentiation of compositional materials, however, would be to misconstrue Forte's argument: his extensive, hierarchic analysis of Debussy's *La terrasse des audiences du clair de lune*, which concludes his instantiation of the theory, itself disproves such an allegation (1988b, 254-63). Forte's analytic graph of the Debussy, reproduced in example 1.6, unambiguously sets forth the levels of structural significance that characterize the set-classes he identifies, and no doubt similar graphs of structural differentiation informed the other generic analyses he presents. But each set-class must relinquish its compositional status upon its induction into the set-class inventory, regardless of how its structural function may have been interpreted at an earlier analytic stage. That set-class 6-z50 is projected at a high structural level in the Debussy, for example, is of no consequence to the

Example 1.6. Forte's analytic graph of Debussy's *La terrasse des audiences du clair de lune*



assessment of genus priority in the work; this and indeed all niceties of hierarchic structural analysis are lost on the genera theory. The salience theory addresses this aspect of the genera theory and might be viewed as a development that opens up new analytic potential.

In Chapter 2, then, I seek to demonstrate the need for a modification of genus representation in Forte's theory and offer a solution. Chapter 3 is devoted to the exposition of the salience theory, its terminology, mechanisms, and purview. Analyses of selected Webern *Lieder* make up the fourth chapter, while the fifth is given to a retrospective assessment of the salience theory and a few comments on directions that further research in this field might take.

Chapter 2

EXCLUSIVITY INDEX: THE REPRESENTATION OF GENUS UNIQUENESS

In the present chapter I shall try to show that Forte's indices do not represent the genera with sufficient precision, and that the genera theory would be strengthened by their recalibration. Although the Squo at first appears to render a fair and subtle measure of the generic structure of set-class inventories, there are instances where it lacks discrimination. Consider, for example, a hypothetical case in which the set-class inventory comprises set-classes 4-1, 6-11, 6-15, 6-21, 6-22, 6-31, and 6-34.[10] Their distribution among the genera and the respective Squos of the genera are shown in Table 2.1. Each genus intersects at least four of the hexachords of the set-class inventory; only

[10]Forte calls the hexachords of this particular collection *gregarious*, because each one holds membership in eleven of the twelve genera (1988b, 209). I choose these hexachords for precisely this property; set-class 4-1 is a singleton, holding membership in only one genus. For the purpose of this first example, which is solely heuristic, one might equally well replace set-class 4-1 with any other singleton. The main point I wish to argue is that the genus identity of a singleton is much stronger than that of a "gregarious" set-class, and, by way of introduction to the matter, the present set-class collection serves that end better than many others. In due course we shall see the analytic ramifications of this point.

"chromatic" Genus 5 intersects set-class 4-1. That Genus 5 is the most representative of the set-class inventory seems intuitively self-evident: not only does it contain four of the six hexachords; most important, it also contains the one set-class of singular generic affiliation, 4-1. Given that the gregarious

Table 2.1. Complete Matrix and Squos of a Hypothetical Case

	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
4-1					o							
6-11	o	o	o		o	o	o	o	o	o	o	o
6-15	o	o	o	o	o	o	o	o	o	o		o
6-21	o	o	o	o	o	o	o	o	o	o		o
6-22	o	o		o	o	o	o	o	o	o	o	o
6-31	o	o	o	o		o	o	o	o	o	o	o
6-34	o	o	o	o		o	o	o	o	o	o	o
Counts:	6	6	5	5	5	6	6	6	6	6	4	6

Squos in Descending Order:

G4:	.357
G5:	.246
G8,G9,G10:	.209
G11:	.197
G6,G7,G12:	.190
G3:	.166
G1:	.136
G2:	.134

hexachords are virtually as indicative of one genus as of any other, their power to engage any particular genus to the exclusion of all the others is negligible. In the generically ambiguous context of the hexachords, the sole genus engaged by set-class 4-1 stands out in stark relief. Contrary to one's intuitive assessment, however, Forte's Squo expression judges Genus 4 (the "augmented" genus) to be the most representative of the set-class inventory, although all five hexachords it intersects appear together as members of eight other genera (along with a sixth hexachord, 6-11).

The Squo index listed in Table 2.1 reveals a telling facet of the expression: for the most part the rankings accorded most of the twelve genera

Table 2.2. Reduced Matrix and Squos of a Hypothetical Case

	G4	G5	G8	G9	G10
4-1		o			
6-11			o	o	o
6-15	o				
6-21	o				
6-22	o				
6-31	o				
6-34	o				
Counts.	5	1	1	1	1

Squos in Descending Order:

G4:	.357
G5:	.246
G8,G9,G10:	.209

simply correlate in inverse proportion to generic size (only the rankings of G11 and G3 deviate from this pattern). Table 2.2 reduces the complete matrix of Table 2.1 following Forte's five interpretative rules (Rule 1 associates set-class 6-11 jointly with three genera); it continues to propound the strong predominance of Genus 4, with Genus 5 appearing a distant second. But not only does Genus 5 place second, it also accounts for only one member of the set-class inventory, set-class 4-1. That interpretation seems counterintuitive. Why should this set-class inventory invoke Genus 4 above all other genera, and indeed to the exclusion of seven others in the reduced matrix, when each of the excluded genera might make a comparable if not identical claim of relatedness? Our hypothetical example exposes a problem: the Squo expression is not sufficiently discriminative to moderate the effect of set-classes that are members of multifarious genera. Gregarious set-classes such as the hexachords of our example are often made to engage only one of the many genera to which they belong, in which case they misrepresent the extent of their actual generic affiliation. We will see that this problem can cause misleading generic interpretations of compositional data.

The Exclusivity Index

The Squo treats all set-classes as though the connection between set-class and genus were a one-to-one correspondence, which, of course, it is not. Only a few set-classes associate exclusively with any one genus; the majority affiliate with two or more genera. The indexing problem may be solved, however, by ranking set-classes according to their capacity for generic association, and to that end I propose the *exclusivity index* (EI). The exclusivity index assigned to each set-class correlates in inverse proportion to the generic exclusivity of that set-class, and may be expressed thus:

$$EI(x) = ((12 - y) / 11)$$

where x denotes a given set-class,[11] and y the number of genus memberships held by x.[12] The difference of (12 - y) is divided by 11 to yield an EI range of 0 to 1.[13] The EI expression models a set-class's power of generic association: the fewer a set-class's genera memberships, the greater its power to engage a particular genus; the greater its number of genera memberships, the lesser its power to engage one specific genus.

Set-class 4-1, for instance, possesses the highest possible degree of exclusivity, because it holds membership in only one genus (Genus 5). Consequently, its power for generic engagement is accorded the highest EI: 1. Set-class 6-22, on the other hand, bears the lowest possible degree of

[11]The set-class universe is limited to trichords, tetrachords, pentachords, hexachords, and their complements.

[12]The exclusivity index expression assumes that each set-class appears in at least one genus. Since set-class 3-6 does not appear directly in any of the genera, this expression does not yield its valid EI. Given the status of set-class 3-6 in Forte's genera theory (i.e., the genus it generates is a subset of the genus produced by set-class 3-8, Genus 2), it is given the same exclusivity index as set-class 3-8: 1.000.

[13]EIs are rounded off to four decimal places. In cases where the fifth place unit is 5, the fourth place unit is rounded to an *even integer* to minimize cumulative rounding errors. I might add that the computer program which generates the EIs calculates them to six decimal places.

exclusivity, because it holds memberships in all genera but one; consequently, its power for generic engagement receives the lowest numerical value: .0909. The impact of set-classes 4-1 and 6-22 on the Squo will now differ markedly: the former will strongly engage its genus while the latter will scarcely affect the status of any one of its eleven genera. Their EIs reflect one's innate sense that set-class 4-1 is significantly more representative of Genus 5 than set-class 6-22 is of Genus 2, for example, or Genus 6, or Genus 9. Table 2.3 presents the EIs of trichords, tetrachords, pentachords, and hexachords.

The ranking of set-classes by the EI expression has several implications for assessing relations between genera and set-class inventories that will be touched upon in the following integration of the EI and Forte's Squo. The integration is straightforward: the Squo expression remains essentially unchanged. The values assumed by its variable terms simply reflect the set-class rankings. To distinguish this altered status quotient from Forte's Squo, it will be termed the *genus salience index*, or *GSI*. The expression is now as follows:

$$GSI_a = ((X / Y) / Z) \times 10,$$

where each variable denotes what it did earlier, except that each of the three factors that contribute to the expression—genus size, set-class inventory size, and the number of intersecting set-classes—sum the EI values of their set-classes rather than simply the set-classes themselves. Thus, each of the variable terms of the expression becomes *weighted.* Table 2.4 presents the sums of the EI values of Genera 1 through 12, the values assumed by Z.

Table 2.3. Exclusivity Indices[14]

Trichords:

1: 1.0000	2: .8182	3: .8182	4: .9091	5: 1.0000	6: 1.0000
7: .8182	8: 1.0000	9: 1.0000	10: 1.0000	11: .8182	12: 1.0000

Tetrachords:

1: 1.0000	2: .9091	3: 1.0000	4: 1.0000	5: .9091	6: 1.0000
7: 1.0000	8: 1.0000	9: 1.0000	10: 1.0000	11: 1.0000	12: .8182
13: .8182	14: 1.0000	15: .9091	16: .9091	17: 1.0000	18: .8182
19: .7273	20: 1.0000	21: 1.0000	22: .9091	23: 1.0000	24: .9091
25: 1.0000	26: 1.0000	27: .8182	28: 1.0000	29: .9091	

Pentachords:

1: .9091	2: .7273	3: .7273	4: .4545	5: .7273	6: .8182
7: .9091	8: .7273	9: .6364	10: .6364	11: .4545	12: .8182
13: .3636	14: .7273	15: 1.0000	16: .6364	17: .6364	18: .4545
19: .6364	20: .8182	21: .7273	22: .5455	23: .7273	24: .6364
25: .6364	26: .2727	27: .7273	28: .6364	29: .4545	30: .3636
31: .4545	32: .7273	33: .9091	34: .7273	35: .9091	36: .3636
37: .6364	38: .4545				

Hexachords:

1: .7273	2: .4545	3: .4545	4: .6364	5: .2727	6: .9091
7: .9091	8: .3636	9: .2727	10: .1818	11: .0909	12: .3636
13: .5455	14: .2727	15: .0909	16: .2727	17: .3636	18: .2727
19: .4545	20: .7273	21: .0909	22: .0909	23: .5455	24: .1818
25: .4545	26: .6364	27: .4545	28: .5455	29: .5455	30: .4545
31: .0909	32: .7273	33: .5455	34: .0909	35: .9091	

[14]Numbers preceding the colons are the ordinal names of set-classes; numbers appearing after the colons are the EIs.

A simple example will demonstrate how the GSI is calculated and adumbrate its implications. Consider again the inventory of our earlier example,

Table 2.4. EIs of Genera 1 through 12

G1: 35.4545	G2: 36.1818	G3: 21.1818	G4: 9.9091	G5: 14.4545	G6: 21.3636
G7: 22.0000	G8: 19.2727	G9: 18.3636	G10: 19.3636	G11: 14.5455	G12: 21.5454

set-classes 4-1, 6-11, 6-15, 6-21, 6-22, 6-31, and 6-34. The weighted sums of intersecting set-classes are given in the complete matrix of Table 2.5; the values

Table 2.5. Complete Matrix and GSIs of a Hypothetical Case

	[EIs]	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
4-1	[1.000]					o							
6-11	[.0909]	o	o	o		o	o	o	o	o	o	o	o
6-15	[.0909]	o	o	o	o	o	o	o	o	o	o		o
6-21	[.0909]	o	o	o	o	o	o	o	o	o	o		o
6-22	[.0909]	o	o		o	o	o	o	o	o	o	o	o
6-31	[.0909]	o	o	o	o		o	o	o	o	o	o	o
6-34	[.0909]	o	o	o	o		o	o	o	o	o	o	o
EI Sums:		.5455	.5455	.4545	.4545	1.3636	.5455	.5455	5455	.5455	.3455	.3636	5455

Set-Class Inventory EI Sum: 1.5455
GSIs in Descending Order:

G5: .610
G4: .297
G9: .192
G8: .183
G10: .182
G6: .165
G12: .164
G11: .162
G7: .160
G3: .139
G1: .100
G2: .098

of term Z are taken from Table 2.4. (Notice in the matrixes that the relevant EIs are displayed in the second column, next to the set-class inventory.) The GSI of Genus 4, for instance, is arrived at as follows:

X = .4545 (sum of EIs of G4 set-classes intersecting the set-class inventory);
Y = 1.5455 (sum of EIs of set-class inventory);
Z = 9.9091 (sum of EIs of members of Genus 4);

$$GSI_4 = ((.4545 \; / \; 1.5455 \;) \; / \; 9.9091 \;) \times 10$$
$$= .297 \text{ (rounded to 3 decimal places)}$$

The matrix in Table 2.6, reduced according to Forte's interpretive rules, provides a substantially different interpretation of the generic essence of the sample set-

Table 2.6. Reduced Matrix and GSIs of a Hypothetical Case

	G4	G5
4-1		o
6-11		o
6-15		o
6-21		o
6-22		o
6-31	o	
6-34	o	

GSIs in Descending Order:

G5: .610
G4 .297

class inventory. The GSI expression ensures that chromatic Genus 5 assumes the highest generic rank; moreover, Forte's interpretative rules attribute most of the set-class inventory to this genus, making it not only the highest ranked but also the best represented. The GSI models more accurately than the Squo those elements that contribute to the uniqueness of Genus 5, and thus offers a nicer assessment of the generic structure of the set-class inventory. In the present example, the GSI ensures that the gregarious hexachords have little influence in the assessment of generic salience.

A Reinterpretation of Two Analyses by Forte

It is instructive to compare the interpretive results of Forte's Squo and the GSI in analytic surroundings more typical than the set-class inventory that served as our example above. Table 2.7 provides the GSI counterpart of Forte's generic analysis of Webern's *Fünf Stücke für Orchester*, Op. 10, No. 5 (1988b, 247-48), which is then reduced in Table 2.8. The generic interpretation differs substantively from Forte's: Genus 4, first in Forte's ranking, is surpassed by both Genus 9 and Genus 1 using the GSI. When one considers the makeup of the set-class inventory, this restratification is hardly surprising. Of the seven set-classes of Genus 4 that intersect the inventory, five are hexachords that each retain membership in most of the other genera: the single most distinctive hexachord is 6-z19, and it belongs to seven genera. The two remaining set-classes, 4-19 and 5-21, belong to four genera. While Genus 9 also intersects common set-classes—indeed, it intersects all set-classes of the inventory that

Table 2.7. Complete Matrix, Webern, Op. 10, No. 5

	[EIs]	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
4-3	[1.000]						o						
4-8	[1.000]	o											
4-9	[1.000]	o											
4-12	[.8182]		o	o			o						
4-z15	[.9091]	o	o										
4-17	[1.000]									o			
4-18	[.8182]	o		o						o			
4-19	[.7273]				o				o	o	o		
4-z29	[.9091]	o	o										
5-6	[.8182]	o	o						o				
5-7	[.9091]	o	o										
5-10	[.6364]	o	o	o			o	o					
5-16	[.6364]	o	o	o			o			o			
5-21	[.7273]				o				o	o	o		
5-23	[.7273]							o			o	o	o
5-32	[.7273]	o	o							o			o
5-35	[.9091]											o	o
5-z38	[.4545]	o	o	o					o	o	o		o
6-14	[.2727]				o	o	o	o	o	o	o	o	o
6-15	[.0909]	o	o	o		o	o	o	o	o	o		o
6-16	[.2727]	o	o			o	o		o	o	o	o	o
6-z19	[.4545]	o	o	o	o				o	o	o		
6-21	[.0909]	o	o	o	o	o	o	o	o	o	o		o
6-22	[.0909]	o	o		o	o	o	o	o	o	o	o	o
6-31	[.0909]	o	o	o	o		o	o	o	o	o	o	o
EI Sums:		9.9091	7.9091	4.0909	2.5455	.81822	4.0000	2.0000	4.0909	6.4545	4.0000	2.3636	3.7273

Set-Class Inventory EI Sums: 16.0909

Indices in Descending Order:

GSIs	Squos
G9: .218	G4: .160[15]
G1: .174	G9: .136
G4: .160	G1: .107
G2: .136	G8: .107
G8: .132	G10: .107
G10: .128	G2: .093
G3: .120	G6: .088
G6: .116	G12: .088
G12: .108	G3: .083
G11: .101	G11: .082
G7: .056	G5: .069
G5: .035	G7: .062

belong to seven or more genera—it contains numerous set-classes whose generic exclusivity ranges from moderate to high. The same holds true for Genus 1. In

[15]Forte lists this Squo as .180, a consequence of wrongly attributing set-class 6-16 to Genus 4.

the Webern piece, the set-classes of Genus 4 that intersect the inventory are sufficiently indistinct with respect to their generic affiliation to warrant their reinterpretation.

Table 2.8. Reduced Matrix, Webern, Op. 10, No. 5

	G1	G2	G6	G9	G10	G11
4-3			o			
4-8	o					
4-9	o					
4-12		o				
4-z15	o					
4-17				o		
4-18				o		
4-19				o		
4-z29	o					
5-6	o					
5-7	o					
5-10	o					
5-16				o		
5-21				o		
5-23					o	
5-32				o		
5-35						o
5-z38				o		
6-14				o		
6-15				o		
6-16				o		
6-z19				o		
6-21				o		
6-22				o		
6-31				o		

Indices in Descending Order:

GSIs:	Squos:
G9: .218	G4: .160[16]
G1: .174	G9: .136
G2: .136	G1,G10: .107
G10: .128	G2: .093
G6: .116	G6,G12: .088
G11: .101	

[16]There is an error in Forte's Squo index: G2 should be included because it intersects set-class 4-12 and has a higher Squo than G6.

The reduced matrix and GSIs of Table 2.8 yield a striking reassessment of the generic structure of the movement. Since the intersecting set-classes of Genus 4 constitute a proper subset of the intersecting set-classes of Genus 9, Genus 4 is eliminated entirely by virtue of Forte's "Rule of Intersection." Genus 1 clearly becomes the secondary genus: it accounts for seven highly exclusive set-classes while the remaining genera each account for single set-classes.

One more comparison of analyses will suffice to demonstrate the implications of the GSI: Schoenberg's *Drei Klavierstücke*, Op. 11, No. 1 (1988b, 238-40). Tables 2.9 and 2.10 present the complete and reduced GSI matrixes respectively. Forte's misattribution of set-class 6-16 to Genus 4 skews the Squo that he lists in his analysis; its Squo is .205, placing it second after Genus 8. Given this revision, we find that the GSI and Squo rankings of Table 2.9 are remarkably similar. Indeed, the reduced matrixes in Table 2.10 are completely identical, offering the same generic interpretation of the Schoenberg set-class inventory.[17] This demonstrates that Forte's Squo will more successfully model generic structure when many set-classes contained in the leading genera are relatively exclusive. Generally the Squo will more closely approximate the GSI if the set-class inventory contains numerous trichords and tetrachords, because

---

[17]Genus 4 is reduced out of Forte's revised matrix because its intersecting sets constitute a proper subset of the intersecting sets of Genus 8.

Table 2.9. Complete Matrix, Schoenberg Op. 11, No. 1

	[EIs]	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
3-3	[.8182]						o		o	o			
3-4	[.9091]								o		o		
4-7	[1.000]								o				
4-19	[.7273]				o				o	o	o		
5-13	[.3636]	o	o		o	o	o		o	o	o		
5-z17	[.6364]				o		o		o	o	o		
5-z18	[.4545]	o	o	o			o		o	o	o		
5-21	[.7273]				o				o	o	o		
5-z37	[.6364]				o				o	o	o		o
5-z38	[.4545]	o	o	o					o	o	o		o
6-z3	[.4545]	o	o	o		o	o	o	o				
6-z10	[.1818]	o	o	o		o	o	o	o	o	o		o
6-z13	[.5454]	o	o	o			o	o		o			
6-16	[.2727]	o	o			o	o		o	o	o	o	o
6-z19	[.4545]	o	o	o	o				o	o	o		
6-21	[.0909]	o	o	o	o	o	o	o	o	o	o		o
6-z43	[.3636]	o	o	o			o		o	o	o		o
EI Sums:		3.6364	3.6364	3.0000	3.6364	1.3636	4.1818	1.2727	8.5454	6.7273	6.2727	2727	2.0000

Set-class Inventory EI Sum: 9.0909

Indices in Descending Order:

GSIs	Squos
G8: .488	G8: .229
G4: .404	G4: .205
G9: .403	G9: .200
G10: .356	G10: .186
G6: .215	G6: .130
G3: .156	G3: .109
G1: .113	G5: .101
G2: .111	G1: .093
G5: .104	G2: .091
G12: .102	G12: .078
G7: .064	G7: .052
G11: .021	G11: .020

many of these set-classes are highly exclusive. As the earlier Webern example demonstrates, however, the generic affiliation of many larger set-classes is not exclusive. For music comprising generically diverse set-classes, the GSI affords a more discriminating perspective of generic structure than the Squo.[18]

Table 2.10. Reduced Matrix, Schoenberg Op. 11, No. 1

	GSI		Squo	
	G8	G9	G8	G9
3-3	o		o	
3-4	o		o	
4-7	o		o	
4-19	o		o	
5-13	o		o	
5-Z17	o		o	
5-Z18	o		o	
5-21	o		o	
5-Z37	o		o	
5-Z38	o		o	
6-Z3	o		o	
6-Z10	o		o	
6-Z13		o		o
6-16	o		o	
6-Z19	o		o	
6-21	o		o	
6-Z43	o		o	

Indices in Descending Order

GSIs		Squos	
G8	486	G8	229
G9	403	G9	20[illegible]

There are two further aspects of the EI that invite brief comment. The first concerns EIs and generic size. Forte's Squo does moderate disparities among generic sizes, of course. That is the function of term Z in the

[18]The GSI adds the practical benefit of reducing ranking duplications among genera by virtue of achieving subtler gradations.

expression: it mitigates what would be a marked advantage of the larger genera in the calculation of the Squo. But the way in which it moderates these disparities takes into account only quantitative factors. Introducing weighted set-classes into the equation does not minimize size differences of genera—in fact, in the case of Genus 4, it accents the disparity (see again Table 2.4)—but it places the disparities on qualitative ground. Consider again the GSIs of our sample set-class inventory in Table 2.6. While the GSIs of most of the genera in the Table 2.6 continue to be ranked in inverse proportion to their size (due to the simplistic exclusivity ratios of most of the members of the set-class inventory), the index is capable of accounting for qualitative factors—in this case, recognizing that the *chromatic* rather than the *augmented* genus is more representative of our sample set-class inventory.

The second facet has to do with the EI's effect on our estimation of the exclusivity of each genus as a whole. The arithmetic mean of the EI values of set-classes comprising each genus gives a general sense of its distinctiveness. (Table 2.11 lists the arithmetic means in descending order.) That Genera 1 and 2 head the list is surprising in some ways. Both are over a third larger than their nearest competitors. One might at first assume that they would contain many gregarious set-classes, which would result in a lower ranking. As it happens, the arithmetic means of their EIs show that they each hold proportionately more exclusive sets than any of the smaller genera in addition to having the greatest number of set-class memberships. With respect to the GSI, this proportionately greater number of exclusive set-classes in the two largest genera mitigates to some extent the disadvantage of their size.[19]

Table 2.11. Arithmetic Means of EI Sums of Each Genus

G2:	.5653
G1:	.5628
G11:	.5016
G5:	.4984
G4:	.4954
G3:	.4926
G7:	.4889
G12:	.4788
G6:	.4747
G10:	.4723
G8:	.4701
G9:	.4479

A brief discussion of Forte's *difference quotient* (or *Difquo*) will conclude our consideration of the effects of the EI. As noted earlier, Forte does base qualitative pronouncements upon the Difquo, although he recognizes it to be an essentially quantitative measure. The expression is as follows (1988b, 220-22):

$$\text{Difquo} = (X / Y) / 4,$$

[19]I submit this point only as a matter of interest. There is no inherent benefit in regularizing the genera with respect to size: size is an important aspect of generic uniqueness. It does seem essential, however, to calibrate generic size qualitatively.

where X is the difference between the number of set-classes of two genera or supragenera that do not intersect and those that do; Y is the difference between the number of set-classes comprising the combined genera and the number of sets they hold in common, thus factoring size into genus identity.[20]

As with the Squo, Forte's Difquo does not differentiate between set-classes that are widely dispersed among genera and ones that represent a single genus or small number of genera. The Difquo depends only on a raw count of set-class memberships, and set-classes holding membership in more than one genus are held to represent any one of their many genera to the same degree as a highly exclusive set-class represents its genus. The EI provides another perspective on abstract generic relations by introducing a qualitative factor: as in the GSI, those set-classes that are particularly indicative of their genus have greater significance in determining the *weighted difference quotient* (abbreviated *W-Difquo*, to distinguish it from the unweighted Difquo). The integration of the EI and the Difquo yields a more discriminative index of abstract generic relations, and its more precise reflection of generic uniqueness strengthens the basis for comparison. The W-Difquos of all twelve genera appear in Table 2.12.

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[20]The quotient is divided by 4 to average the Difquos of each cardinality, 3 through 6.

Table 2.12

W-Difquo Comparisons

	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
G1	.04831	.39867	.93034	.80154	.62129	.55699	.727321	.61590	.72381	.79794	.61534
	G2	.42002	.82504	.79839	.57638	.64330	.74572	.69208	.74253	.79503	.57059
		G3	.92194	.83879	.48677	.47241	.77858	.51205	.80688	.86667	.55528
			G4	.94267	.91178	.95568	.57919	.55984	.58077	.94318	.91249
				G5	.15662	.52929	.57039	.86100	.83123	.85090	.87256
					G6	.38640	.41923	.47063	.81229	87238	.71499
						G7	.74738	.75612	.74328	.52453	.38308
							G8	.32260	.29970	.83123	.81272
								G9	.32477	.86189	.46923
									G10	.56793	.41803
										G11	.15678

An important consequence of weighting the difference quotient is that, with one exception, the duplication of values in Forte's Difquo comparison table disappears. Only generic pairs 8/11 and 5/10 retain the same value under the W-Difquo. The W-Difquos of the supragenera yield no duplicate values at all (Table 2.13). While the EI refines the Difquo's ability to model abstract generic

Table 2.13. W-Difquo Comparison of Supragenera

	SII	SIII	SIV
SI	.58242	.49184	.57690
	SII	.44856	.72061
		SIII	.44236

relations, it also impoverishes the connections among genera posited by the unweighted index. The W-Difquo values suggest that the matches generated by Forte's Difquo reflect the limitations of the index as much as they reveal meaningful relations among genera, which further implies that the qualitative judgements deriving from the unweighted Difquo must be tempered. With respect to analysis, the EI does not significantly enhance the Difquo's contribution to specific analytic decisions; the Difquo remains an abstract, albeit interesting, measure of generic relatedness.

Chapter 3

THE SALIENCE THEORY: ITS DERIVATION AND IMPLICATIONS

Salience theory definitions

This chapter is devoted to the exposition of the salience theory, which proceeds informally by way of definition and illustration. The following definitions will afford an overview of the theory:

(1) *Event* denotes the musical articulation of a pitch-group whose constituents instance a specifiable continuity in some parameter (such as attack point, register, timbre, etc.).

(2) *Event-Class* (*EC*) circumscribes a group of events whose properties and functions are in some sense conterminous, specifiable, and generalizable.

(3) The *Event-class Salience Index* (*ESI*) is a numerical value within the range of 0 to 1 that reflects the relative compositional prominence of a given event-class measured in quantitative terms.

(4) The *Set-class Salience Index* (*SSI*) is a numerical value within the range of 0 to 1 that reflects the relative compositional prominence of a given set-class measured in quantitative terms.

(5) The *salience matrix* is a table whose x-axis is defined by event-classes and whose y-axis is defined by set-class inventory members. The sum of each of its rows yields SSIs, the sum of each of its columns, ESIs.

The salience theory assumes that post-tonal compositions comprise series of events, many of which may be specified and grouped into event-classes. Through its association with event-classes each set-class within a composition has the potential to achieve a unique SSI. The more times a set-class instantiates an event-class, and the broader the range of event-classes it instantiates, the greater its salience is held to be within the composition.

Events and Event-classes

An *event* is simply a musical object: an entity that is in some way distinguished from prior, coincident, or subsequent musical objects. All events manifest properties of two sorts: *structural* and *contextual*. An event's structural properties are its pitches, the relations among them, and the abstract relations they engage. We may group the contextual properties of an event into two types, *parametric* and *positional*. *Parametric* denotes all of an event's non-pitch parameters and their possible interrelations; *positional* signifies the point at which an event lies along the temporal axis of a composition.

While, obviously, events may vary widely in their functions within a composition, in the salience theory I am primarily concerned with only two kinds of events. First, I am interested in those that can be correlated structurally with other events, ones whose structures are either literally equivalent or may be deemed related under a limited group of specified functions. Second, I am interested in events that produce or engage significant discontinuities within the event succession that a composition comprises. We may investigate the compositional role of these two kinds of events through a quantification process such as the salience theory proposes below. There remain within any composition events that do not fall into either of these two categories, and these the salience theory does not take into account.

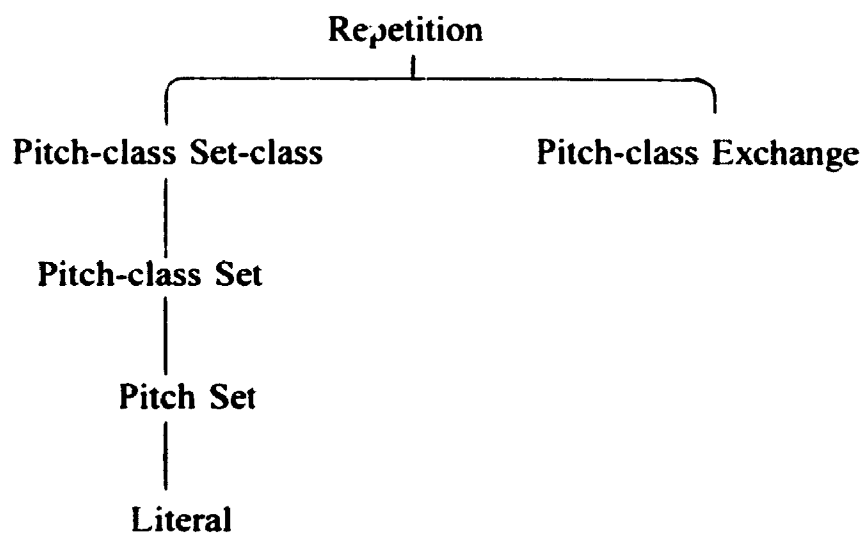
It is the role of *event-classes* to group events of the two types just described according to their characteristic properties and functions. Indeed, an event-class is simply a specification of the properties and functions that render a particular group of events isomorphic. An event-class, then, describes a group of events whose properties and functions are shared, and is *ipso facto* a generalization of a particular event.

This is a convenient place to introduce the event-classes that set the boundaries of the salience theory. To limit redundancy in the definition of event-classes, I present their specifications in the form of a tree structure. The *root* of each branch of event-classes in the tree, which is not itself an actual instantiable event-class, constitutes a description of a family of event-classes, which I shall call an EC group.[21] Subsequent levels of the structure describe the

[21] I am not using the term *group* in a mathematical sense.

functional limitations of particular event-classes within a group.[22] Each event-class inherits the limitations of all the event-classes that lie between itself and the specification root, and enumerates its own unique limitations. Let us begin by positing one specification root and tracing its branches to their logical conclusions (see Figure 3.1).

Figure 3.1. Specification root: *Repetition*



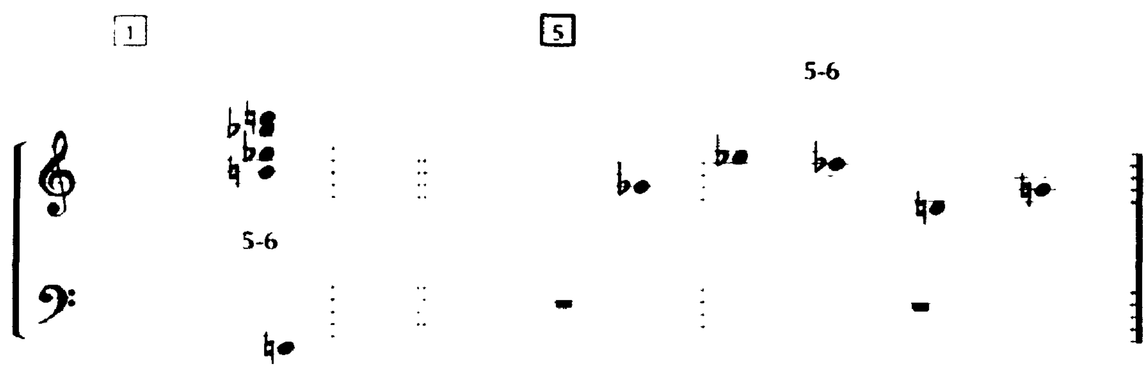
The specification root of Figure 3.1, *Repetition*, denotes a type of event whose structure is in some sense isomorphic to an earlier event; subsequent

[22]Although the definition of event-classes assumes a hierarchical form, there is implied no hierarchy of structural value whatever; the only use of the tree structure is to demonstrate the relatedness of event-classes and to simplify their definition.

levels of the specification tree further delimit this definition. The properties and limitations of each event-class, which I shall term its *equivalence conditions*, may be either structural, or contextual, or both. And, of course, the contextual equivalence conditions may be either parametric, or positional, or both.

The structural equivalence conditions of EC *Pitch-class Set-class* admit the two set-theoretic functions, transposition and inversion.[23] Thus, events described by this event-class are considered isomorphic if their pitches map onto each other under either transposition or inversion (example 3.1). This event-

Example 3.1. EC *Pitch-class Set-class* (Webern's Op. 3/1)



[23]All event-classes assume the equivalence of enharmonic spellings.

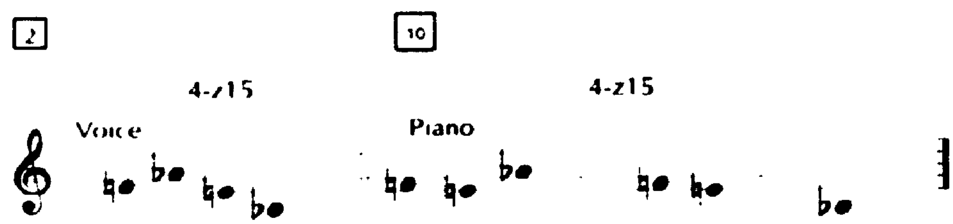
class, then, asserts the equivalence of interval content and successive-interval-array. The contextual equivalence conditions of EC *Pitch-class Set-class* admit any and all caprices of context but one; the event-class requires that each of its events comprise contiguous pitches. The registral or temporal order of events, their registral placement, rhythmic properties (pattern, duration, or accent), textural or timbral properties, dynamic level, nature of deployment (sonority or line), syntactic function (if one may be ascertained), etc., are irrelevant to this event-class.

EC *Pitch-class Set* inherits the limitations of EC *Pitch-class Set-class*, such as they are, and adds limitations of its own. Specifically, this event-class permits no structural transformations among the events it describes. To meet the structural equivalence conditions of this event-class, events must share the same pitch-classes (example 3.2). It introduces no new contextual equivalence

Example 3.2. EC *Pitch-class Set* (Webern's Op. 3/1)

conditions. EC *Pitch Set* inherits the limitations of both EC *Pitch-class Set-class* and EC *Pitch-class Set*, and adds the following contextual equivalence condition: the events it describes must be registrally equivalent (example 3.3).

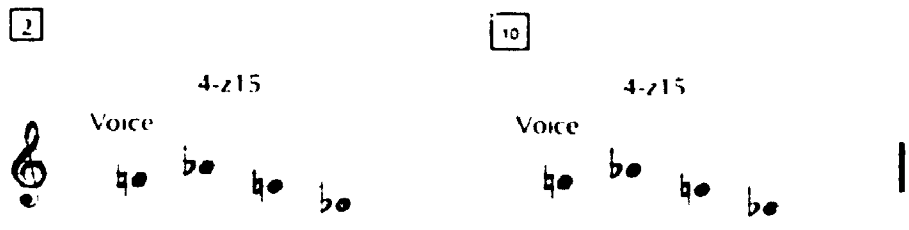
Example 3.3. EC *Pitch Set* (Webern's Op. 3/1)



EC *Literal* inherits the limitations of the three ECs that lie between itself and the specification root, *Repetition*, and adds a few contextual equivalence conditions. It requires events to be isomorphic with respect to deployment (sonority/line) and the pattern aspect of rhythm in the case of linear deployment (example 3.4). This EC does not require events to be isomorphic with respect to metrical placement, timbre, texture, syntactic function, etc.

A second shorter branch issues from the specification root *Repetition* that specifies a pitch-class exchange. The structural equivalence conditions of EC *Pitch-class Exchange* are two: to qualify, any two events must (1) share a common dyad; and (2) exchange the pitches of the common dyad. Apart from

Example 3.4. EC *Literal* (Webern's Op. 3/1)

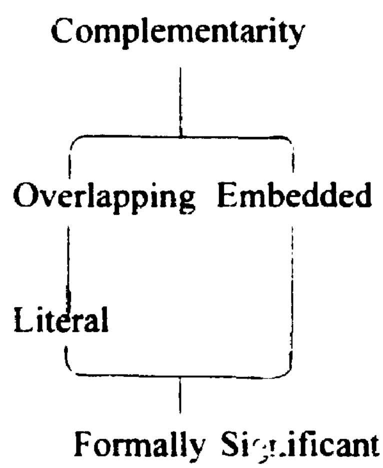


the shared dyad, the structure of these events may be dissimilar. This event-class places only one restriction on its contextual equivalence conditions; it requires the registral placement of the shared dyad to remain constant (example 3.5). All other contextual possibilities are admitted, including the adjacent or non-adjacent articulation of any two of the events in question.

Example 3.5. EC *Pitch-class Exchange* (Webern's Op. 3/1)

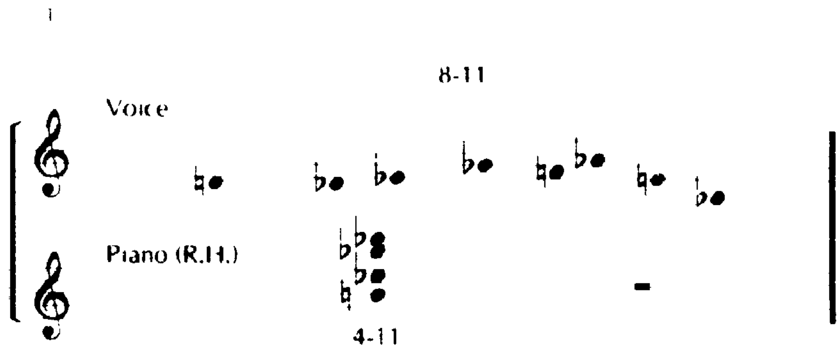
The specification root of Figure 3.2, *Complementarity*, circumscribes events that meet the conditions of the set-theoretic complement relation. The structural equivalence condition of EC *Overlapping* requires only the similarity of interval-class distribution that characterizes the complement relation;[24] it permits an overlapping of pitch-classes between two events (example 3.6).

Figure 3.2. Specification root: *Complementarity*



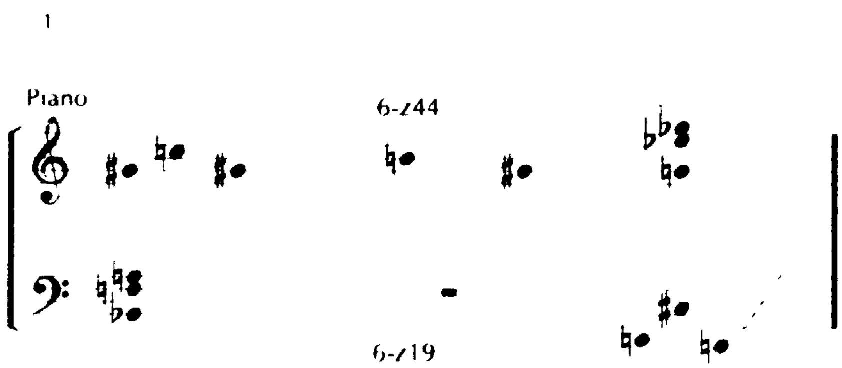
[24]The difference of cardinality between two sets in complement relation may be added to each interval vector entry of the smaller set to produce the interval vector of the larger set, except the entry for interval class 6, which adds half the difference of cardinality (see Forte 1973, 77-78).

Example 3.6. EC *Overlapping* (Webern's Op. 3/1)



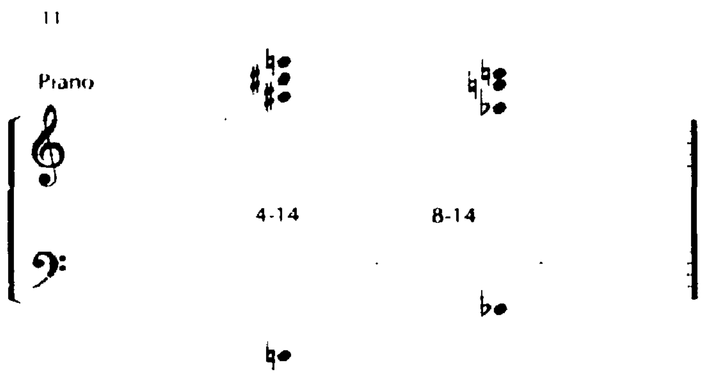
EC *Literal* requires pitch-class complementarity of the two events (example 3.7). EC *Embedded* has the same structural equivalence condition as EC *Overlapping*; furthermore, it also requires all pcs of the smaller set to be

Example 3.7. EC *Literal* (Webern's Op. 12/1)



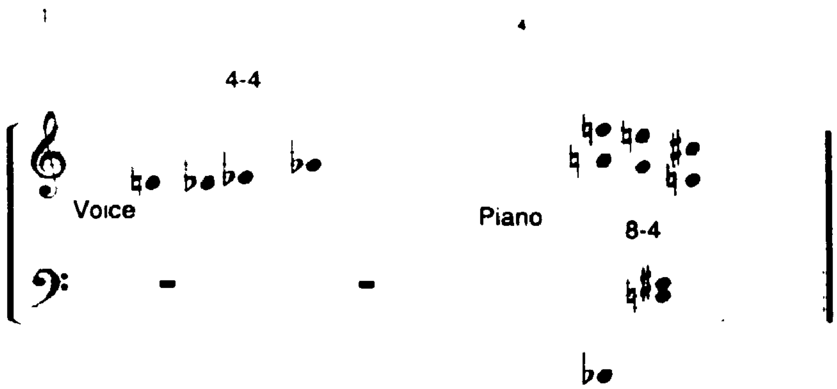
members of the larger set (example 3.8). None of these ECs specifies any contextual equivalence conditions.

Example 3.8. EC *Embedded* (Webern's Op. 12/1)



Events that instantiate any of these three ECs may also meet the conditions of EC *Formally Significant* (see again figure 3.2). This EC specifies the following contextual equivalence conditions: (1) the two events in complement relation must mark the beginning and end of the same formal segment, be it phrase, section, or whole composition (except EC *Embedded*, which will of necessity mark only one extreme of a formal segment); or (2) the two events must both initiate or both terminate two disparate formal segments of the same formal magnitude (example 3.9). An event that instantiates one of the

Example 3.9. EC *Formally Significant* (Webern's Op. 3/1)

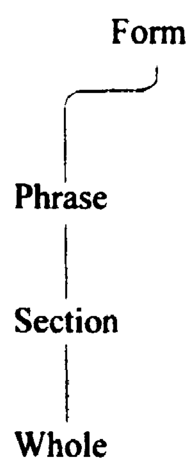


three classes of complement relations specified above as well as EC *Formally Significant* will double its numerical salience value in th , event-class group.

One event-class, EC *Inclusion*, is not part of a larger family of event-classes, but remains a singleton. Only one structural equivalence condition governs this EC: the pc set of an event must be a *literal* subset or superset of one or more events that comprise the composition. The salience value that an event may accrue in this EC is limited only by the number of the event's literal subset and/or superset relations; it accrues 1 point for each inclusion relation. EC *Inclusion* has no contextual equivalence conditions.

All of the above event-classes, from repetition to inclusion, have one thing in common. To a greater or lesser extent, their equivalence conditions all engage event *structure*. The equivalence conditions specified by event-classes flowing from specification root *Form*, however, are exclusively contextual, indeed, exclusively positional (Figure 3.3). To instantiate these ECs, an event must mark the terminal point of a formal span ranging from "phrase" to complete composition.

Figure 3.3. Specification root: *Form*

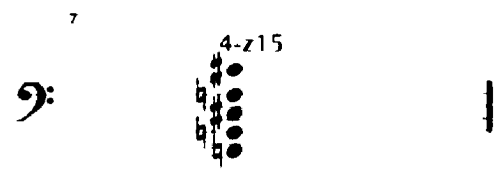


While most post-tonal music is amenable to relatively systematic formal analysis, its general lack of reference to an external syntax presents special analytic challenges. Unlike tonal music, for instance, phrase identity in post-tonal music does not derive from a limited number of syntactic functions and contextual states, a factor which renders analysis of phrase structure less secure in post-tonal than in tonal music. Nevertheless, the concept of phrase remains a useful one in post-tonal music (see, for example, Hasty 1984).

While the number of formal levels specified by EC group *Form* need not necessarily be determinate, for our analyses of the Webern *Lieder*, a maximum of three levels suffices. An event may accrue as many points within EC group *Form* as there are formal levels. If a composition exhibits three formal levels, for example, its final event may accrue 3 points, because in addition to marking the end of the composition it also marks the end of a phrase and a section.

Not every event that coincides with a formal discontinuity—especially at the level of phrases—supplies a sense of closure. Indeed, in the contrapuntal texture of the Webern *Lieder*, a sense of closure is often thwarted by overlapping accompanimental gestures at the ends of vocal phrases. Nonetheless, the sense of formal division is clear, and so EC group *Form* recognizes all events that intersect a formal discontinuity. In the *Lieder*, the point of formal disjunction is usually defined by textual cadence; there are events, however, that do not literally intersect such a vocal juncture, but whose formal role is obvious. Such events are also recognized within EC group *Form* (example 3.10). One task of the analyses in Chapter 4 is to supply sufficient grounds for an interpretation of formal structure, thereby supplying a basis for the instantiation of ECs within EC group *Form*.

Example 3.10. EC *Section* (Webern's Op. 3/1)



The Salience Matrix

Analytic results of the salience theory are displayed in a table, which I shall call the *salience matrix*. (A sample matrix appears in table 3.1.) The event-classes specified above lie along its x-axis; set-classes are arranged along its y-axis. One additional entry appears as the rightmost event-class: EC *Base Value*. This "event-class" registers each member of the set-class inventory in the salience theory. In analyses of individual compositions, all events registered by EC *Base Value* bear equally upon the SSIs. In multi-composition analysis, which I comment on in the concluding chapter, events within EC *Base Value* may assume a range of values.

The matrix provides a means of determining the salience of events. Events are represented in the matrix by their structural properties, that is, by their set-class names. An integer at the intersection of a set-class and an event-class indicates the number of times that the set-class has instantiated the event-class. Values in the matrix are summed by row to form the basis for the *set-class salience index* (*SSI*), the range of which is 0 to 1.[25]

The sum of each matrix column produces an *event-class salience index* (*ESI*); like the SSI, its value may range from 0 to 1. This index provides a means of determining the relative compositional prominence of an event-class. By permitting one to gain a general sense of the ubiquity and importance of ECs, it provides a platform for speculation about the significance of common set-theoretically-defined relations as functions in the Webern *Lieder*. The ESI is not especially useful for certain event-classes, however, particularly those of EC group *Form*, where instantiation depends solely upon the number of formal levels and spans exhibited by a composition. While the ESI is only of peripheral interest for the present study, in Chapter 5 I will discuss its analytic potential in some detail.

To illustrate the operation of the salience matrix, let us consider a small selection of set-classes from Webern's "Dies ist ein Lied," Op. 3, No. 1 (example 3.11). What follows does not constitute an analysis of the song; there are, of course, many more set-classes in the song than the few we shall consider. My purpose at this juncture is simply to explain (1) how an event

[25]Later I discuss the calculation of the SSI in detail.

Example 3.11. Selected set-classes from Webern's "Dies is ein Lied," Op. 3/1

translates from musical surface to matrix, and (2) how indices of the matrix, the SSIs and ESIs, are produced. An analysis of the song appears in Chapter 4, so I will postpone comment on various analytic issues that this composition raises.

The set-class inventory in the salience matrix of table 3.1 lists the three set-classes identified in example 3.11: 4-4, 4-7, and 4-13. Integers at the intersections of set-classes and event-classes indicate the number of times that the given set-class has instantiated the given event-class. Let us begin by tracing the instantiation of set-class 4-4. This set-class appears four times in the

Table 3.1. Salience matrix: selected set-classes from Op. 3/1

		(Repetition					Inclusion	Complementarity				Form			Base Value)	
		PCSC	PCS	PS	LR	PCX	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BV	SSI
4-4	[1.000]	1	2				3	4			1	1	1		1	.8300
4-7	[1.000]	3				1	1					3	2		1	.6667
4-13	[.8182]					1									1	.2500
(ESI)		1.000	.5000	.0000	.0000	.5000	1.000	1.000	.0000	.0000	.2500	1.000	.7500	.0000	.7500	

song: once in m. 1, once in m. 5, and twice in m. 6.[26] In the salience matrix of table 3.1, set-class 4-4 is shown instantiating EC *Pitch-class Set-class* (abbreviated to *PCSC* in the matrix) once and EC *Pitch-class Set* (*PCS*) twice.[27]

[26]I identify each occurrence of a set-class by the measure in which it begins.

[27]A list of all abbreviations used in this study appears on p. xvi.

The first appearance of pc set 4-4 (1,2,3,6) instantiates EC *Base Value* (*BV*); its subsequent reappearances in mm. 5 and 6 with the same pitch-class content produce the integer 2 at its intersection with EC *PCS* in the matrix. The final statement of a pc set 4-4 (2,3,4,7) in m. 6, shares only interval content with earlier statements, which is indicated by the integer 1 at its intersection with EC *PCSC*. The complement of set-class 4-4, pc set 8-4, appears in m. 4. Because all four occurrences of set-class 4-4 overlap some of the pc content of pc set 8-4, integer 4 appears at the intersection of 4-4 and EC *Overlapping* (*OVL*) in the matrix. Also instantiated within EC group *Complementarity* is EC *Formally Significant* (*FS*): pc set 4-4 marks the onset of Part 1 of the song while pc set 8-4 marks its close. Set-class 4-4 is the most connected of the selected set-classes in terms of the inclusion relation. Together with its complement, this set-class is a literal subset or superset of three pc sets within our sample.

Set-classes 4-7 and 4-13 are included in our sample inventory because they instantiate EC *Pitch-class Exchange* (*PCX*) (see mm. 2-3, example 3.11). The pcs exchanged are (10) and (11), B♭ and B♮; integer 1 appears at the intersections of both set-classes with EC *PCX*. Set-class 4-7 is also interesting for its formal role. In m. 2 it marks the close of the first phrase; in m. 4 it coincides with the end of the second phrase. It appears again in m. 5, where it forms a "codetta" in m. 5 to close Part 1 of the song. The formal role of set-class 4-7 is recognized in the matrix by integer 3 at its intersection with EC *Phrase* (*PHR*), and integer 2 at EC *Section* (*SEC*).

In calculating the SSI, each of the five EC groups, *Repetition, Inclusion, Complementarity, Form,* and *Base Value*, have equal influence; the maximum value a set-class may achieve within an EC group is 1. (The number of instantiations of the most salient set-class within a EC group becomes the divisor for the number of instantiations of all other set-classes within that EC group.) The SSI is simply the arithmetic mean of the values that a set-class achieves within each EC group. To illustrate how the SSI is calculated, let us again take set-class 4-4. It instantiates ECs within the first EC group, *Repetition*, 3 times, achieving .75 within that EC group (set-class 4-7 is the most salient within EC group *Repetition*, so the sum of its instantiations, 4, becomes the divisor for the group). In EC groups *Inclusion, Complementarity,* and *Base Value,* the sum of instantiations for set-class 4-4 matches or exceeds the sum of instantiations for either set-class 4-7 or 4-13; consequently it achieves a value of 1 in each of these three EC groups. Within EC group *Form,* set-class 4-4 achieves a value of .4 (the sum of instantiations for set-class 4-7 within EC group *Form* is greater than that of set-class 4-4; its sum, 5, becomes the divisor for this EC group). The SSI for set-class 4-4 is the average of these five values ((.75 + 1 + 1 + .4 + 1) / 5 = .8300). The SSIs of set-classes 4-4, 4-7, and 4-13 appear in the rightmost column of the matrix in table 3.1.

Having assessed the salience of each member of the set-class inventory, only the integration of the SSIs and the genera theory remains. The integration requires one adjustment to the GSI. The expression is now as follows:

$$GSI_a = ((((X_y + X_z) / 2) / Y) / Z) \times 10,$$

where each variable denotes what it did before, except that the set-class inventory, represented by X_y and X_z, now bears the influence of the SSI as well as the EI. X_y denotes the cumulated EIs of intersecting set-classes, X_z the cumulated SSIs of intersecting set-classes. The sum of X_y and X_z is divided by 2 to ensure that a single set-class can achieve a maximum value no greater than 1. Variable Y, which represents the set-class inventory, also reflects the SSI. The genera matrix of our sample inventory appears in table 3.2. I include the genera matrix only to complete our illustration of the operation of the salience matrix; it contains nothing of analytic interest, given that its set-class inventory does not represent either a section or complete composition.

Before proceeding to the analyses of Chapter 4, it is instructive to consider just how the set-class inventory is derived from the compositional surface, namely, principles of segmentation. In the discussion below I attempt to identify the assumptions that inform my approach to segmentation.

Table 3.2. Genera matrix: selected set-classes from Op. 3.1

		G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
4-4	[9150]								o				
4-7	[8333]								o				
4-13	[.5341]	o		o				o					
		5341	.0000	.5341	0000	0000	0000	5341	1 748	0000	0000	[illegible]	0000

GSIs in Descending Order:
G8: 398
G3: .111
G7: .106
G1: 066
G2: 000
G4: 000
G5: .000
G6: .000
G9: 000
G10: 000
G11: .000
G12: 000

Segmentation and the Salience Theory

A theme that has been touched upon in literature dealing either directly or indirectly with segmentation in post-tonal music, and which is compellingly argued in the recent dissertation by Sarah Schaffer (1992), is the distinction between pc set and segment. Schaffer puts it thus:

> A segment is a collection of notes delineated on the basis of specifically non-pitch parameters. Such grouping phenomena integral to segment definition might include, for example, metric placement, register, timbre, duration, and accentual and dynamic patterns. In fact, just one of the many attributes of a segment is its harmonic content, i.e., its set identity and structure, its pitch and intervallic content. However, the

> segment is neither defined by nor characterized solely by it [sic] pitch identity, but rather by its non-pitch characteristics. . . .
>
> A set, on the other hand, indicates one of two related but different situations, both of which underscore a restriction to "abstract" pitch/interval considerations, without consideration for non-pitch parameters. The first, and probably the most common, meaning of set is descriptive, and refers to the harmonic content . . . of any delineated unity or group (e.g., segment), as well as to all the "abstract" relations . . . which exist between it and other such sets or collections. The other meaning of set derives from the process of segmentation and refers to those compositional units actually defined and delineated on the basis of their abstracted pitch or interval content, a group whose meaning or significance derives solely from its harmonic content but not from other presentational features, a group isolated from a compositional context only on the basis of its pitch content (1992, 241-42).

For our present purpose, I adopt Schaffer's distinction, but suggest a slight modification in her definition of *segment*. Rather than defining *segment* as being "delineated on the basis of specifically *non-pitch* parameters," let us define it as being delineated on the basis of *non-set-class* parameters. The point may seem captious, but I believe it is useful if we consider that certain music-gestural clues for segmentation, such as imitation, while certainly pitch-based, need not necessarily be set-class-based. In my analysis of Webern's Op. 3/1 in Chapter 4, for example, the segmentation occasionally distinguishes the upper voice of the accompaniment from the remaining piano voices not on the basis of non-pitch parameters—the upper voice is parametrically more closely related to events in the piano than in the vocal line—but on the basis of pitch parameters. One such instance appears in example 3.12; here three members of set-class 4-4

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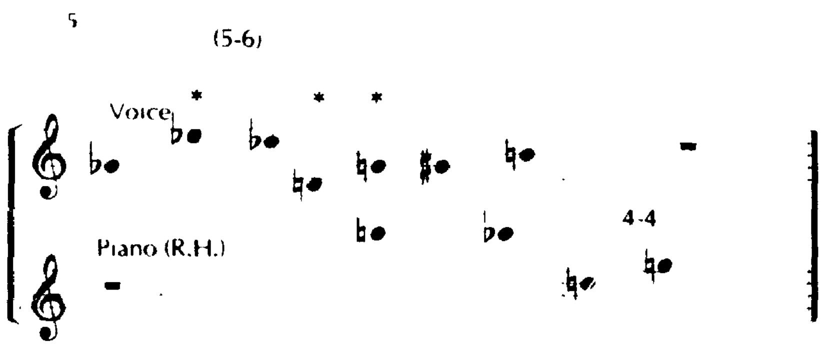
(E♭ D♮ G♮) refer to vocal line notes in m. 6. This line is distinguished because of its gestural relation to the vocal line, whose pitches

Example 3.12. Imitation in Webern's Op. 3/1



it imitates.[28] Nevertheless, it is clear that set-class parameters do not influence the segmentation, because the melodic embellishment in the piano imitation produces a pc set that is different from its counterpart in the vocal line (pc set 5-6).[29]

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[28]In this example the segment also enjoys registral continuity. Register is not, however, the chief determinant of the segment, for if it were, then the registral extreme(s) of all other sonorities would have to be connected into a line.

[29]Having gone to this trouble to distinguish pitch from set-class, I must add that the tenor of Schaffer's definition and her later expansion of it imply that by *pitch* she means *set-class*.

When the term *set* (or *set-class*) is used in the present study, I mean it in Schaffer's first sense, that is, as a description of its harmonic content and its abstract relations. The distinction between set and segment is useful for the salience theory. By ensuring that the grouping of pitches proceeds on the basis of segment and not set, the salience theory can avoid self-validating circularity in this domain. That, then, is the objective of my segmentation strategy: to delineate segments on the basis of non-set-class parameters.

The segmentation strategy attempts to group musical gestures, paying special heed to textural identity. It is these musical gestures that inform the salience theory: they represent the basic constructional elements of a composition. Advantages accrue to this approach. There is more likely to be greater agreement among theorists on segments representing elemental gestures than on segments which cut across gestural bounds. No doubt this is so, in part, because segments that reflect gestures are not highly interpretive; they are generally corroborated by clear notational clues. They remain consonant with musical intuition, and yet are amenable to a systematic approach. But this approach also has disadvantages. It focusses largely on the foreground, making little effort to interpret higher-level structures. It also does not integrate textural elements in many instances. I attempt to address these problems by admitting secondary and integral segments at a later analytic stage. There the salience theory, representing the basic constructional elements of a composition, supplies a context for segmentation of a more interpretive nature.

My strategy acts upon a suggestion by Fred Lerdahl (1989, 68) that the segmentation process might be profitably formulated using *well-formedness rules* (*WFRs*) and *preference rules* (*PRs*).[30] Lerdahl and Jackendoff (1983) employ such rules to various ends in their tonal theory, and readers familiar with that work will find an analogy here in concept if only rarely in content. Some of the rules offered below distinguish among three textural types: *line*, *simultaneity*, and, for want of a better term, *sonority*. Although it is difficult, perhaps impossible, to specify these three elements definitively, one may note common characteristics. For our purposes, a line comprises pitches sequentially disposed and having a unique rhythmic identity. Often line and simultaneity intersect; where this is so, the line will tend to be registrally distinct. By simultaneity I mean an event whose pitches have a common or proximate attack point and timbral similarity. As used here, sonority lies somewhere between simultaneity and line, although most often it might be characterized as an

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[30]By adding two *Special Grouping Preference Rules*, James Perone (1985) adapts *Grouping Well-Formedness Rules* and *Grouping Preference Rules* of Lerdahl and Jackendoff (1983) to the atonal context. Because his work addresses only single-instrument compositions, however, it does not bear directly on the well-formedness and preference rules developed here.

"arpeggiated" simultaneity. The importance of this distinction between textural types will become apparent in subsequent analyses.

This segmentation process yields what I characterize as *gestural* segments; hence the terms *Gestural Well-Formedness Rule* (*GWFR*) and *Gestural Preference Rule* (*GPR*) below. These rules are not intended to yield a rigidly predictive theory of segmentation. They reflect instead an attempt to render explicit the assumptions that underlie my segmentation strategy, to verbalize my own intuitions about grouping functions in post-tonal music. To the extent that they regiment my segmentation strategy, they also help to verify my segments. To help ensure that pc sets do not influence the segmentation process, I parse each composition in its entirety without deducing the pc set identity of segments. Only when all the segments have been specified do I go back to determine their pc set identities.

GWFR 1 A segment comprises 3 to 9 unique pitch-classes.

> This limitation reflects a common practice in set-theoretic analysis. Apart from set identity, the properties of pc sets smaller than trichords or larger than nonachords are not sufficiently restrictive to be considered set-theoretically significant. Dyads, and single pitches for that matter, may play important compositional roles, but they are more usefully described motivically, gesturally, syntactically, etc., than set-theoretically.

GWFR 2 A segment comprises contiguous pitches

> Segments are admitted that are non-contiguous in the temporal sequence of all instruments taken together but contiguous in the sequence of one instrument taken singly.

GWFR 3 Segment boundaries are determined by a discontinuity[31] in the parameter(s) effecting segmental cohesion that is greater than at any point within the segment.

> The musical parameters most frequently invoked for their grouping properties are temporal discontinuity, rhythmic identity, attack point, and register. Textual discontinuities play a particularly significant role in determining segments in the vocal line.

GWFR 4 Excepting the conditions specified by **GWFR 5**, a segment that is partitioned into smaller segments must be exhaustively partitioned.

> This rule corroborates my sense that the interior boundary(s) of one (sub)segment necessarily effects a boundary(s) for the remaining pitches in the "parent" segment, grouping them into one or more other (sub)segments.

GWFR 5 Segments may overlap where the following conditions apply:
(a) where a line intersects sonorities;
(b) where preference rules are unable to solve an ambiguity.

> With respect to GWFR 5a, the line will generally also evince some rhythmic independence and registral continuity. The reason for GWFR 5b will become clear below.

Occasionally the musical surface supports multiple segments, each of which will meet the criteria established by the well-formedness rules. The following preference rules, arranged from least to most verifiable/falsifiable,

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[31]Christopher Hasty (1981) has dealt most explicitly with the grouping tendencies of parametric continuity and discontinuity. I use the terms in his sense.

attempt to identify the most preferred of several possible segments. With the exception of GPR 3 and GPR 4, where the former has priority over the latter, the preference rules are not assigned precedence. Given the nature of their interrelations, it is impossible to prioritize them systematically so that they will necessarily produce an unambiguously preferred segment. Where preference rules give rise to an insoluble ambiguity, I fall back on intuition in deciding to segment the musical event either multiply (GWFR 5b) or to choose one segment over others.

GPR 1 Prefer the segment that best clarifies textural types (line; simultaneity; sonority).

GPR 2 Prefer the segment that corroborates obvious constructional devices (canon; palindrome; symmetry; pattern imitation).

GPR 3 For the following textural types, prefer the segment that exhibits these properties:

- (a) Line
    - (1) distinct rhythmic identity
    - (2) demarcated by slurs
    - (3) delimited by rests
    - (4) registral continuity
    - (5) in the vocal part, segments whose boundaries are reinforced by textual cadence
- (b) Simultaneity
    - (1) timbral continuity
    - (2) common attack point
- (c) Sonority
    - (1) pattern imitation (rhythm; contour)
    - (2) demarcated by slurs
    - (3) bounded by a regular metrical unit (beat; measure)

GPR 4 Where GPR 3 does not produce a preferred segment, prefer the segment where the greatest number of parameters meet GWFR 3.

The gestural segments described by the preceding well-formedness rules and preference rules are the only ones registered by the salience theory. They provide the context for analytic comment. As intimated above, however, we shall find occasion in the analyses of Chapter 4 to go beyond these primary segments to point out various other structural features of the Webern *Lieder*. In contrast to the primary segments, these secondary (structural) segments are derived principally on the basis of set-class identity. Their contextual justification need not be as great as for primary segments; they must, however, demonstrate a close relation to set-classes that have already appeared as primary segments. In sum, the primary segments, their properties, and their interrelations define the parameters of analytic discourse.

Chapter 4

ANALYSES OF SELECTED WEBERN *LIEDER*

Introduction

There is general agreement among scholars of Webern's music that the composer's post-tonal, pre-serial period begins with the Stefan George *Lieder*, Op. 3, and ends with the *Five Canons on Latin Texts*, Op. 16. Curiously, most of Webern's compositions during this period were songs: Opera 3, 4, 8, and 12-16. During 1908 to 1909,[32] Webern set fourteen poems by Stefan George, ten of which were later published as Opera 3 and 4. After composing a number of instrumental works, Webern again returned to setting text in the two Rilke songs of Op. 8, which he completed in the summer of 1910. Where the songs of Opera 3 and 4 are accompanied by piano, the songs of Op. 8 are accompanied by nine solo orchestral instruments. After another brief hiatus from vocal writing, during which time Webern composed his most aphoristic instrumental works, the composer turned again to songs. The period 1914 to

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[32]The dates are Moldenhauer's (1979).

1924 saw Webern composing only songs. Moldenhauer notes that the songs of Opera 12-15:

> . . . by no means evolved in a chronological sequence. Instead, the individual songs came into being at overlapping periods of time and apparently without a preconceived plan as to their ultimate place within a fixed work (1979, 263-64).

The *Five Canons on Latin Texts*, Op. 16, begun in 1923, were completed in 1924.

The songs I have chosen for our consideration in the present chapter are five:

"Dies ist ein Lied"	(Op. 3/1)
"Du, der ichs nicht sage"	(Op. 8/1)
"Der Tag ist vergangen"	(Op. 12/1)
"Nachts"	(Op. 14/5)
"Dormi Jesu"	(Op. 16/2)

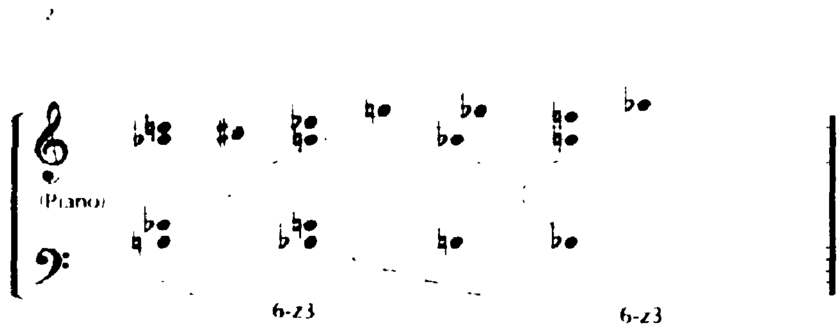
Their texts are provided in Appendix 3, along with their translations. If the intertwined evolution of the songs from which these five are drawn is not sufficient to discourage a teleological slant to the analyses, the complex series of revisions many of them underwent certainly is. As Anne Schreffler writes in her review of a recent book that includes sketch studies of Webern's compositions, "the work's 'final state' is simply the last of several possibilities, not the result of an absolute artistic necessity" (1993, 273-74). Several studies of Webern's sketches bear out Schreffler's assertion.[33] Having noted the absence of teleological purpose in the analyses below, however, I believe it is instructive to bear in mind that each of the five songs reflects a distinctive compositional stance, and that occasional comparisons among the songs can enrich the analysis.

"Dies ist ein Lied" (Op. 3/1)

Imitation, a constructional device favoured by Webern in not just early but also later works, permeates his setting of George's poem, "Dies ist ein Lied." Throughout most of the song the vocal line forms the *dux* and the top line of the piano R.H. forms the *comes.* This relation is briefly altered in mm. 8-9, where the piano R.H. assumes the leading role; the vocal line resumes the lead in the final three measures. In mm. 6-7 the piano L.H. also joins in the imitation of the vocal line. While the imitative line(s) is often altered in both pitch content and rhythm, the relation is readily apparent throughout the song. Another obvious constructional device in Op. 3/1 is pitch-class exchange, which appears in mm. 2-3. Events bounded by the exchanged pitch-classes yield identical set-classes: 6-z3s (see example 4.1).

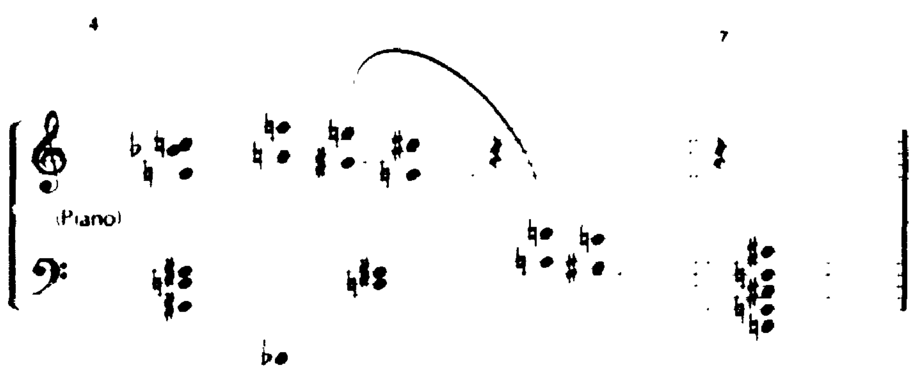
[33]These sketch studies include Budde (1971), Brinkmann (1972/73), Schreffler (1989), and Meyer (1991).

Example 4.1. Pitch-class Exchange, Op. 3/1



The principal formal divisions of the song are clearly articulated by ritards (m. 5 and m. 7) and changes in texture. Both junctures are also marked by codetta-like figures in the accompaniment (example 4.2). The "codetta" in

Example 4.2. "Codettas," Op. 3/1



m. 5 restates an octave lower a portion of the gesture appearing on the last beat of the previous measure (piano R.H.: the first two note-groups of the triplet, F♮/A♮ - E♮/G♯). The "codetta" in mm. 7-8, a simultaneity, bears no direct reference to immediately preceding material, but the pitches at the registral extremes of the simultaneity, D♮ and C♯, do recall the opening notes of the vocal line (m. 1). The three sections of the song, then, are as follows: Part 1, mm. 1-5; Part 2, mm. 5-8; and Part 3, mm. 8-12.

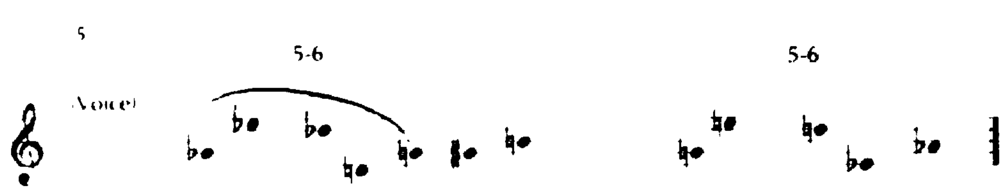
The three sections form a simple ternary design, *A-B-A'*. The middle section is distinguished from the two flanking ones by increased rhythmic activity, and it holds the registral extremes of the song. This ternary design reinforces the poetic structure. Robert Morgan writes the following about the correlation between text and music:

> The music is intimately tied to the text by Stefan George. The *A-B-A* structure follows the text's form and meaning; and the vocal line mirrors the rhyme scheme, *a-b-c-c-d-d-b-a-b*, with similar music for corresponding lines. Line seven is the exception, its music corresponding to that of lines three and four rather than two. This produces rearrangement of content in the repeated *A* section, lending the voice part a more symmetrical structure:
>
> *A B C C D D C A B*
>
> As a further result, the voice now canonically follows the piano rather than precedes it, with the original relationship reestablished in the final three measures (1992, 177-78).

In the set-class analysis below, we shall discover that Morgan's somewhat loosely construed thematic relations (*A*, *B*, *C*, etc.) find a parallel in the more demanding equivalence relations of set theory.

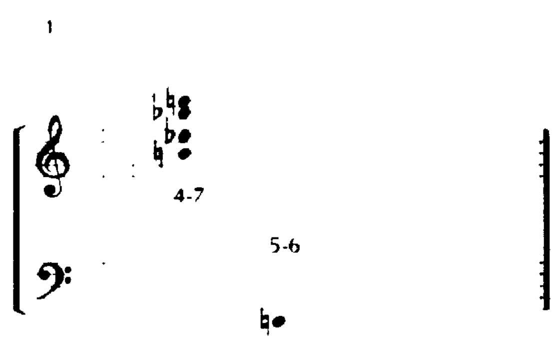
Before proceeding to the analysis of set-class salience, however, I wish to consider aspects of the process by which analytic units (events) are derived, namely, segmentation. The gestures in this song, vocal and instrumental, are generally clearly defined by textual, textural, and notational clues. Segmentation of the vocal line is rendered rather straightforward by the fact that, for the most part, Webern sets each couplet of the poem as a musical phrase. This provides a clear textual basis, at the very least, for parsing the line. An interesting case arises, however, in the setting of the couplet that comprises the middle section of the song. Here Webern's setting of the second line of the couplet is simply a transposed, truncated version of the first (example 4.3). Webern highlights the connection between the two phrase components by joining with a slur the notes

Example 4.3. Vocal line segments. Part 2, Op. 3/1



of the first line (mm. 5.2-6.2) that appear transposed in the second (m. 7). My segmentation of the first line reflects the impact of the slur, sub-partitioning set-class 7-20 into set-class 5-6. According to GWFR 4, which requires a segment that is sub-partitioned to be exhaustively partitioned, G♯ and B♮ also constitute a valid sub-partition. The two pitch-classes do not, however, constitute a valid set-theoretic segment because they do not meet GWFR 1, which requires a segment to consist of 3 to 9 pitch-classes. A similar case occurs in the accompaniment of m. 1, in the first segment of the song (example 4.4). The

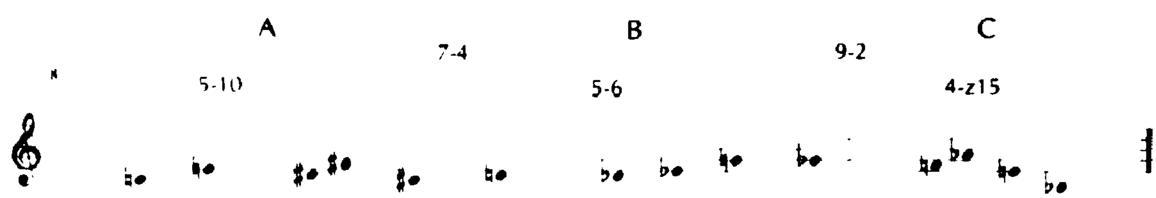
Example 4.4. Sub-partitions, Op. 3/1



proximate attack points of the simultaneity, B♮-E♭-B♭-D♮, on the one hand, and the single note, E♮, on the other, is regarded as a unified musical gesture (set-class 5-6). The identical attack point and registral continuity of the four members of the simultaneity on B♮, however, also suggest a sub-partition (set-class 4-7). As in the earlier case involving the G♯ and B♮, the E♮ constitutes a valid sub-partition, but it is not a valid segment. I draw attention to these segments to point out that GWFR 4 does not require all sub-partitions to be valid segments. As we shall see elsewhere, GWFR 4 merely implies that all sub-partitions that are also valid segments should be recognized.

The segmentation of Webern's setting of the closing three lines of poetry (mm. 8-10) invokes GWFR 5, which admits overlapping segments. Here the question does not lie in the identification of phrase components: they are readily apparent. In addition to reflecting poetic structure, the two vocal segments in mm. 8-9 are partitioned musically by melismas on the final words of the two poetic lines, "allein" and "Lied"; the last vocal segment is separated from the preceding two by rests (m. 10). The question regards, instead, the connection of three phrase components, which I shall name *A*, *B*, and *C* (example 4.5).

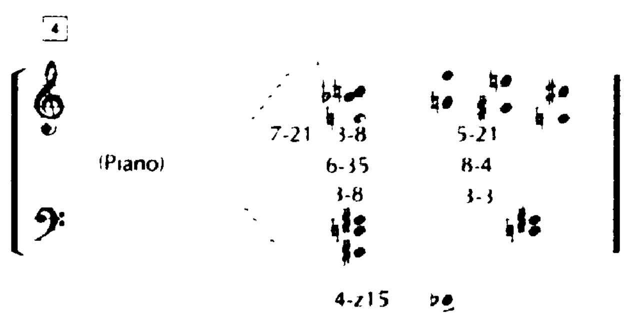
Example 4.5. Overlapping segments, Op. 3/1



Since no rests divide them, segments *A* and *B* (mm. 8-9) form a reasonable compound segment; certainly they best meet GPR 3. But, then again, perhaps our experience within the piece of having heard segments *B* and *C* (mm. 9-10) as a unit at the opening of the song (m. 1-2) and again in the piano (mm. 8-9), which they imitate, establishes a sufficient basis for combining them instead of *A* and *B*. GPR 2 would support this segmentation. Because both composite segments *A/B* and *B/C* find support in the GPRs, my segmentation invokes GWFR 5b to admit both. The result is two overlapping segments whose pitch-class identities are 7-4 and 9-2 (m. 8 and m. 9).

The piano gesture in m. 4 (example 4.6) provides another notable parsing problem. The gesture as a whole contains too many pitch-classes to qualify as

Example 4.6. Multiple segments, Op. 3/1



a set-theoretically valid set-class, so one intuitive way to segment it is to distinguish the simultaneity (set-class 6-35) from the cross rhythms of the remaining part of the gesture (set-class 8-4). Another reasonable way in which to partition the gesture is to account for the rhythmic identity of R.H. and L.H. and, to some extent, registral identity;[34] this yields set-classes 4-z15 and 7-21. Furthermore, GWFR 4 recognizes each of the four sub-partitions generated by the superimposed segments to be valid: hence, set-classes 3-8, 3-3, and 5-21. Consequently, this one gesture yields eight set-classes, a highly unusual circumstance.[35]

The segments of example 4.7[36] yield the salience matrix that appears in table 4.1. While most of the entries in EC group *Form* are derived

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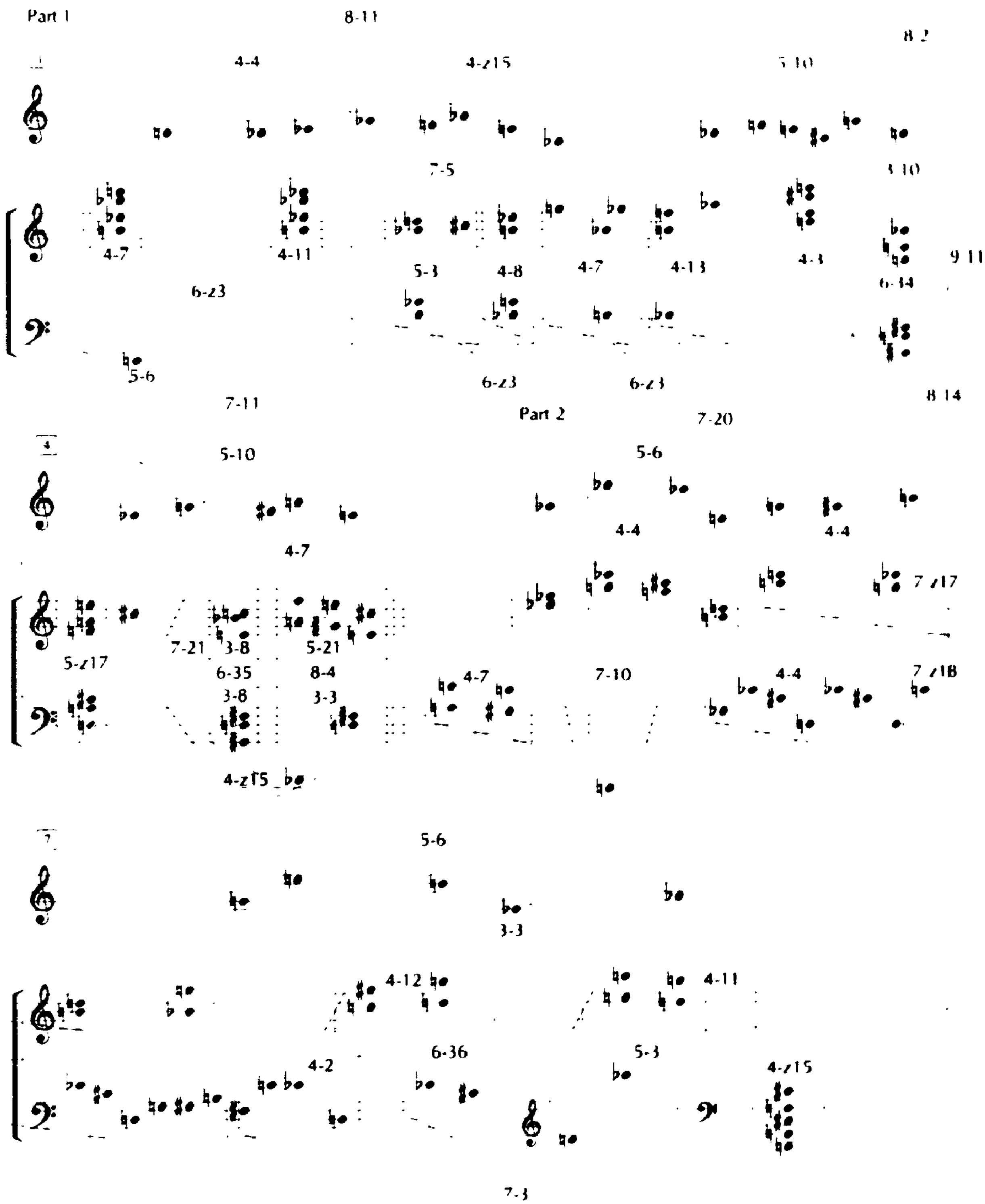
[34]Although the piano L.H. and R.H. each may be understood to define distinct registral strata, register alone is not sufficient reason to partition the gesture in this way. The registral discontinuity that defines the two strata (interval 10 between F♯^{3} and E♮^{4}) is superseded in the L.H. segment by interval 23 (E♭^{1} to D♮^{3}); that is to say, registral discontinuity does not meet GWFR 3.

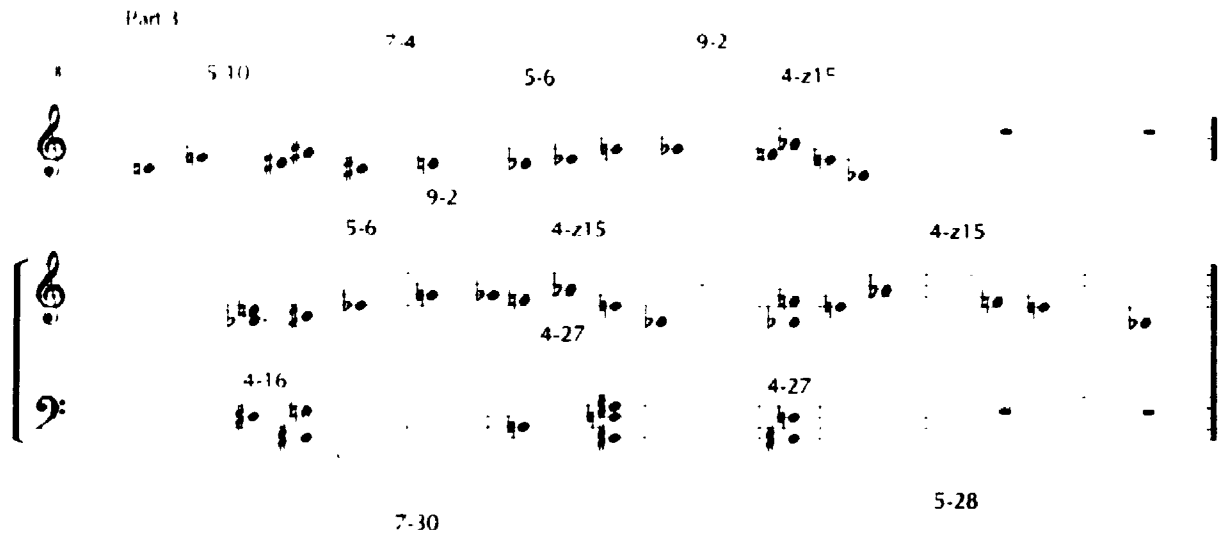
[35]The reader may have noticed that I use more or less synonymously the two terms, *sub-partition* and *composite segment*. In general, *sub-partition* seems more descriptive where one's attention is first drawn to a gesture as a whole. Conversely, *composite segment* seems the more appropriate term in cases where one first apprehends the discrete elements of a gesture. In the end, with respect to my segmentation strategy, both terms describe the same general phenomenon, that is, multiple segments.

[36]In my segmentation, a down-facing bracket represents the line of pitches lying immediately below it; an up-facing bracket represents all the pitches that lie above it.

Example 4.7. Segmentation. Webern's Op. 3/1



(Example 4.7 continued)



systematically according to the specifications presented in Chapter 3 (that is, the matrix entries represent events that intersect the closing note of a given formal span), two result from interpretive decisions. The first is set-class 4-7, the "codetta" in m. 5. The second is set-class 4-z15, the "codetta" in mm. 7-8. The appearance of both set-classes at other important junctures in the song corroborates the interpretation. Set-class 4-7 is especially significant in Part 1, where it marks the ends of both phrases in the section. In m. 2 it appears as a simultaneity; in m. 4 it appears as a line. Furthermore, it is notable that set-class 4-7 is also the first gesture of the song. One might loosely describe it as a point of departure and return.

Table 4.1. Salience Matrix, Op. 3/1

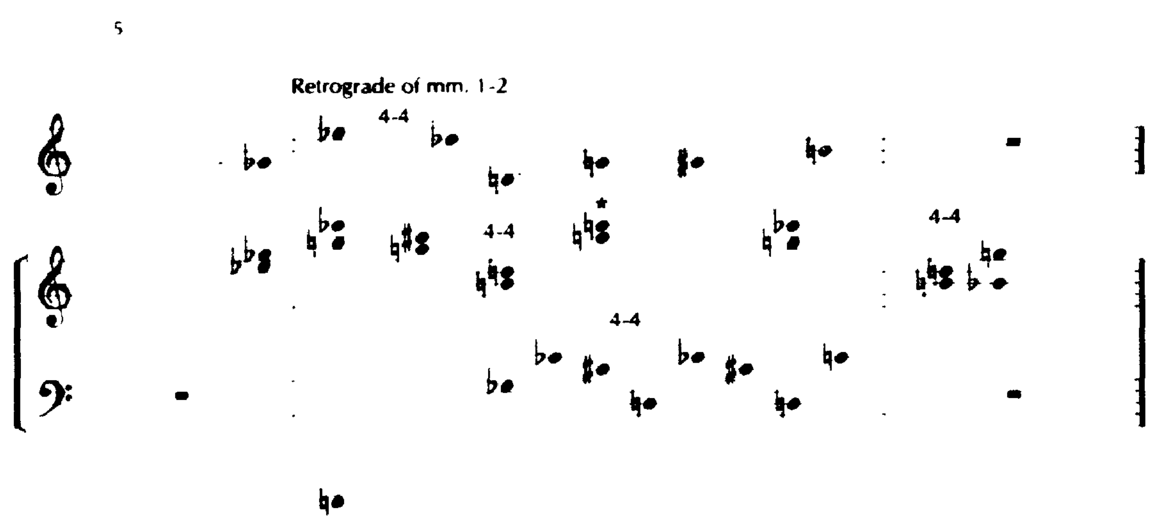
		PCSC	PCS	PS	LR	PCN	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BN	SSI
4-4	[1.000]	1	2				28	4			1	1	1		1	7564
4-z15	[.9091]	2		1	2		18					5	4	[illegible]	1	7286
4-7	[1.000]	3				2	12					3	2		1	5766
5-10	[.6364]	2					8	3			1	1	1		1	5335
5-6	[.8182]	1		1	1		18					1	1		1	4849
4-11	[1.000]	1					17	2				1	1		1	4578
5-3	[.7273]	1								1	1	1	1		1	4278
6-z3	[.4545]							3				1			1	4168
7-21	[.7273]						9			1	1	2	1		1	4060
3-3	[.8182]						20					1	1		1	3792
4-2	[.9091]						19	1							1	3757
9-2	[.8182]				1		18								1	3686
3-8	[1.000]	1					15								1	3471
5-z17	[.6364]						12	1							1	3257
4-27	[.8182]	1					10								1	3114
9-11	[.8182]						13								1	2929
5-28	[.6364]						5					1	1	1	1	2903
7-30	[.3636]						12								1	2857
8-14	[1.000]						11								1	2786
7-11	[.4545]						10								1	2714
4-3	[1.000]						7								1	2500
7-5	[.7273]						7								1	2500
7-20	[.8182]						7								1	2500
7-4	[.4545]						6								1	2429
6-34	[.0909]						5								1	2357
3-10	[1.000]						5								1	2357
4-8	[1.000]						5								1	2357
4-16	[.9091]						3								1	2214
7-z18	[.4545]						3								1	2214
4-13	[.8182]						3								1	2214
6-35	[.9091]						2								1	2143
4-12	[.8182]						2								1	2143
ESI		.0392	.0060	.0060	.0120	.0060	1.000	0422	.0000	.0060	0120	0542	0422	0090	0964	

The salience matrix shows set-class 4-z15 to be the most significant of all set-classes with respect to formal function. It appears 5 times at the close of phrases (mm. 2,4,7,10,10), 4 times at the close of sections (mm. 4,7,10,10), and 2 times at the end of the song (mm. 10,10). We shall see that, of all the set-classes engaged by our analyses of the five songs, set-class 4-z15 is unique for the fact that it marks all sectional divisions of a given song.

More than formal function contributes to the salience of set-classes 4-z15 and 4-7, however; the SSIs of both set-classes, .7286 and .5766 respectively, rank them second and third in overall salience. This is partly the result of their instantiation of ECs within EC group *Repetition* Set-class 4-7, with its instantiations of EC *PCX* as well as EC *PCSC*, matches the highest salience within EC group *Repetition*: 5. Set-class 4-z15, which multiply instantiates EC *PCSC* and EC *LR*, and which instantiates EC *PS* once, also achieves 5 instantiations in this EC group.

First in rank in the salience matrix is set-class 4-4 (SSI: .7564). As an often repeated set-class, 4-4 is especially pervasive in Part 2 of the song (example 4.8). There, the first four notes of the vocal line (mm. 5-6) present

Example 4.8. Set-class 4-4, Part 2, Op. 3/1



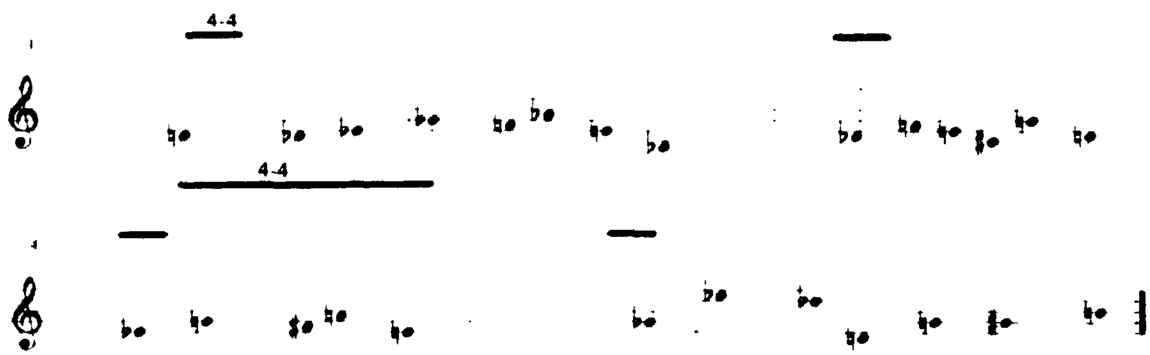
the first four notes of the vocal line of Part 1 (mm. 1-2) in retrograde. The top line of the piano R.H. beginning with the pick-up to m. 6, although rhythmically distinct, essentially doubles the vocal line. It is particularly interesting to find in the top line of the piano R.H. (marked '*' in example 4.8) that Webern has chosen the highest pitch in the song, E♮⁶, to embellish the *comes*, thus producing another pc set 4-4. And, of course, set-class 4-4 also appears in the piano L.H. in strict pitch-class/contour imitation of the opening vocal gesture in Part 2.

While instantiating ECs in all EC groups, set-class 4-4[37] is the most salient of all set-classes in inclusion relations and complementarity. Among inclusion relations, its connectedness substantially out-ranks its closest competitor, set-class 3-3; whereas set-class 3-3 stands in inclusion relation to 20 other pc sets, set-class 4-4 is thus related to 28 other pc sets. Of the numerous complement relations that are formed by the various forms of set-class 4-4 and the one form of set-class 8-4, only one has formal significance. That complement relation involves pc set 4-4 in the vocal line of mm. 1-2, which marks the beginning of Part 1, and the pc set 8-4 (m. 4), which coincides with the close of Part 1.

[37]As we have noted earlier, a set-class name in the salience matrix may also represent its complement; consequently, in my discussion of salience matrices, reference to a particular set-class may also imply its complement. A glance at EC group *Complementarity* in the matrix will confirm if a set-class's complement is also present.

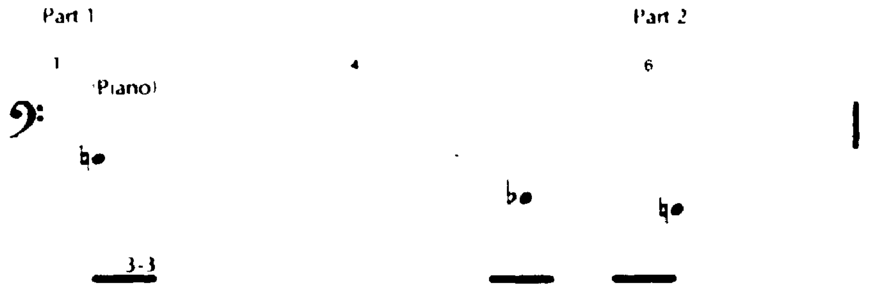
Set-class 4-4 is not only a salient gestural pc set; it also makes an intriguing appearance as a secondary pc set. The pitch members of its first statement in m. 1, D♮-D♭-E♭-G♭, in turn initiate the first four phrase components that are preceded by rests (example 4.9).

Example 4.9. Projection of set-class 4-4, Op. 3/1



Where pc set 4-4 is projected in the vocal line across Part 1 to link with Part 2, another set-class is projected by a different means over the same temporal span in the accompaniment: 3-3 (example 4.10). The three pitches are connected on the basis of their registral isolation. Like set-class 4-4, set-class 3-3 is a salient feature of many local contexts, particularly in the voice (e.g., m. 3, D♭-F♮-E♮; m. 4, E♭-G♮-F♯; m. 6, G♮-G♯-B♮). Its structure, a "major third" plus an interior semitone, appears to have been favoured by Webern in this

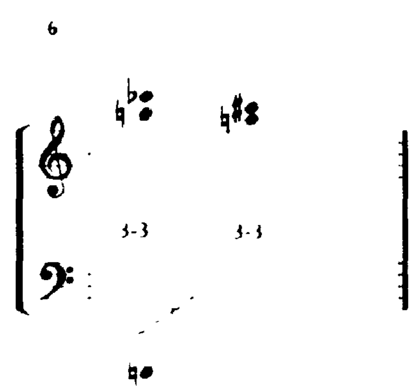
Example 4.10. Projection of set-class 3-3, Op. 3/1



song. The final note of the projected 3-3, C♮¹, forms two more 3-3s when connected with simultaneous or proximate notes in the piano (example 4.11).

I mentioned in the introduction to "Dies ist ein Lied" that equivalence relations, alluded to by Morgan's chart of text/music relations, play an important

Example 4.11. Set-class 3-3, Op. 3/1



role. In example 4.12 I reproduce Morgan's chart, replacing his letter designations with set names. Perhaps to a greater extent than one might have

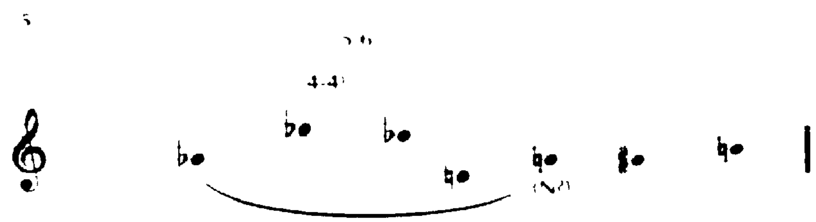
Example 4.12. Set-class equivalence and form, Op. 3/1

4-4 4-z15 5-10 5-10 (5-6) 7-20 5-6 5-10 (4-4) 5-6 4-z15

expected, the more exacting set-class designations corroborate the thematic relations Morgan identifies. While there is a clear sectionalization of form in the song, Webern also ensures a certain homogeneity of pitch resources throughout all sections, and this he accomplishes in part by the most subtle of means: by a note that makes its first appearance as an embellishment. In m. 2, a G♮ precedes the expected G♭ of the *comes* in the piano R.H.; this G♮ combines with the retrograded set-class 4-4 that initiates the middle section (m. 6) to produce set-class 5-6 (example 4.13). There the G♮ no longer functions as a local "upper neighbour" to G♭.[38] When what we expect to be set-class 4-4 reappears in the vocal line of m. 9, it incorporates G♮ to form another pc set

[38] One possible interpretation is to consider G♮ a larger-scale neighbour to G♭, given that it defines the closing boundary of a gesture initiated on G♭.

Example 4.13. Role of G♮ "neighbour note," Op. 3 1



5-6, thus recalling the principal set-class of the vocal line in Part 2. By this subtle means, the middle section of the song is linked to the flanking sections.

Let us now turn to a brief generic analysis of "Dies ist ein Lied." Its reduced genera matrix in table 4.2 shows Genus 8, an "atonal" genus, to be predominant (GSI: .190). One of the two trichordal progenitors of Genus 8 is set-class 3-3, which ranks among the more active set-classes within the salience matrix. More significant than set-class 3-3 in ensuring the predominance of Genus 8, however, are set-classes 4-4 and 4-7. Both set-classes hold membership exclusively in Genus 8, and both are among the most salient set-classes of the song. Consequently, their impact on the GSI is maximal, as the bracketed numbers next to the set-class names in the genera matrix indicate.[39] Most of the set-classes with high SSIs hold membership in either Genus 8 or

[39]Values in the brackets reflect the average of a given set-class's SSI and EI.

Table 4.2. Reduced Genera Matrix, Op. 3/1

		G1	G2	G3	G5	G6	G7	G8	G10
3-2	[5934]					o			
3-3	[5987]							o	
3-8	[6736]		o						
3-10	[6179]			o					
3-11	[5555]								o
4-2	[6424]					o			
4-3	[6250]					o			
4-4	[8782]							o	
4-7	[7883]							o	
4-8	[6179]	o							
4-11	[7389]						o		
4-12	[5162]					o			
4-13	[5198]			o					
4-14	[6393]								o
4-Z15	[8188]		o						
4-16	[5653]		o						
4-27	[5648]		o						
5-3	[5775]							o	
5-4	[3487]							o	
5-5	[4887]				o				
5-6	[6516]							o	
5-10	[5850]					o			
5-11	[3639]							o	
5-Z17	[4811]							o	
5-Z18	[3380]							o	
5-20	[5341]								o
5-21	[5666]							o	
5-28	[4633]					o			
5-30	[3247]							o	
6-Z3	[4356]							o	
6-34	[1633]							o	
6-35	[5617]		o						

GSIs in Descending Order.

G8	190
G6	177
G5	134
G10	129
G2	125
G3	121
G1	108
G7	101

Genus 6, the "semichromatic" genus, one of whose two progenitors, incidentally, is set-class 3-3 (Genus 8: 4-4, 4-7, 5-6, 6-3, 5-21, 3-3; Genus 6: 5-10, 4-2, 3-2).

One exception is set-class 4-z15, the second most salient set-class, which is claimed in the reduced genera matrix by "wholetone" Genus 2.

"Du, der ichs nicht sage" (Op. 8/1)

The first of Webern's *Zwei Lieder*, Op. 8, both of which are settings of poems by expressionist poet Rainer Maria Rilke, differs markedly in style and construction from "Dies ist ein Lied" of Op. 3. Where imitative writing and unequivocal formal design distinguish Op. 3/1, free textures and formal ambiguity characterize Op. 8/1.[40] Doubtless, part of the reason for the formal ambiguity of the latter song lies in the structure of the poem itself. Its rhyme scheme is as follows:

Du, der ichs nicht sage, dass ich bei Nacht	a
weinend liege,	b
deren Wesen mich müde macht	a
wie eine Wiege.	b
Du, die mir nicht sagt, wenn sie wacht	a
meinetwillen;	c
wie, wenn wir diese Pracht	a
ohne zu stillen	c

[40]Felix Meyer (1991) has published an exhaustive account of Webern's revisions of these two songs. Originally composed in 1910, the songs underwent four distinct stages of revision before being published in 1926. What began in 1910 as an impressionistic setting requiring a large chamber group, by the time it was published, had turned into a leaner work reflecting a more expressionistic aesthetic.

in uns ertrügen?   d
  [*kurze Pause und zögernd*][41]
Sieh dir die Liebenden an,   e
wenn erst das Bekennen begann,   e
wie bald sie lügen.   d

The rhyme scheme presents a regular strophic structure, but the ninth line, "in uns ertrügen," which is grouped by rhyme to the third strophe, is syntactically connected to the second. And, of course, the "performance direction" inserted into the poem also reinforces the link of the ninth line to the second strophe. In addition to observing these readily apparent aspects of the poem's structure, Felix Meyer (1991) also notes that the poem's content suggests yet another formal design. The scope of the poem broadens from the opening "I" and "you" (lines 1-6) to "we" (lines 7-9), and finally, "they" (lines 10-12). The structure, then, may be variously interpreted thus:

Rhyme scheme: 4 + 4 + 4;
Syntactical structure: 4 (2 + 2) + 5 (2 + 3) + 3;
Narrative structure: 6 + 6 (3 + 3) (Meyer 1991, 78).

While we shall see that Webern's setting captures aspects of the poem's formal ambiguities, for the purpose of analysis I consider the song's formal design to be tripartite, *A-A'-B* (example 4.14).

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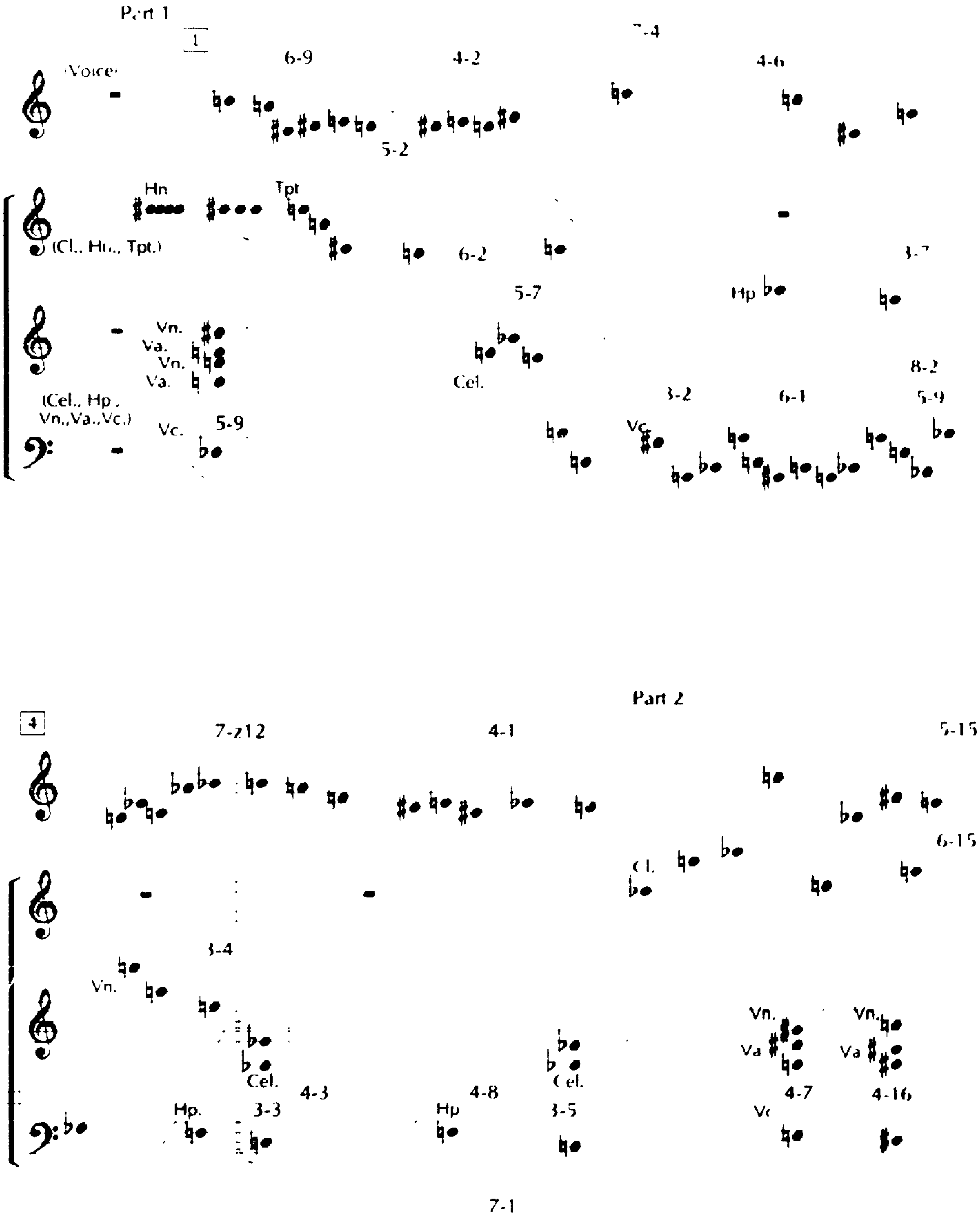
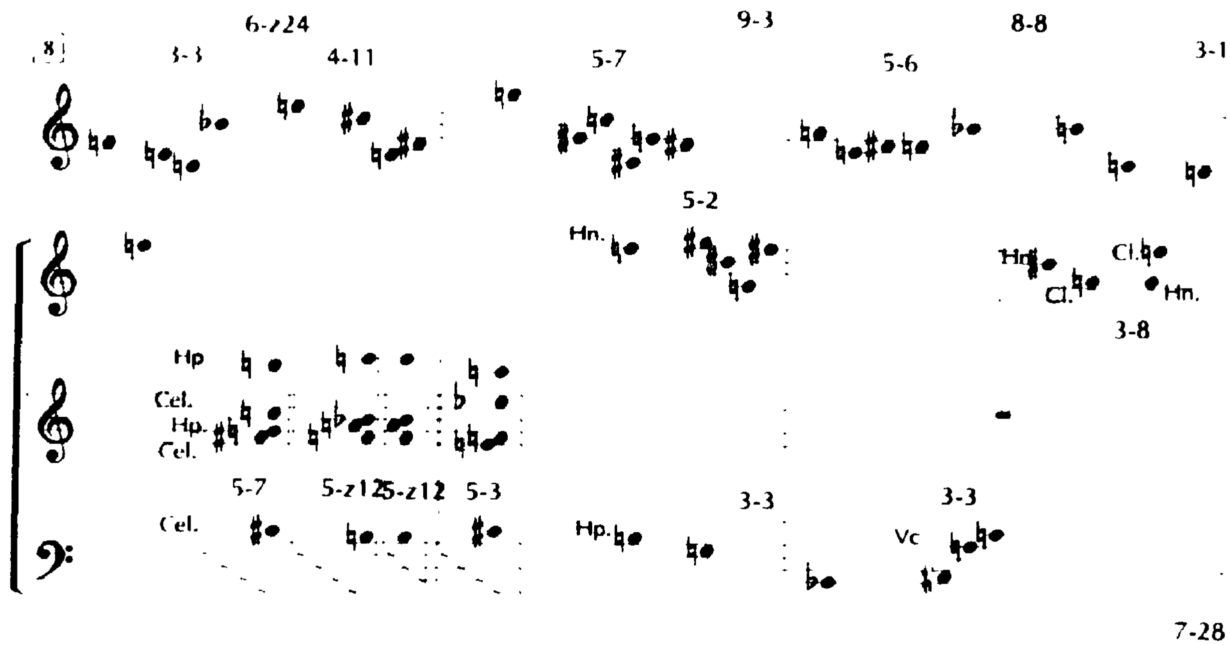
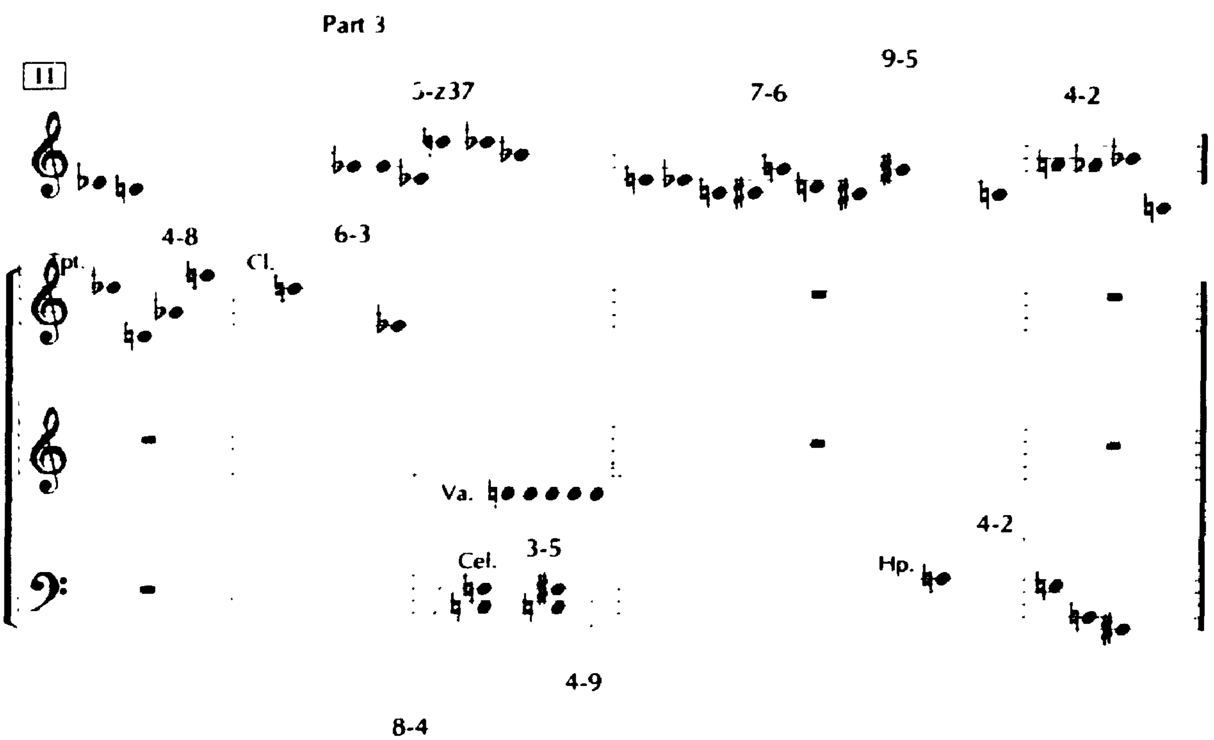
[41]This "performance direction" appears in Rilke's poem, which is a folk song sung by a girl in his book, *Die Aufzeichnungen des Malte Laurids Brigge*.

Example 4.14. Segmentation, Webern's Op. 8/1



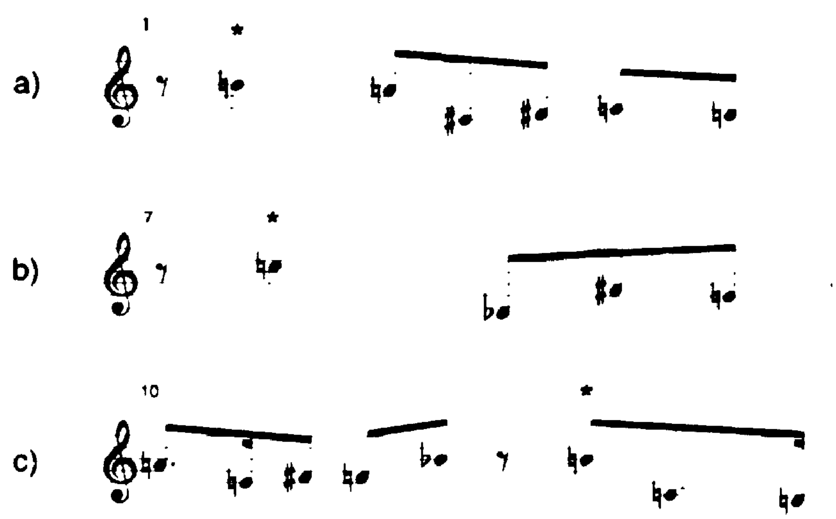
(Example 14.4 continued)





Webern's setting reinforces by subtle means the structural ambiguity of Rilke's poem. In the vocal line, the first two strophes begin in parallel fashion (example 4.15a and 4.15b). The opening of the third *rhyme* group (line 9, example 4.15c) sounds B♮ off the beat, an allusion to the beginning of the first strophe (example 4.15a). The more obvious structural break of the poem, however, which falls between lines 9 and 10 of the text, is marked in the setting by rests (mm. 11-12). As further corroboration of these primary divisions,

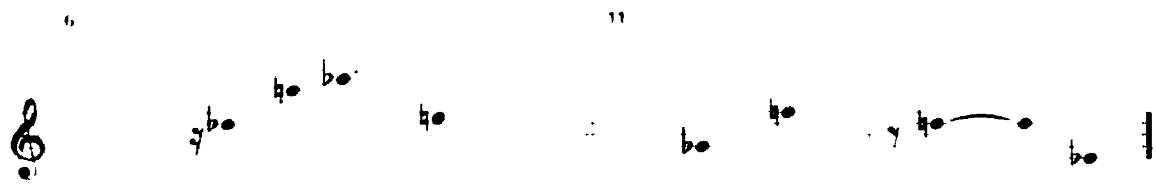
Example 4.15. Parallel settings of corresponding formal junctures, Op. 8/1



Meyer also notes a motivic parallelism, which appears only in the final version of the song, between the clarinet part of mm. 6-7 (successive interval array:

+11/+3/-11) and the trumpet/clarinet part of mm. 11-12 (+11/-3/-11) (see example 4.16). These gestures reflect the poem's syntactic structure. One of Meyer's most interesting observations, however, regards the articulation of the

Example 4.16. Motivic parallelism as a corroboration of form, Op. 8/1



narrative structure (6 + 6 lines) in the music (1991, 84-85). In his final revision, Webern reinforces the shift from "I/You" to "We/They" by introducing the highest note in the vocal line, G♮[5], at the precise temporal midpoint of the song (example 4.17). This juncture is further emphasized by rhythmic and dynamic intensification.

Example 4.17. The "narrative" division of Op. 8/1

As I intimated earlier, for the purposes of the salience theory I consider Op. 8/1 to be tripartite in form, following the *syntactical* divisions of the poem. These divisions are corroborated in the music more than the others. The close of Part 1, which spans mm. 1-6, is marked by a decrease in rhythmic activity (including a ritard) and dynamics. The end of Part 2, which coincides with Rilke's "performance direction," "kurze Pause und zögernd," is marked by a rest in the vocal line that is of greater duration than rests anywhere else in the vocal line. Part 2, then, spans mm. 7-11, and Part 3, mm. 12-14. The events that instantiate EC *Section* within EC group *Form* in the salience matrix are limited to those that intersect the closing vocal notes of the respective phrases. Unlike Op. 3/1, in this song there are no other events whose formal role seems perspicacious.

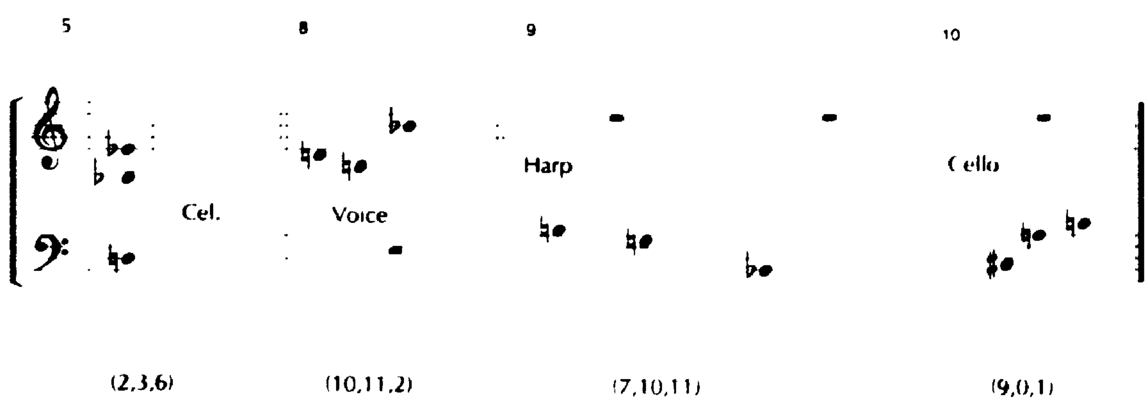
The salience matrix of the song is peculiar with respect to the rate of decrease of its SSIs (table 4.3). Whereas the SSIs of Op. 3/1 decreased at a fairly regular rate, SSIs of Op. 8/1 group themselves into three distinct categories. Two set-classes, 3-3 and 4-2 (whose respective SSIs are .8000 and .7900), form the first category; they are separated from the next category by a considerable margin. Set-classes 3-5 and 4-8 (SSIs, .6133 and .5533 respectively) hold something of a middle ground. The remaining set-classes fall sharply in salience, ranging in SSIs from .3733 to .2067.

Table 4.3. Salience Matrix, Op. 8/1

		PC SC	PCS	PS	LR	PC X	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BV	SSI
3-3	[.8182]	3					30	4							1	.8000
4-2	[.9091]	2					16	[illegible]				2	2	2	1	.7900
3-5	[1.000]	1					27	2				1	1		1	.6133
4-8	[1.000]		1				18	1			1	1	1		1	.5533
5-7	[.9091]	2					6								1	.3733
5-Z12	[.8182]				1		5	1							1	.3500
7-1	[.9091]						11					1	1		1	.3400
7-28	[.6364]						8					1	1		1	.3200
5-9	[.2727]	1					2					1			1	.3133
3-1	[1.000]						5					1	1		1	.3000
4-1	[1.000]						5					1	1		1	.3000
5-6	[.8182]						7	1							1	.2967
5-2	[.7273]	1					3								1	.2867
3-7	[.8182]						7					1			1	.2800
8-4	[1.000]						11								1	.2733
4-6	[1.000]						4					1			1	.2600
6-Z3	[.4545]						8								1	.2533
7-4	[.4545]						7								1	.2467
6-1	[.7273]						5								1	.2333
6-15	[.0909]						5								1	.2333
3-4	[.9091]						5								1	.2333
3-2	[.8182]						4								1	.2267
4-3	[1.000]						4								1	.2267
4-9	[1.000]						4								1	.2267
3-8	[1.000]						3								1	.2200
5-3	[.7273]						3								1	.2200
5-15	[1.000]						3								1	.2200
4-11	[1.000]						3								1	.2200
6-2	[.4545]						3								1	.2200
6-Z24	[.1818]						2								1	.2133
5-Z37	[.6364]						2								1	.2133
4-7	[1.000]						2								1	.2133
6-9	[.9091]						1								1	.2067
4-16	[.9091]						1								1	.2067
		.0435	.0043	.0000	.0043	.0000	1.000	.0522	.0000	.0000	.0043	.0478	.0348	.0087	.1478	

This curious arrangement of SSIs is partly due to the nature of inclusion relations within the song. The four most salient set-classes, 3-3, 4-2, 3-5, and 4-8, are all highly connected with respect to inclusion. There is, of course, a correlation between the number of a set-class's instantiations of ECs within EC group *Repetition* and its salience within EC *INC*, because EC *INC* measures pitch-class, not interval-class, inclusion. Consequently, the greater the number of unique occurrences of a pc set—that is to say, the broader the range of pitch-classes that pc set recurrences present—the more likely it is to be a subset or superset of other pc sets. This fact gives set-class 3-3 an advantage with respect to inclusion. It appears four times in the song, each time adding at least one new pitch-class: celesta, m. 5 (2,3,6); voice, m. 8 (2,10,11); harp, m. 9 (7,10,11); 'cello, m. 10 (9,0,1) (see example 4.18). Furthermore, set-class 3-3's complement, 9-3, also appears in the song (voice, m. 9). Given that the salience matrix assesses the salience of set-classes as well as their complements,

Example 4.18. 3-3 pc sets, Op. 8/1

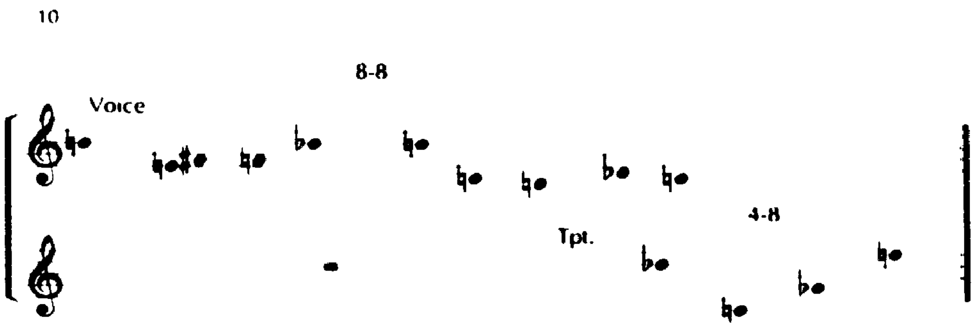


set-class 3-3 in the matrix represents not only its four unique deployments in the song, but also its complement, set-class 9-3.

Like set-class 3-3, set-classes 4-2 and 3-5 also represent more than one form of pc set within the song as well as their respective complements. Set-class 4-8, on the other hand, although it appears twice (harp/celesta, m. 5, and trumpet, m. 11), presents only four pitches: (0,1,5,6). As the entry at the intersection of set-class 4-8 and EC *OVL* indicates, of course, set-class 4-8's complement, set-class 8-8, also appears in the song (voice, m. 10). Despite the fact that it represents a smaller range of actual pitch materials, set-class 4-8 is highly connected with respect to inclusion.

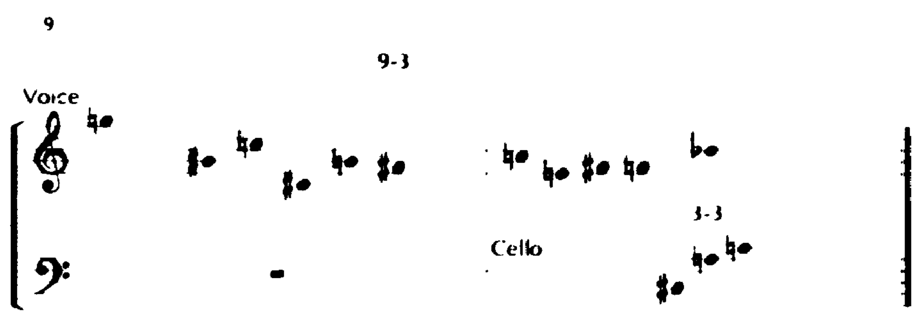
Of the several complement relations that occur in Op. 8/1 (set-class pairs 3-3/9-3, 4-2/8-2, 3-5/9-5, 5-z12/7-z12, 5-6/7-6), set-class pair 4-8/8-8 is among the most striking, as it marks the close of Part 2. Set-class 8-8 appears in the vocal line; its complement comprises an accompanimental gesture (example 4.19). One other complement relation bears mention because it reflects the formal ambiguity of the song: set-class pair 3-3/9-3. Whereas the 4-8/8-8 complement relation marks the formal disjunction that I have adopted as the primary one at the end of Part 2 (m. 11), complement relation 3-3/9-3 appears in an analogous manner one measure earlier. This is the point at which the second strophe—as defined by the rhyme scheme—ends. It is at this juncture that the 3-3/9-3 complement relation occurs. As with the 4-8/8-8 complement

Example 4.19. Complement relation 4-8/8-8, Op. 8/1



relation, the larger pc set, set-class 9-3, is presented in the vocal line while its complement appears in the accompaniment (see example 4.20).

Example 4.20. Complement relation 3-3/9-3, Op. 8/1



Before leaving Op. 8/1, let us briefly consider its generic profile. "Chromatic" Genus 5 heads the GSIs by a considerable margin (see the GSI list in table 4.4). This is hardly surprising, given the salience of numerous highly chromatic set-classes in the song. Especially notable in this regard are set-

Table 4.4. Reduced Genera Matrix, Op. 8/1

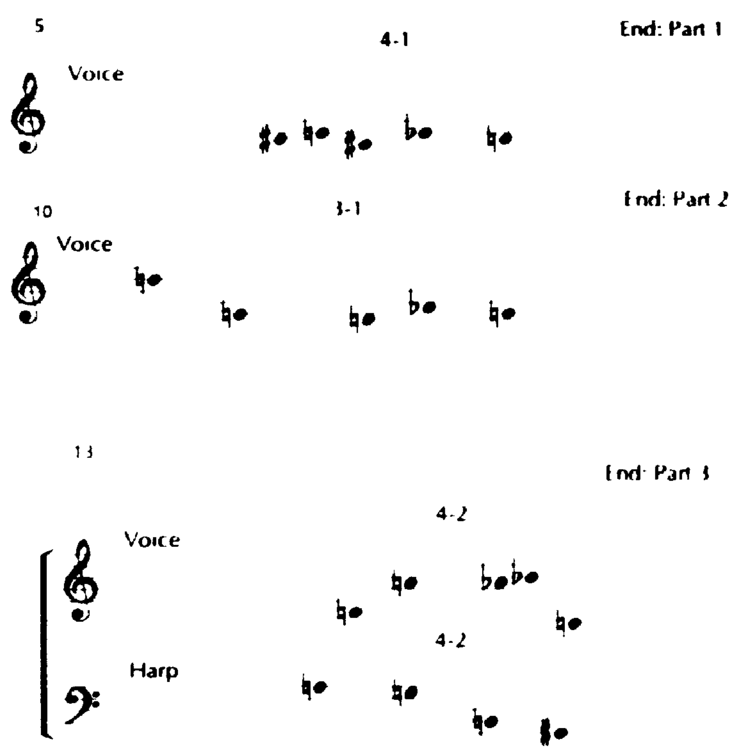
		G1	G2	G5	G6	G7	G8
3-1	[.6500]			o			
3-2	[.5224]			o			
3-3	[.8091]						o
3-4	[.5712]						o
3-5	[.8067]	o					
3-7	[.5491]					o	
3-8	[.6100]		o				
4-1	[.6500]			o			
4-2	[.8496]			o			
4-3	[.6133]				o		
8-4	[.6367]						o
4-6	[.6300]	o					
4-7	[.6067]						o
4-8	[.7767]	o					
4-9	[.6133]	o					
4-11	[.6100]					o	
4-16	[.5579]	o					
7-1	[.6246]			o			
5-2	[.5070]			o			
5-3	[.4736]			o			
7-4	[.3506]			o			
5-6	[.5574]						o
5-7	[.6412]	o					
5-9	[.2930]			o			
5-Z12	[.5841]					o	
5-15	[.6100]	o					
7-28	[.4782]				o		
5-Z37	[.[illegible]49]						o
6-1	[.4803]			o			
6-2	[.3373]			o			
6-Z3	[.3539]			o			
6-9	[.5579]			o			
6-15	[.1621]			o			
6-Z24	[.1976]						o

GSIs in Descending Order:

G5	252
G8	195
G6	191
G7	145
G1	128
G2	075

classes 4-2, 4-1, 5-2, and 3-1 (see again the salience matrix in table 4.3). It is worth observing, too, that several chromatic set-classes play significant formal roles. Set-class 4-2 appears in both the accompaniment (harp) and vocal line to close the song (m. 14). This set-class has the greatest influence on the GSI; the average of its SSI and EI is .8496. Other chromatic set-classes, including 4-1 and 3-1, also appear at formally significant junctures (example 4.21).

Example 4.21. Set-classes 4-1, 3-1, and 4-2; Op. 8/1

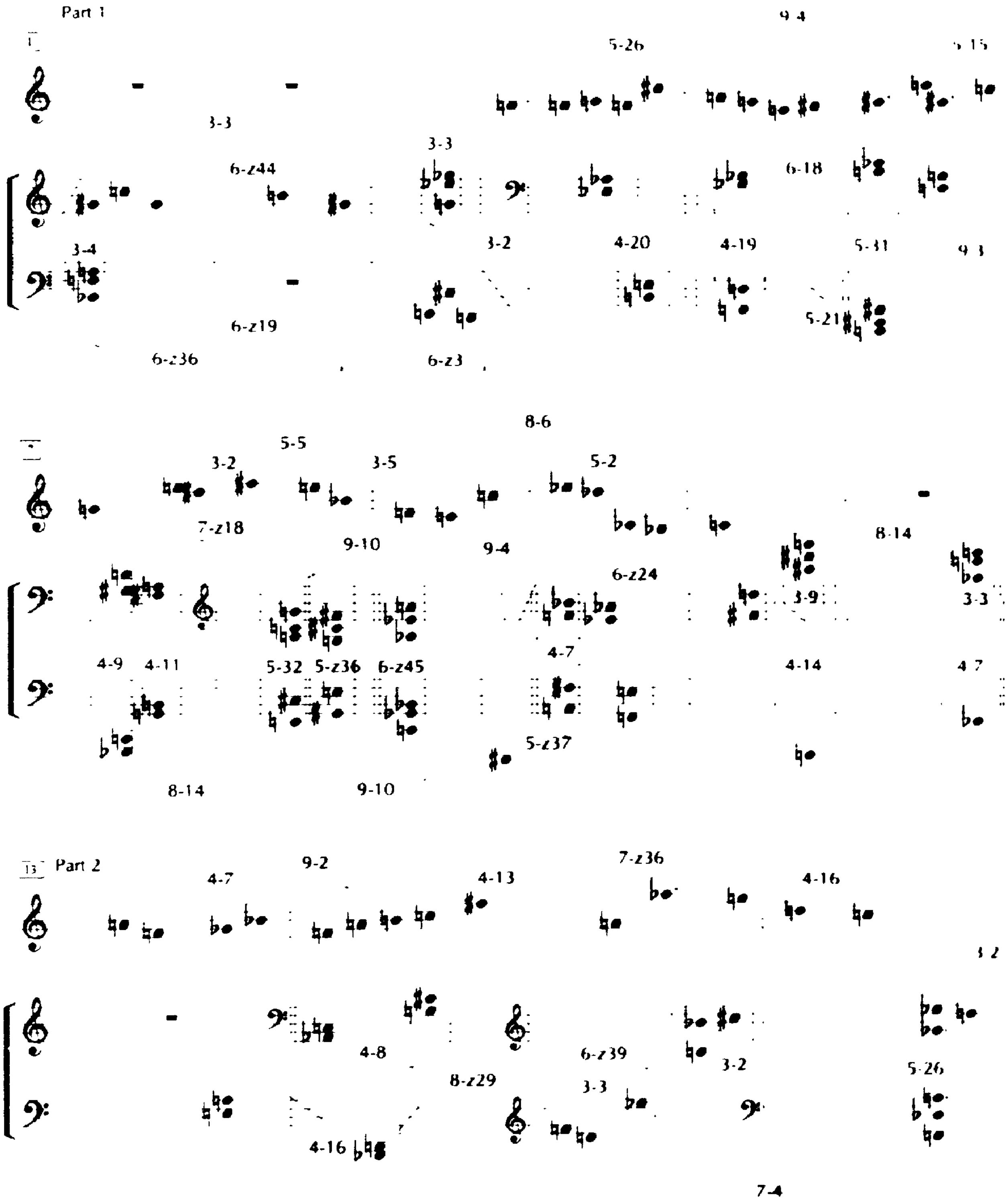


"Der Tag is vergangen" (Op. 12/1)

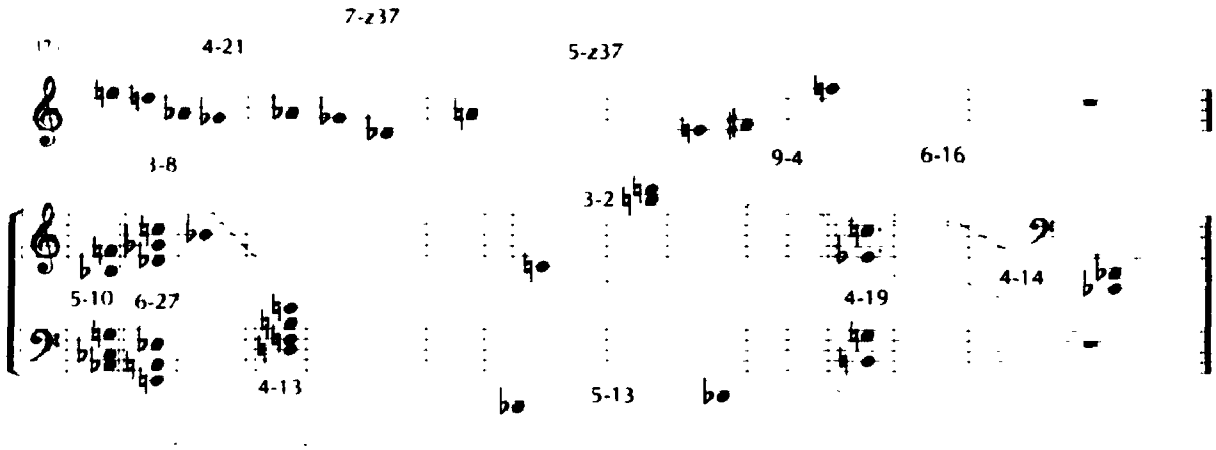
None of the formal ambiguities that pervade Op. 8/1 characterize Webern's Op. 12/1, "Der Tag ist vergangen." The two strophes of this simple folk-song text, with their *a-b-c-b* | *a-d-a-d* rhyme scheme, form the basis for the formal structure of the setting. The end of Part 1, which spans mm. 1-12, is marked by a ritard and further reinforced by a "codetta." In this sense, the formal design is reminiscent of "Dies ist ein Lied," Op. 3/1. Another "codetta" closes the song (mm. 21-23). As always, in Op. 12/1 the formal role of events that intersect the closing notes of phrases are recognized in the salience matrix. To these I add the "codettas" just mentioned, whose pitch structure we shall examine at a later stage.

Segmentation of "Der Tag ist vergangen" presents few difficulties (example 4.22), but I wish to highlight the implications of one common parsing situation. Webern has structured the piano accompaniment so that it is comprised of a number of discrete gestures bounded by rests. In most cases these gestures meet GWFR 1; that is, they hold from 3 to 9 pitch-classes. Usually, however, these gestures also comprise unique textural strata, which are generally defined by rhythmic identity or registral continuity. Consequently, the large gestures bounded by rests are commonly sub-partitioned to reflect more primitive elements of distinct gestural identity. One consequence of these

Example 4.22. Segmentation, Webern's Op. 12/1



(Example 4.22 continued)



multiple segments for the salience analysis of Op. 12/1, as we shall see, is a large number of instantiations of EC *INC* by certain set-classes.

The piano introduction to the song, which is set off from the following material by vertical rests (m. 3), exhausts the aggregate. Webern's deployment of the twelve pitch-classes would seem to adumbrate aspects of twelve-tone composition. Significant in this regard is his division of the aggregate into hexachords and trichords, a division which later characterizes many of his twelve-tone rows. Parsed by registral deployment, the introduction yields the two z-related hexachords, set-classes 6-z44 and 6-z19. The iconic significance of these two hexachords is well known: set-class 6-z44 is the famous

Schoenberg "signature set;"[42] set-class 6-z19 is its complement. When parsed by temporal discontinuity, the introduction yields hexachords 6-z36 and 6-z3, the latter being a particularly ubiquitous set-class that appears in all five songs under discussion.

Webern emphasizes the four trichordal partitions of the aggregate in the introduction by identifying trichords with textural types, which he then juxtaposes. The first (temporal) hexachord is comprised of one trichord deployed as a line (piano R.H.) and the other deployed as a simultaneity (piano L.H.). The same textural types characterize the second hexachord, 6-z3 (m. 3), but there they are exchanged: piano L.H. plays the line while piano R.H. plays the simultaneity. The trichords delineated by this deployment, set-classes 3-2, 3-3, and 3-4, are among the most salient set-classes of the song (see table 4.5).

As I mentioned earlier, the multiple segments invited by the structure of the accompaniment as a whole in "Der Tag ist vergangen" contribute to the significance of inclusion relations in the salience matrix. The three trichords that appear in the opening twelve pitches-classes of the song, set-classes 3-2, 3-3, and 3-4, instantiate EC *INC* far more often than any other set-class (their number of instantiations are 44, 43, and 55 respectively). The next most salient set-class within EC *INC* is set-class 9-10 (20 instantiations).

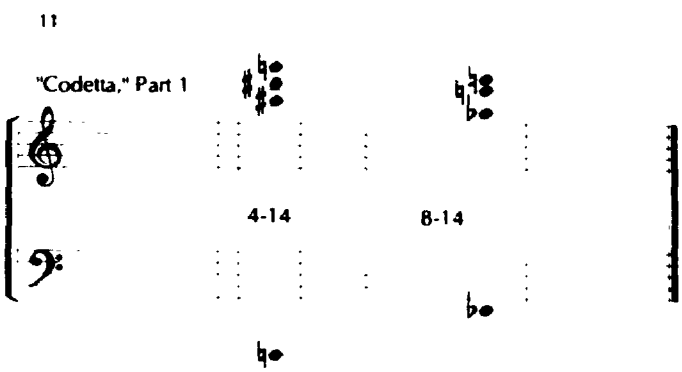
[42]See, for instance, Allen Forte (1978).

Table 4.5. Salience Matrix, Webern's Op. 12/1

		PCSC	PCS	PS	LR	PCX	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BV	SSI
3-2	[.8182]	4					44	5				1			1	.7667
4-14	[1.000]	1					27	3		1	2	2	2	1	1	.7482
3-3	[.8182]	3					43	3	1			1			1	.6797
3-4	[.9091]	1					55	2				1	1	1	1	.6367
5-z37	[.6364]		1				11	1		1	1	2	2	1	1	.5900
4-19	[.7273]	1					7					1	1	1	1	.3955
6-16	[.2727]						5					1	1	1	1	.3382
6-z3	[.4545]						8		1		1	1			1	.3358
4-7	[1.000]	1	1				9								1	.3327
4-16	[.9091]	1					10					1			1	.3264
7-4	[.4545]						6					1	1		1	.3018
3-9	[1.000]						5					1	1		1	.2982
6-24	[.1818]						3					1	1		1	.2909
5-z36	[.3636]						11	1							1	.2733
9-10	[1.000]						20								1	.2727
5-26	[.2727]	1					5								1	.2682
6-z19	[.4545]						9		1						1	.2661
4-13	[.8182]	1					3								1	.2609
5-15	[1.000]						5					1			1	.2582
5-2	[.7273]						4					1			1	.2545
7-z18	[.4545]						4					1			1	.2545
4-9	[1.000]						3					1			1	.2509
8-6	[1.000]						8								1	.2291
8-z29	[.9091]						7								1	.2255
4-8	[1.000]						6								1	.2218
3-5	[1.000]						5								1	.2182
5-5	[.7273]						5								1	.2182
4-21	[1.000]						5								1	.2182
5-13	[.3636]						4								1	.2145
4-11	[1.000]						4								1	.2145
5-21	[.7273]						4								1	.2145
3-8	[1.000]						3								1	.2109
6-27	[.4545]						3								1	.2109
6-z39	[.1818]						3								1	.2109
5-31	[.4545]						3								1	.2109
5-32	[.7273]						3								1	.2109
6-18	[.2727]						2								1	.2073
4-20	[1.000]						2								1	.2073
6-z45	[.5455]						1								1	.2036
5-10	[.6364]						1								1	.2036
		.0383	.0055	.0000	.0000	.0000	1.000	.0410	.0082	.0055	.0109	.0492	.0273	.0137	.1093	

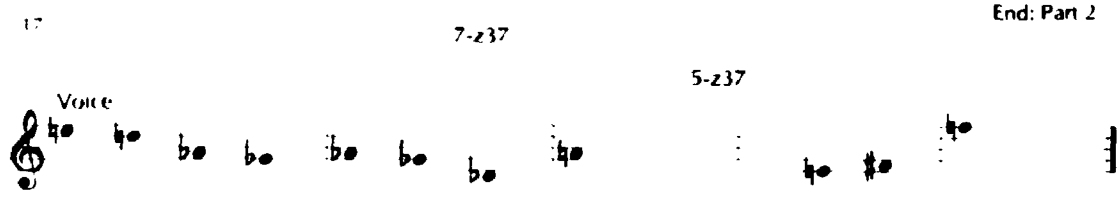
Perhaps more notable than inclusion relations, however, is the role of complement relations in Op. 12/1, particularly of complementary set-class pairs 8-14/4-14 and 7-z37/5-z37. Set-class 4-14 appears in m. 11, embedded in its complement; set-class 8-14 is, of course, the set-class identity of the "codetta" that closes Part 1 (example 4.23). In an analogous manner in the

Example 4.23. Embedded complement, 4-14/8-14, Op. 12/1



vocal line at the end of Part 2, set-class 5-z37 is embedded in its complement, 7-z37 (example 4.24). Set-classes 4-14 and 5-z37 are among the most salient set-classes of the song.

Example 4.24. Embedded complements, 5-z37/7-z37, Op. 12/1



The reduced genera matrix of Webern's "Der Tag ist vergangen" is given in table 4.6. As in "Dies ist ein Lied," "atonal" Genus 8 receives the highest GSI (.188). For the first time in our analyses the "atonal-tonal" Genera 9 and 10 make a strong showing. (Forte combines Genera 8, 9, and 10 to form Supragenus III, thereby reflecting the abstract similarity among them.) That Genus 10 is ranked second (GSI: .169) is partly due to the influence of set-class 4-14, which Genus 10 alone holds as a member. Set-class 4-14, together with set-classes 3-2, 3-4, and 3-3, have the greatest impact on the determination of GSIs (respective SSI/EI averages: .8741, .7924, .7729, and 7489).

Table 4.6. Reduced Genera Matrix, Webern's Op. 12/1

	G1	G2	G3	G6	G7	G8	G9	G10	G11
3-2 [.7924]				o					
3-3 [.7489]						o			
3-4 [.7729]						o			
3-5 [.6091]	o								
3-8 [.6055]		o							
3-9 [.6491]									o
9-10 [.6364]			o						
8-6 [.6145]	o								
4-7 [.6664]						o			
4-8 [.6109]	o								
4-9 [.6255]	o								
4-11 [.6073]					o				
4-13 [.5396]	o								
4-14 [.8741]								o	
4-16 [.6177]	o								
4-19 [.5614]						o			
4-20 [.6036]								o	
4-21 [.6091]		o							
8-z29 [.5673]	o								
5-2 [.4909]						o			
5-4 [.3782]						o			
5-5 [.4727]								o	
5-10 [.4200]				o					
5-13 [.2891]						o			
5-15 [.6291]	o								
7-z18 [.3545]						o			
5-21 [.4709]						o			
5-26 [.2704]						o			
5-31 [.3327]							o		
5-32 [.4691]							o		
5-z36 [.3185]							o		
5-z37 [.6132]						o			
6-z3 [.3951]						o			
6-z39 [.1964]						o			
6-16 [.3054]						o			
6-18 [.2400]						o			
6-z19 [.3603]						o			
6-z45 [.3746]				o					
6-z24 [.2364]						o			
6-27 [.3327]							o		

GSIs in Descending Order:

G8: .188
G10: .169
G9: .164
G6: .144
G1 .143
G7. .133
G3: .126
G2: .107
G11: .059

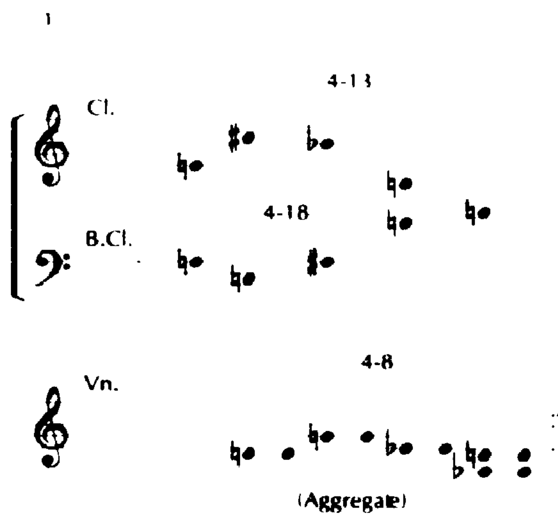
"Nachts" (Op. 14/5)

George Trakl's "Nachts," which has an irregular meter and rhyme scheme, falls into two strophes. The subject of the poem shifts from "meiner" (mine) in the first strophe to "deiner" (yours) in the second. In Webern's setting, a fermata marks the close of the first strophe (m. 11); other contextual features, including a decrease in rhythmic activity, vertical rests, and a lightened texture, reinforce this formal juncture. (The voice alone marks the close of Part 1, without instrumental accompaniment.) Part 1, then, spans mm. 1-11, and Part 2, mm. 11-17. Vertical rests unequivocally mark the ends of the two phrases in Part 1 (m. 5 and m. 11). The close of the first phrase of Part 2 (m. 13) is less emphasized than the previous phrases; nonetheless, this point in the poem is marked by the only rest in the vocal line of Part 2.

The dense counterpoint of the accompaniment in "Nachts," which is comprised of clarinet, bass clarinet, and 'cello, stands in contrast to the sparse piano accompaniment of "Der Tag ist vergangen." Curiously, however, as in Op. 12/1, the opening contrapuntal lines of "Nachts," presented by the three instruments, exhaust the aggregate. Here they are deployed in three tetrachords, each stated by a different instrument (see example 4.25).

Because there are virtually no vertical rests in the accompaniment apart from ones at formal junctures, primitive linear gestures do not lend themselves to unambiguous compound segments. My segmentation of the song

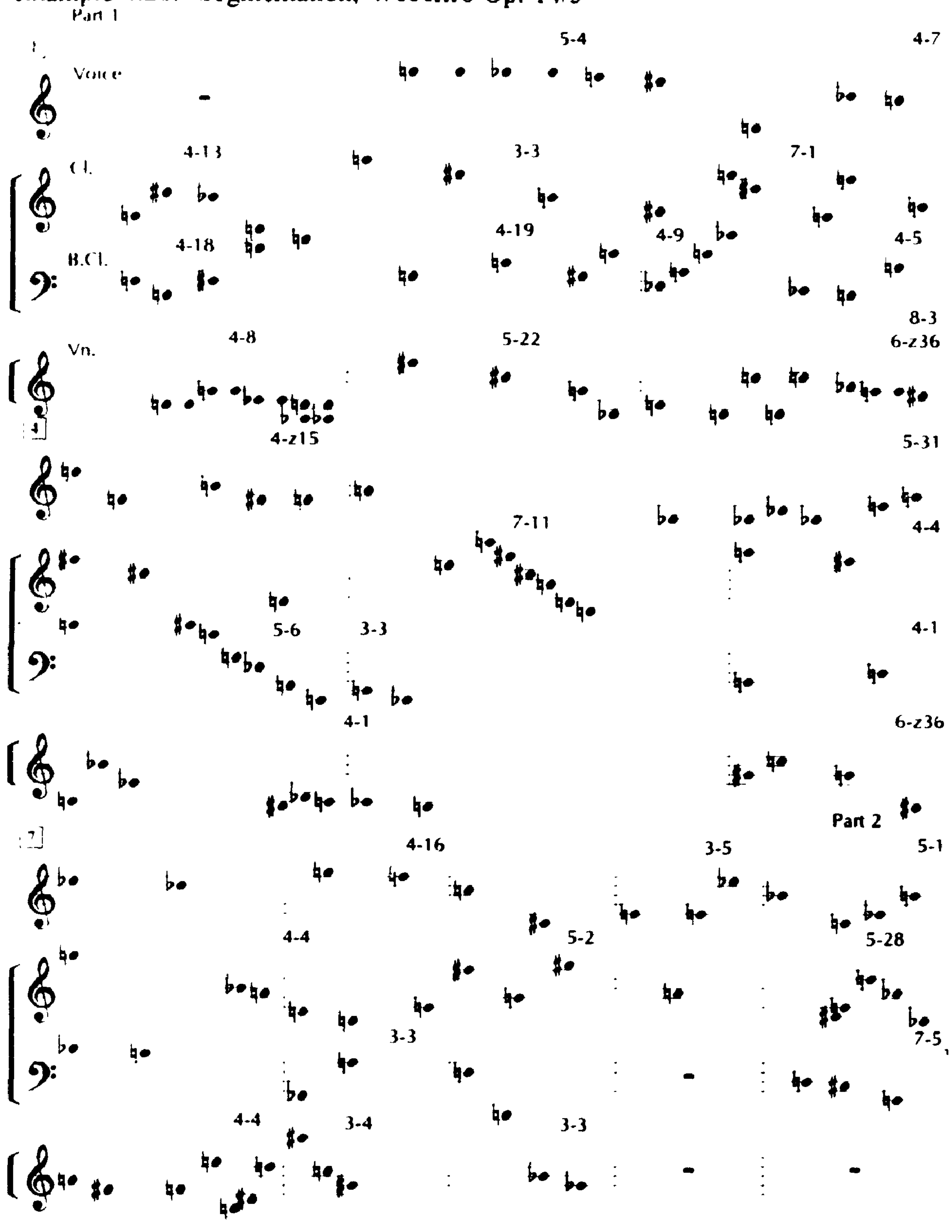
Example 4.25. The aggregate, Op. 14/5



(example 4.26) reflects the textural strata formed by contrapuntal strands, each reflecting unique rhythmic and timbral identities.

The salience matrix of Webern's Op. 14/5, which is provided in table 4.7, shows a handful of set-classes to be especially salient. As it has in the preceding three songs that we have analysed, set-class 3-3 plays a prominent role in "Nachts." One particular form of the set-class, (3,4,7), appears three times: once at the end of the first phrase (bass clarinet, mm. 4-5), once in the clarinet of mm. 15-16, and finally as part of the closing accompanimental

Example 4.26. Segmentation, Webern's Op. 14/5



(Example 4.26 continued)

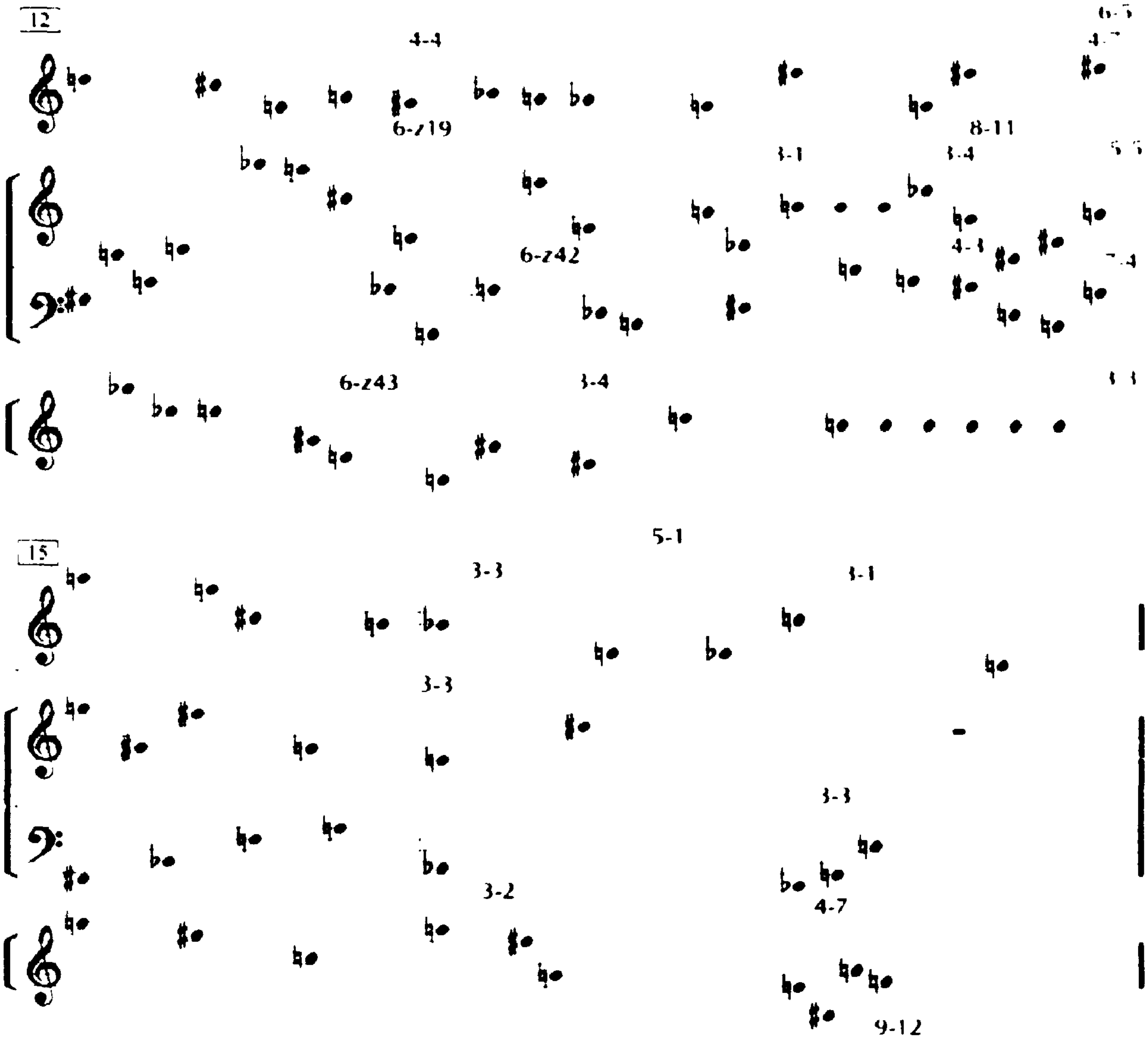


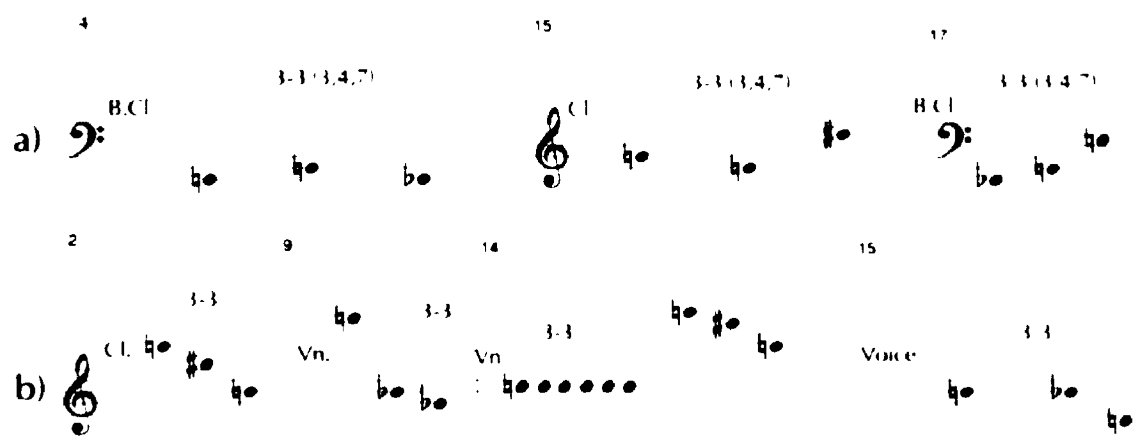
Table 4.7. Salience Matrix, Webern's Op. 14/5

		PCSC	PCS	PS	LR	PCX	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BV	SSI
3-3	[.8182]	3	3				19					1			1	6667
3-1	[1.000]	1					14					1	1	1	1	.5807
9-12	[1.000]						12					1	1	1	1	.5263
5-1	[.9091]	1					8	2							1	.5175
3-4	[.9091]	2					14					1			1	.4807
4-4	[1.000]	3					10					1			1	.4719
5-4	[.4545]						10	1							1	.4053
4-3	[1.000]						10		1						1	.4053
4-1	[1.000]	1					8					1			·	.3842
3-5	[1.000]						3					1	1		1	.3649
4-7	[1.000]	2					8								1	3509
7-11	[.4545]						5					1			1	.3193
6-z36	[.4545]	1					8								1	.3175
6-z42	[.5455]						4					1			1	.3088
5-5	[.7273]						9								1	.2947
8-11	[1.000]						8								1	.2842
4-z15	[.9091]						1					1			1	2772
3-2	[.8182]						7								1	.2737
6-z43	[.3636]						4								1	.2421
6-5	[.2727]						4								1	.2421
5-6	[.8182]						3								1	.2316
4-5	[.9091]						3								1	.2316
4-8	[1.000]						2								1	.2211
5-31	[.4545]						2								1	.2211
4-18	[.8182]						2								1	.2211
5-22	[.5455]						1								1	.2105
6-z19	[.4545]						1								1	.2105
4-16	[.9091]						1								1	.2105
5-2	[.7273]						1								1	.2105
4-9	[1.000]						1								1	.2105
4-19	[.8283]						1								1	.2105
4-13	[.8182]														1	.2000
5-28	[.6364]														1	.2000
		.0761	.0163	.0000	.0000	.0000	1.000	.0163	.0054	.0000	.0000	.0543	.0163	.0109	.1793	

gesture of the song (bass clarinet, m. 17) (see example 4.27a). It appears in other forms in the clarinet of m. 2, the violin of m. 9 and m. 14, and the voice of m. 15 (example 4.27b).

Also salient in "Nachts" are a number of chromatic set-classes, including 3-1 and 5-1. The salience of set-class 3-1 is primarily the consequence of its

Example 4.27. 3-3 pc sets, Op. 14/5



formal role and its connectedness to other pc sets by inclusion. It appears as the final event of the song (voice, mm. 16-17), joined only by set-class 9-12 in the matrix in its instantiation of EC *WHL*.

The greatest GSI in the genera matrix of table 4.8, belongs to Genus 5, the "chromatic" genus (GSI: .199). Genus 8 follows closely with a GSI of .197. Upon comparison of the genera matrix with the salience matrix, we notice that many of the most salient set-classes of "Nachts" belong either to Genus 5 (e.g., set-classes 3-1, 5-1, 5-4, 4-1) or Genus 8 (e.g., set-classes 3-3, 4-4, 3-4, 4-7).

Table 4.8. Reduced Genera Matrix, Webern's Op. 14/5

		G1	G4	G5	G6	G7	G8
3-1	[7904]			o			
3-2	[5459]			o			
3-3	[7424]						o
3-4	[6949]						o
3-5	[6825]	o					
3-12	[7632]		o				
4-1	[6921]			o			
4-3	[7026]				o		
4-4	[7360]						o
4-5	[5703]	o					
4-7	[6754]						o
4-8	[6105]	o					
4-9	[6053]	o					
8-11	[6421]					o	
4-13	[5091]	o					
4-Z15	[5931]	o					
4-16	[5598]	o					
4-18	[5196]	o					
4-19	[5194]						o
5-1	[7133]			o			
5-2	[4689]			o			
5-4	[4299]			o			
5-5	[5110]			o			
5-6	[5249]						o
7-11	[3869]			o			
5-22	[.3780]						o
5-28	[4182]				o		
5-31	[3378]				o		
6-5	[2574]			o			
6-Z19	[3325]						o
6-Z36	[.3860]			o			
6-Z42	[4271]				o		
6-Z43	[3029]						o

GSIs in Descending Order:

G5 199
G8 197
G6 159
G1 140
G4 112
G7 101

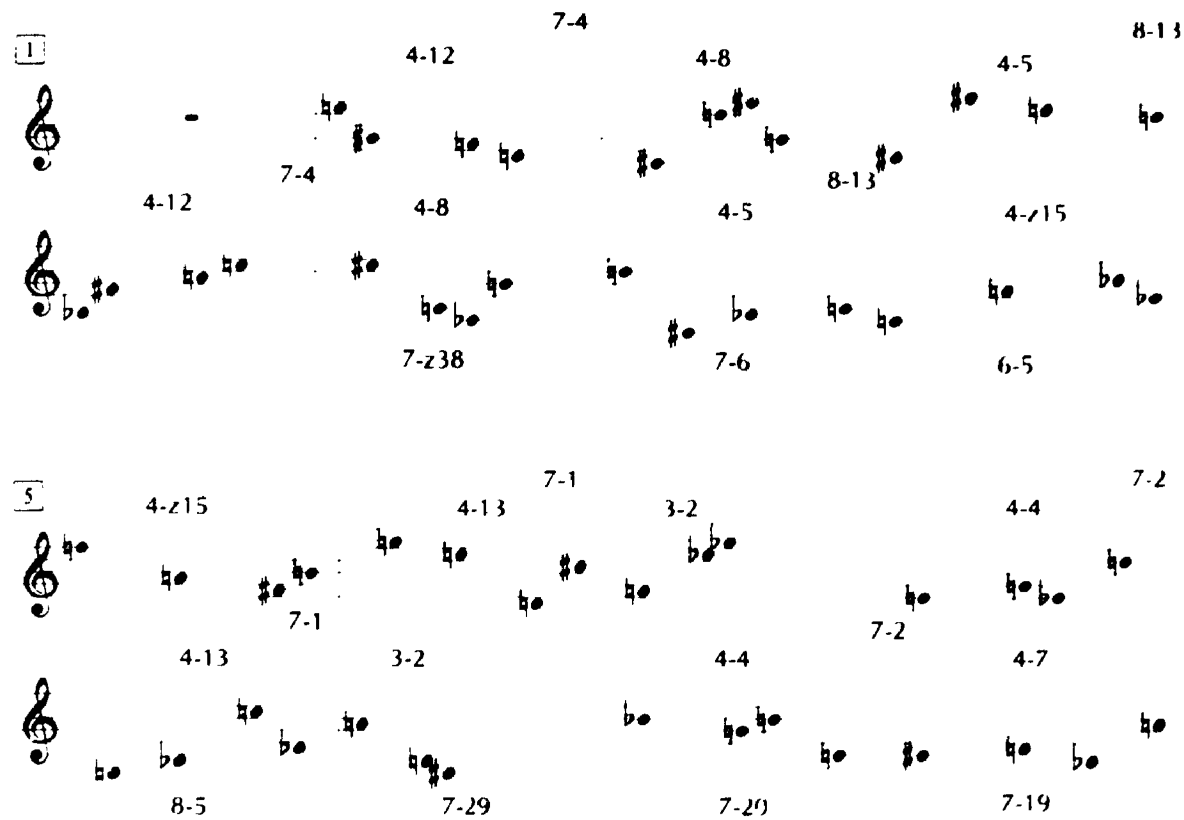
"Dormi Jesu" (Op. 16/2)

As it has been in the songs we have already examined, the form of Webern's setting of this simple poem, which is taken from *Des Knaben*

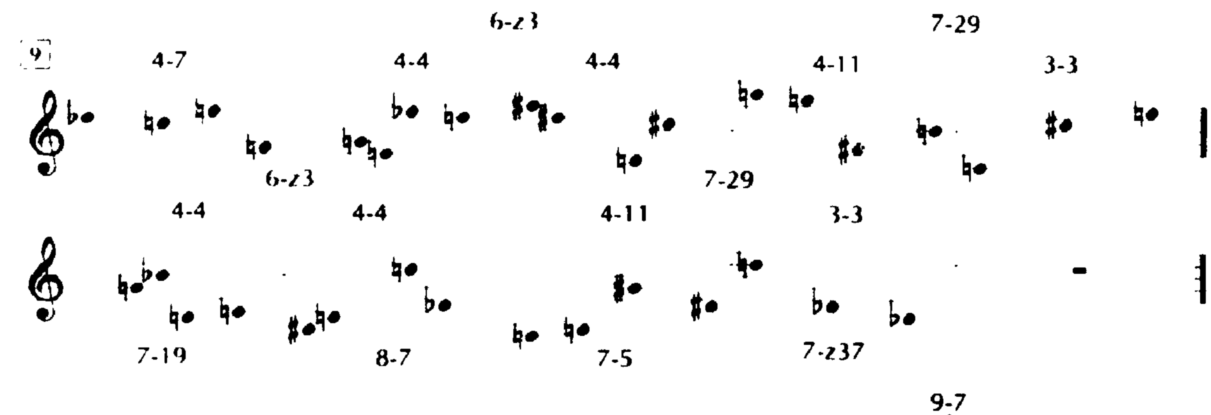
Wunderhorn, is largely determined by the text. The poem, of regular meter (*8-8-7* | *8-8-7*) and rhyme scheme (*a-a-b* | *c-c-b*), suggests a bipartite form. Webern reinforces the poem's structure by marking the principal formal disjunction with a ritard (m. 7). Part 1, then, spans mm. 1-7, Part 2, mm. 7-13. Scored for voice and clarinet, the two lines proceed in strict inversional canon at the tritone. Every detail, not just of pitch but also of rhythm, remains constant between *dux* and *comes*. Apart from instrumentation, only subtle changes in dynamic markings individuate corresponding junctures of the two textural strata.

This song presents few difficulties in segmentation (example 4.28); the

Example 4.28. Segmentation, Webern's Op. 16/2

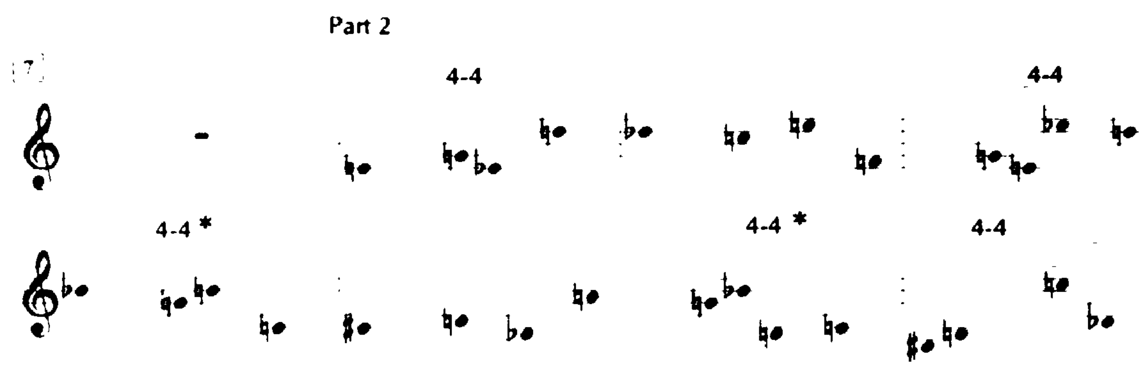


(Example 4.28 continued)



unique timbral and rhythmic identities of coincident gestures are recognized, as are the "integral" gestures. Of course, the strict canon ensures the repetition of most set-classes, a fact reflected in the salience matrix of the song (table 4.9). Two set-classes emerge with comparatively high SSIs in the matrix: 4-4 (SSI: .7400) and 4-13 (SSI: .6900). Set-class 4-4 (example 4.29) achieves its salience

Example 4.29. 4-4 pc sets, Part 2, Op. 16/1



(Example 4.29 continued)

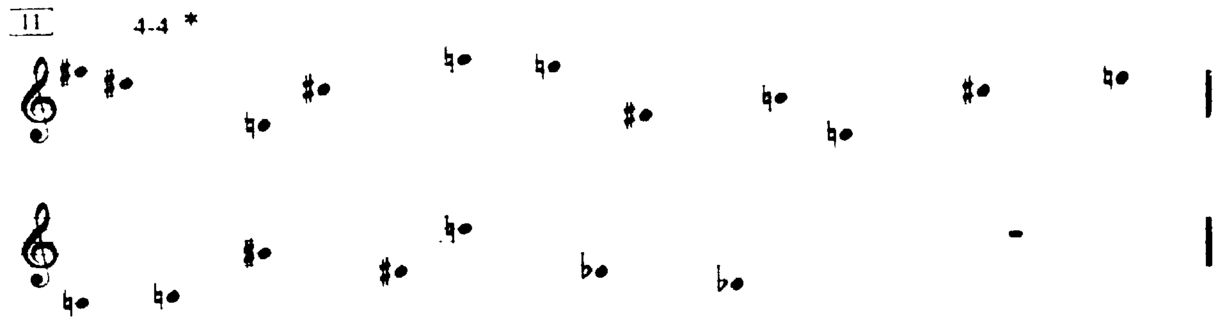


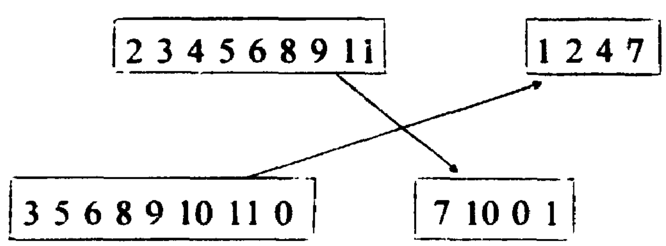
Table 4.9. Salience Matrix, Webern's Op. 16/2

		PCSC	PCS	PS	LR	PCX	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BV	SSI
4-4	[1.000]	3	2				21					3	1		1	7400
4-13	[.8182]	1					30	2	2			1			1	.6900
4-7	[1.000]	1					15	2				1			1	4900
3-3	[.8182]	1					15					1	1	1	1	4900
4-5	[.9091]	1					14	2				1			1	4833
9-7	[.8182]						14					1	1	1	1	4433
3-2	[.8182]	1					9					1	1		1	4000
4-8	[1.000]	1					12					1			1	3700
7-19	[.6364]	1					8					1			1	.3433
4-11	[1.000]	1					6					1			1	3300
4-z15	[.9091]	1					6					1			1	3300
7-29	[.4545]	2					7								1	3267
7-1	[.9091]	1					12								1	3200
7-20	[.8182]						3					1	1		1	3200
6-z3	[.4545]	1					11								1	3133
7-2	[.7273]	1					9								1	3000
7-4	[.4545]	1					9								1	3000
7-6	[.8182]						6					1			1	2900
4-12	[.8182]	1					7								1	2867
7-5	[.7273]						4					1			1	2767
7-z38	[.4545]						5								1	2333
7-z37	[.6364]						5								1	2333
6-5	[.2727]						4								1	2267
		.0819	.0086	.0000	.0000	.0000	1.000	0259	.0086	0000	.0000	0690	.0216	0086	0991	

rank primarily by instantiating ECs in EC group *Form* and EC group *Repetition*. Appearing first in the clarinet of m. 7, set-class 4-4 saturates Part 2; only the final two measures do not hold the set-class in some form. Its ubiquity ensures its coincidence with formal junctures (marked by asterisks in example 4.29).

The other highly salient set-class, 4-13, is the most connected of all set-classes with respect to inclusion relations. Although not the only set-class whose complement appears in the song, set-class 4-13 does form a notable complement relation (see set-class 8-13: clarinet, m. 3, and voice, m. 4). When reckoned as shown in example 4.30, two of the four possible complement relations formed by the 4-13s and 8-13s are literal. (Reckoned the other way,

Example 4.30. Literal complements, 4-13/8-13 (Op. 16/2, mm. 3-6)



of course, the complements overlap.) Literal complement relations have occurred only rarely in our analyses: three times in Op. 12/1 (two of which involve hexachords), and once in Op. 14/5. The proximity of literal complements in both Op. 12 and in the present song, Op. 16, would seem significant in light of Webern's increasing interest in exhaustion of the aggregate, which is the fundamental tenet of twelve-tone composition, and which he adopts systematically in his next opus.

The genera matrix of table 4.10 reveals what by now has become rather expected, the predominance of "atonal" Genus 8, together with high rankings

Table 4.10. Reduced Genera Matrix, Webern's Op. 16/2

		G1	G5	G6	G7	G8
3-2	[.6091]				o	
3-3	[.6541]					o
9-7	[.6308]				o	
4-4	[.8700]					o
4-5	[.6962]	o				
4-7	[.7450]					o
4-8	[.6850]	o				
4-11	[.6650]				o	
4-12	[.5524]			o		
4-13	[.7541]				o	
4-z15	[.6196]	o				
7-1	[.6146]		o			
7-2	[.5137]					o
7-4	[.3772]					o
7-5	[.5020]		o			
7-6	[.5541]					o
7-19	[.4899]				o	
7-20	[.5691]	o				
7-29	[.3906]				o	
7-z37	[.4349]					o
7-z38	[.3439]					o
6-z3	[.3839]					o
6-5	[.2497]					o

GSIs in Descending Order:

G8: .206
G7: .178
G5: .174
G1: .145
G6: .143

for Genera 7 and 5. And as we have seen before, set-classes 4-4 and 3-3, both members of Genus 8, are among the most salient of all set-classes in the song.

Chapter 5

CONCLUSIONS

In this closing chapter I wish to consider in general terms the analytic results of the salience theory, especially the set-classes and event-classes that emerge as particularly prominent, and the genera which come to the fore. And, finally, I wish to offer a few suggestions about future research in this field.

Macro-salience: the Five *Lieder* Combined

The salience theory affords the possibility of assessing event salience not just within but also among compositions. The multi-composition matrix that I present in table 5.1, although more abstract than the previous matrices which represented only single compositions, retains a link to the musical surface: the information it offers about the nature of pitch deployment is traceable to each of the five songs. Each set-class's salience data registers its actual activity within the five songs; the integers marking the instantiations of ECs are simply the sums of the relevant instantiations in each of the songs. In this composite

Table 5.1. Multi-composition Salience Matrix

		PCSC	PCS	PS	LR	PCX	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BV	SSI
3-3	[.8182]	10	3				127	7	1			4	2	1	5	.9077
4-4	[1.000]	7	4				70	4			1	5	2		4	.6722
3-2	[.8182]	5			1		82	5				2	1		5	.5926
4-7	[1.000]	7	1			2	46	2				4	2		5	5686
6-z3	[.4545]	2					46	3	1		1	2			5	.4590
4-z15	[.9091]	3		1	2		25					7	4	2	3	.4517
4-8	[1.000]	1	1				43	1			1	2	1		5	.3946
3-4	[.9091]	3					74	2				2	1	1	3	3942
4-11	[1.000]	2					38	2				2	1		5	.3868
4-14	[1.000]	1					38	3		1	2	2	2	1	2	.3822
4-13	[.8182]	2					36	2	2			1			4	.3628
4-2	[.9091]	2					35	4				2	2	2	2	.3582
5-4	[.4545]	1					38	1				1	1		5	.3310
5-6	[.8182]	1		1	1		34	1				2	1		4	.3309
5-z37	[.6364]		1				18	1		1	1	2	2	1	3	.3157
3-5	[1.000]	1					35	2				2	2		3	.3020
5-1	[.9091]	2					31	2				1	1		3	.2804
5-10	[.6364]	2					9	3			1	1	1		2	.2557
5-2	[.7273]	2					17					1			4	.2329
5-28	[.6364]						13					2	2	1	3	.2174
5-5	[.7273]						25					1			4	.2148
4-16	[.9091]	1					15					1			4	.2144
3-1	[1.000]	1					19					2	2	1	2	.2022
5-21	[.7273]						14			1	1	2	1		2	.1982
5-3	[.7273]	1					13			1	1	1	1		2	.1966
4-5	[.9091]	1					17	2				1			2	.1875
4-3	[1.000]						21		1						3	.1781
3-7	[.8182]						21					2	1	1	2	.1746
3-8	[1.000]	1					21								3	.1685
4-1	[1.000]	1					13					2	1		2	.1620
4-19	[.7273]	1					8					1	1	1	2	.1541
4-9	[1.000]						8					1			3	.1480
5-20	[.8182]						10					1	1		2	.1265
6-z19	[.4545]						10		1						2	.1207
3-10	[1.000]						25								2	.1194
5-11	[.4545]						15					1			2	.1190
6-z24	[.1818]						5					1	1		2	.1186
4-6	[1.000]						12					1			2	.1143
4-12	[.8182]	1					9								2	.1096
5-15	[1.000]						8					1			2	.1080
5-18	[.4545]						7					1			2	.1064
3-12	[1.000]						12					1	1	1	1	.1051
6-16	[.2727]						5					1	1	1	1	.0940
6-5	[.2727]						8								2	.0926
5-z12	[.8182]				1		5	1							1	.0883
5-31	[.4545]						5								2	.0879
5-z17	[.6364]						12	1							1	.0839
5-19	[.6364]	1					8					1			1	0834
5-z36	[.3636]						11	1							1	.0823
5-29	[.4545]	2					7								1	.0818
5-7	[.9091]	2					6								1	.0802
3-9	[1.000]						5					1	1		1	.0786
5-9	[.2727]	1					2					1			1	.0739
4-27	[.8182]	1					10								1	.0711
5-26	[.2727]	1					5								1	.0633
6-z13	[.5455]						4					1			1	.0617

(Table 5.1 continued)

		PCSC	PCS	PS	LR	PCX	INC	OVL	LC	EMB	FS	PHR	SEC	WHL	BV	SSI
3-11	[.8182]						13								1	.0605
5-30	[.3636]						12								1	.0589
4-z29	[.9091]						7								1	.0510
6-15	[.0909]						5								1	.0479
6-1	[.7273]						5								1	.0479
6-34	[.0909]						5								1	.0479
5-z38	[.4545]						5								1	.0479
4-21	[1.000]						5								1	.0479
5-13	[.3636]						4								1	.0463
6-z17	[.3636]						4								1	.0463
5-32	[.7273]						3								1	.0447
6-z10	[.1818]						3								1	.0447
6-2	[.4545]						3								1	.0447
6-27	[.4545]						3								1	.0447
4-20	[1.000]						2								1	.0431
4-18	[.8182]						2								1	.0431
6-18	[.2727]						2								1	.0431
6-35	[.9091]						2								1	.0431
5-22	[.5455]						1								1	.0416
6-9	[.9091]						1								1	.0416
6-z23	[.5455]						1								1	.0416
("Raw ESIs")		70	10	2	5	2	1344	50	6	4	9	73	40	14	162	
		.0521	.0074	.0015	.0037	.0015	1.000	.0372	.0045	.0030	.0067	.0543	.0298	.0104	.1205	

matrix, the instantiations of EC *BV* range from 1 to 5, and reflect the number of songs in which a given set-class appears.

Of all the set-classes that the five analyses have generated, set-class 3-3 is the most salient by a considerable margin (SSI: .9077); the SSI of the next most salient set-class, 4-4, is .6722. Set-class 3-3 is remarkable in the first place for its ubiquity. It appears in all five songs and instantiates ECs within EC group *Repetition* the greatest number of times (13, as opposed to the 11, 6, and 10 of the next most prominent set-classes, 4-4, 3-2, and 4-7). Set-class 3-3 is also the most connected set-class with respect to inclusion and complementarity. It is out-ranked by other set-classes only in EC group *Form*.

Given their prominence in our earlier analyses, the overall salience of a number of tetrachords, particularly set-classes 4-4, 4-7, and 4-z15, is not unexpected. All three tetrachords, but especially set-class 4-z15, play active roles in delineating form. What is more surprising is the salience of set-class 6-z3. Its rank, when compared to all the other hexachords, is remarkable (SSI: .4590, as opposed to the next highest hexachord, 6-z19, whose SSI is .1207). Set-class 6-z3's salience is largely the result of its appearance in all five songs, its relatively high rank in inclusion relations, and its number of instantiations in EC group *Complementarity*. Many of the remaining hexachords' SSIs place them in the lower third of the matrix.

Event-class Salience Indices (*ESIs*) in the composite matrix suggest the predominance of certain ECs within the songs. By far the most prevalent event-class to be instantiated is EC *INC*. As the raw totals of instantiations in the matrix of table 4.11 reveal, EC *INC*, with its 1344 instantiations, eclipses all other ECs. Its range of instantiations is also greater than that of any other EC, spanning set-classes 6-z23, 6-9, and 5-22, which instantiate the event-class only once each, to set-class 3-3, which instantiates the event-class 127 times. It is hardly surprising, given their "inclusiveness," that theorists should have turned first to inclusion relations as a means of assessing set-theoretic relations. With its reliance on inclusion relations the set complex, one of the earliest "meta-structures" in set theory, holds the greatest potential of any single-parameter model for yielding rich analytic results.

In general, as one would intuit, instantiations of ECs within EC groups *Repetition* and *Complementarity* correlate in inverse proportion to the number of structural and contextual limitations specified by the equivalence conditions of their ECs. The exception involves EC *PS* and EC *LR* from EC group *Repetition*; although EC *LR* specifies more equivalence conditions than EC *PS*, it is the one more often instantiated in the five songs.

Like the composite salience matrix, the reduced genera matrix of table 5.2 represents all of the five songs. Although the range of set-classes, especially of those with high EIs, ensures the presence of nine of the twelve genera in the reduced matrix, three genera emerge as especially prominent: "atonal" Genus 8; "chromatic" Genus 5; and "semichromatic" Genus 6. The preeminent position of the two genera that achieved the highest GSIs in the songs taken singly, Genera 8 and 5, is confirmed in this composite matrix. The fact that either Genus 8 or Genus 5 achieved the highest GSI for each song individually, and that these two genera hold the highest two GSIs in the composite matrix, points to the homogeneity of pitch resources in the five songs.

Table 5.2. Reduced Genera Matrix (Composite)

		G1	G2	G3	G4	G5	G6	G7	G8	G10	G11
3-1	[.6011]					o					
3-2	[.7054]					o					
3-3	[.8629]								o		
3-4	[.6517]								o		
3-5	[.6510]	o									
3-7	[.4964]							o			
3-8	[.5842]		o								
3-9	[.5393]										o
3-10	[.5597]			o							
3-11	[.4393]									o	
3-12	[.5525]				o						
4-1	[.5810]					o					
4-2	[.6336]					o					
4-3	[.5890]						o				
4-4	[.8361]								o		
4-5	[.5483]	o									
4-6	[.5571]	o									
4-7	[.7643]								o		
4-8	[.6734]	o									
4-9	[.5740]	o									
4-11	[.6934]							o			
4-12	[.4639]						o				
4-13	[.5905]	o									
4-14	[.6911]									o	
4-z15	[.6804]	o									
4-16	[.5617]	o									
4-18	[.4307]	o									
4-19	[.4407]								o		
4-20	[.5216]									o	
4-21	[.5239]		o								
4-27	[.4447]			o							
4-z29	[.4801]	o									
5-1	[.5947]					o					
5-2	[.4801]								o		
5-3	[.4620]								o		
5-4	[.3927]								o		
5-5	[.4710]					o					
5-6	[.5745]								o		
5-7	[.4947]	o									
5-9	[.1733]					o					
5-10	[.4461]						o				
5-11	[.2589]								o		
5-z12	[.4532]	o									
5-13	[.2049]								o		
5-15	[.5540]	o									
5-z17	[.3601]								o		
5-z18	[.2805]								o		
5-19	[.3599]	o									
5-20	[.47[illegible]4]	o									
5-21	[.4628]								o		
5-22	[.2935]								o		
5-26	[.1680]								o		
5-28	[.3799]						o				
5-29	[.2681]	o									
5-30	[.2112]								o		

(Table 5.2 continued)

	G1	G2	G3	G4	G5	G6	G7	G8	G10	G11
5-31 [.2712]						o				
5-32 [.3860]	o									
5-z36 [.2230]					o					
5-z37 [.4760]								o		
5-z38 [.2512]								o		
6-1 [.3876]								o		
6-2 [.2496]								o		
6-z3 [.4567]								o		
6-5 [.1826]								o		
6-9 [.4753]								o		
6-z10 [.1133]								o		
6-z13 [.3036]						o				
6-15 [.0694]								o		
6-16 [.1834]								o		
6-z17 [.2049]								o		
6-18 [.1579]								o		
6-z19 [.2876]								o		
6-z23 [.2935]						o				
6-z24 [.1502]								o		
6-27 [.2496]						o				
6-34 [.0694]								o		
6-35 [.4761]				o						

GSIs in Descending Order:

G8: 176
G5: .162
G6: .158
G1: .137
G10: 135
G3: 127
G7. 126
G4. .122
G2 115
G11 .062

Future Research

In this study I have sought to develop an analytic approach to post-tonal music that would systematically rank the salience of set-classes. To this end, I proposed the theory of set-class salience. At the heart of this theory lies the notion of event-class, the idea that some structural and contextual aspects of post-tonal musical events are amenable to specification and generalization. The parameters for the event-classes of the salience theory are informed largely by set theory. Three of the five event-class groups—*Repetition, Inclusion Relations*, and *Complementarity*—directly engage classical set-theoretic operators in the assessment of set-class salience. In an attempt to integrate set-theoretical and compositional contexts, however, the specifications of event-classes within these event-class groups include, where possible, contextual as well as structural equivalence conditions. And, of course, event-class group *Form* specifies solely contextual equivalence conditions. The one remaining event-class, EC *BV*, although essential to the theory, assumes a rather pedestrian role in analyses of individual songs, where all its set-classes bear equally upon the SSIs. Only in the "composite" analysis of two or more compositions taken together does it have a more meaningful impact on the determination of set-class salience.

The analytic units represented within the salience theory are the product of a rather regimented segmentation strategy. Of the several assumptions that inform the segmentation strategy, perhaps the most important one is the distinction between set-class and segment, an issue that has long lurked between the lines of set-theoretic analyses and which recently has been compellingly drawn to account by Schaffer (1992). Broadly stated, the objective of my strategy is to recognize the gestural integrity of the musical surface and to produce segments which affirm that integrity. The analyses of Chapter 4 reveal that this relatively systematic approach to parsing the post-tonal musical surface has the capacity to yield results rich in set-theoretic relations.

The salience matrix and its indices, the SSIs and ESIs, provide a means of systematically quantifying set-class as well as event-class salience. It is clear from the analyses of Chapter 4 that SSIs are generally more useful than ESIs as guides to the interpretation of salience matrices. As I observed in Chapter 3, while ESIs do provide information about the ubiquity of all event-classes, they are meaningful only for certain event-classes. And even for those select event-classes, the information that ESIs yield is of greater interest on the large rather than small scale. I think, however, that under the right circumstances ESIs could hold the potential for greater analytic usefulness, a topic that I wish to explore briefly toward the end of the present chapter.

The referential collections employed by the salience theory, the twelve pitch-class set genera, do indeed provide "an objective frame of reference for harmonic materials," as Forte intended them to in his own work. Although in Chapter 2 the EI recalibrates the Squo to render more precise the representation of genus uniqueness, and although the compositional context is made to bear upon the GSI through the SSI, the essential role of Forte's genera remains unchanged. And, as the analyses of Chapter 4 affirm, the genera theory is an efficacious tool for tracing harmonic usage.

Let me conclude by making a few comments on directions that further investigation in this area of study might take. The most obvious course would be to extend the analytic purview of the salience theory, not just to other composers, but also to genres other than *Lieder*. To apply the salience theory to texted works by composers other than Anton Webern would require few if any adjustments. The issue most likely to demand further attention would be the segmentation strategy. While the segmentation strategy that I propose at the end of Chapter 3 has generalizability as its goal, the compositional practices of other composers might point out weaknesses in the GWFRs and GPRs. If this were so, the segmentation strategy would have to be refined. I should add, however, that if comparisons between the work of different composers are to be valid, the segmentation strategy should remain constant for all compositions under consideration. To extend the salience theory to instrumental genres would require working out ancillary assumptions about formal design and closure for EC group *Form*. Important work has been done on form and closure in post-tonal music (see, for example, Hasty 1984), which might be adapted to meet the requirements of the salience theory.

The other direction that development of the salience theory might take is a restructuring of the parameters of the theory itself. As it stands in the present study, the parameters of the salience theory, that is, its event-classes, are informed to a considerable extent by set-theoretic considerations. They serve the larger purpose of the present study well, which is to engage set-theoretic considerations in the assessment of set-class salience, but their is no *a priori* reason to restrict event-classes to these fourteen, or, for that matter, to include these fourteen. I noted above that the notion of event-class essentially assumes that aspects of post-tonal events are amenable to specification and generalization. One might ask the question, what aspects are amenable? What are their limitations? When one considers not just the number of musical parameters (register, dynamics, rhythm, etc.) but also the complexity of their interrelations, the range of possible contextual states seems endless, and perhaps it is. It seems to me, however that once the question of limitations is (perhaps arbitrarily) decided, one should be able to adapt the architecture of the theory to study the relative salience of various contextual—that is, parametric and positional—aspects of musical events. It is in the context of a restructured salience theory that ESIs could assume greater analytic meaning.

The present study has tried to demonstrate the analytical efficacy and potential of a new approach to assessing set-class salience in post-tonal music. Whatever turns further investigation in this field might take, the salience theory offers another vantage from which to explore a repertoire that continues to engage the imagination of music scholars, not just for its analytic puzzles, but also for its artistic accomplishment.

APPENDIX 1

The Pitch-class Set Genera[43]

Genus 1 (3-5)
Tetrachords
5 6 8 9 13 15 16 18 29
Pentachords
4 5 6 7 9 10 12 13 14 15 16 18 19 20 22 24 25 28 29 30 31 32 36 38
Hexachords
2 3 4 5 6 7 9 10 11 12 13 15 16 17 18 19 21 22 23 24 25 26 27 28 29 30 31 33 34

Genus 2 (3-8)
Tetrachords
5 12 15 16 21 24 25 27 29
Pentachords
4 5 6 7 8 9 10 13 14 16 18 19 20 24 25 26 28 29 30 31 32 33 34 38
Hexachords
2 3 4 5 6 7 9 10 11 12 13 15 16 17 18 19 21 22 23 24 25 26 27 28 29 30 31 33 34 35

Genus 3 (3-10)
Tetrachords
12 13 18 27 28
Pentachords
4 8 10 12 16 18 19 22 25 26 28 29 31 34 36 38
Hexachords
2 3 5 10 11 12 13 15 17 18 19 21 23 24 25 27 28 29 30 31 34

Genus 4 (3-12)
Tetrachords
19 24

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[43]The twelve genera and four supragenera appear on pp. 264-66 of Forte (1988b).

Pentachords
13 17 21 22 26 30 33 37
Hexachords
14 15 19 20 21 22 31 34 35

Genus 5 (3-1 & 3-2)
Tetrachords
1 2
Pentachords
1 2 3 4 5 8 9 11 13 36
Hexachords
1 2 3 4 5 8 9 10 11 12 14 15 16 21 22

Genus 6 (3-2 & 3-3)
Tetrachords
2 3 12
Pentachords
1 2 3 4 8 9 10 11 13 16 17 18 26 28 31 36
Hexachords
1 2 3 4 5 8 9 10 11 12 13 14 15 16 17 21 22 23 24 27 28 30 31 34

Genus 7 (3-2 & 3-7)
Tetrachords
10 11 13
Pentachords
2 3 4 9 10 12 19 23 24 25 26 27 29 31 36
Hexachords
1 2 3 5 8 9 10 11 12 13 14 15 18 21 22 23 24 25 27 29 30 31 32 33 34

Genus 8 (3-3 & 3-4)
Tetrachords
4 7 19
Pentachords
2 3 4 6 11 13 14 17 18 21 22 26 30 37 38
Hexachords
1 2 3 4 5 8 9 10 11 14 15 16 17 18 19 20 21 22 24 31 34

Genus 9 (3-3 & 3-11)
Tetrachords
17 18 19

Pentachords
11 13 16 17 18 19 21 22 26 30 31 32 36 37 38
Hexachords
5 8 10 11 13 14 15 16 17 18 19 20 21 22 24 27 28 29 30 31 34

Genus 10 (3-4 & 3-11)
Tetrachords
14 19 20
Pentachords
5 11 13 17 18 20 21 22 23 26 27 29 30 37 38
Hexachords
5 8 9 10 11 14 15 16 17 18 19 20 21 22 24 25 26 31 32 33 34

Genus 11 (3-7 & 3-9)
Tetrachords
22 23
Pentachords
11 14 23 24 27 29 30 34 35 36
Hexachords
8 9 11 12 14 16 18 22 24 25 26 31 32 33 34

Genus 12 (3-7 & 3-11)
Tetrachords
22 26 27
Pentachords
11 23 24 25 26 27 28 29 30 31 32 34 35 36 37 38
Hexachords
8 9 10 11 12 14 15 16 17 18 21 22 23 24 25 26 27 28 29 30 31 32 33 34

Supragenus I (G1 + G2 + G3)
Tetrachords
5 6 8 9 12 13 15 16 18 21 24 25 27 28 29
Pentachords
4 5 6 7 8 9 10 12 13 14 15 16 18 19 20 22 24 25 26 28 29 30 31 32 33 34 36 38
Hexachords
2 3 4 5 6 7 9 10 11 12 13 15 16 17 18 19 21 22 23 24 25 26 27 28 29 30 31 33 34 35

Supragenus II (G5 + G6)
Tetrachords
1 2 3 12
Pentachords
1 2 3 4 5 8 9 10 11 13 16 17 18 26 28 31 36
Hexachords
1 2 3 4 5 8 9 10 11 12 13 14 15 16 17 21 22 23 24 27 28 30 31 34

Supragenus III (G8 + G9 + G10)
Tetrachords
4 7 14 17 18 19 20
Pentachords
2 3 4 5 6 11 13 14 16 17 18 19 20 21 22 23 26 27 29 30 31 32 36 37 38
Hexachords
1 2 3 4 5 8 9 10 11 13 14 15 16 17 18 19 20 21 24 25 26 27 28 29 30 31 32 33 34

Supragenus IV (G11 + G12)
Tetrachords
22 23 26 27
Pentachords
11 14 23 24 25 26 27 28 29 30 31 32 34 35 36 37 38
Hexachords
8 9 10 11 12 14 15 16 17 18 21 22 23 24 25 26 27 28 29 30 31 32 33 34

APPENDIX 2

Forte's Five Rules of Interpretation[44]

1. *Rule of greatest status quotient* determines the genus with primary role, unless the representatives of that genus are a proper subset of a genus with a greater Squo, in which case Rule 2 takes effect. If more than one genus enjoys a particular Squo, Rule 1 associates the relevant pitch-class set with it (them) as well, unless there is a third candidate genus which has been invoked by Rule 4, the Rule of Singleton Extension, in which case the latter genus receives the pitch-class set.

2. The *Rule of Intersection* omits genera which are proper subsets of other genera with higher Squos.

3. The *Rule of Completion* completes the generic matrix in case the genus with the highest "operational" Squo (if Rule 2 has been placed in effect) does not account for every set, by invoking the genus with the next highest Squo to provide a setting for the vagrant pitch-class set(s).

4. The *Rule of Singleton Extension* causes pitch-class sets which are attached to only one genus ("singletons") to engage that genus in its entirety. Genera so engaged may incorporate other pitch-class sets not yet situated in the matrix by Rules 1 or 3. Rules 1 and 3 apply if more than one genus is a candidate.

5. The *Rule of Reduction* omits genera, "passive genera," which do not contribute to the generic profile of the composition, as determined by Rules 1, 3, and 4, and produces the reduced matrix representations . . . in which each pitch-class set in the matrix is assigned to only one genus.

[44]Forte presents these rules on pp. 234-35 of his genera article (1988b).

APPENDIX 3

Song Texts, with Translations[45]

Opus 3/1

Dies ist ein Lied für dich allein:
von kindischem Wähnen,
von frommen Tränen . . .
Durch Morgengärten klingt es
ein leicht-beschwingtes.
Nur dir allein
möcht es ein Lied das rühre sein.

> This is a song for you alone:
> of childish longing
> of pious tears . . .
> Through morning gardens it sings,
> lightly winged.
> This song is meant
> to move but you alone.

Opus 8/1

Du, der ichs nicht sage, dass ich bei Nacht
weinend liege,
deren Wesen mich müde macht
wie eine Wiege.
Du, die mir nicht sagt, wenn sie wacht
meinetwillen:

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[45]The translations are those given in the liner notes to the recording of *The Complete Works of Anton Webern* (Columbia album M4 35193).

wie, wenn wir diese Pracht
ohne zu stillen
in uns ertrügen?
Sieh dir die Lebenden an,
wenn erst das Bekennen begann,
wie bald sie lügen.

> You, whom I do not tell
> that I lie awake weeping at night,
> whose manner makes me sleepy,
> like a cradle;
> you, who does not mention
> when she is awake because of me.
> How if we were to endure this glory
> without remaining silent?
> Behold the lovers:
> once they have begun to confess,
> how untruthful they become.

Opus 12/1

Der Tag ist vergangen
die Nacht ist schone hier,
gute Nacht, o Maria,
bleib ewig bei mir.
Der Tag is vergangen,
die Nacht kommt herzu,
gib auch den Verstorbnen
die ewige Ruh.

> The day has gone
> the night is already here,
> goodnight, O Maria,
> stay always with me.
> The day has gone
> the night is approaching.
> Give eternal rest
> also to the departed.

Opus 14/5

Die Bläue meiner Augen ist erloschen in dieser Nacht,
das rote Gold meines Herzens. O! wie stille brannte das Licht.
Dein blauer Mantel umfing den Sinkenden;
dein roter Mund besiegelte des Freundes Umnachtung.

> The blue of my eyes has faded this night.
> the red gold of my heart! Oh how softly the light burned.
> Your blue mantle enveloped the sinking one;
> your red mouth sealed the friend's enshroudment.

Opus 16/2

Dormi Jesu, mater ridet,
quae tam dulcem somnum videt.
dormi Jesu blandule.
Si non dormis, mater plorat,
inter fila cantans orat:
blande veni somnule.

> Sleep, my Jesus; mother smiles when
> She can see you sweetly sleeping.
> Sleep, my Jesus, tenderly.
> When you don't sleep, mother weeps and
> Plucks the strings and sings a prayer
> Calling tender sleep to you.

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