Title
Polystratalism: Compositional Layering Techniques and Perception of Polytonal and Other Multi-Strata Music

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Polystratalism:

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A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Music

by

Nicholas James Carlozzi

2022

ABSTRACT OF THE DISSERTATION

Polystratalism:

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and Perception of Polytonal and Other Multi-Strata Music

by

Nicholas James Carlozzi

Doctor of Philosophy in Music

University of California, Los Angeles, 2022

Professor Ian Krouse, Co-Chair

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How is music that is in two or more distinct layers, which may be closely related, only distantly related, or not related at all, perceived and apprehended by human listeners? Polytonality and other similar forms of simultaneous juxtaposition are described as forms of "Polystratalism": a new term meant to encompass an array of layering techniques found in 20th-century composition. This dissertation explores Polystratalism from three vantage points: a music-theoretic view (focusing especially on terminology), a cognitive psychology view (using auditory stream analysis), and a compositional view (exploring what techniques composers of

the past have used to create and to reinforce their polystratal music). On the basis of these approaches, hypotheses regarding how compositional parameters combine to support the independence of layers within a polytonal texture, and how this independence supports perceptibility of polytonality are presented. Works by Adams, Britten, Corigliano, Danielpour, Ives, Mahler, Milhaud, and Ravel are examined through the lenses of time, timbre, space, register, and tonality. Polystratalism's potential for meaning in music is explored. The accompanying orchestral composition, *Millennial Lullabies*, is introduced and briefly analyzed.

The dissertation of Nicholas James Carlozzi is approved.

Munir Beken

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Ian Krouse, Committee Co-Chair

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University of California, Los Angeles

2022

For my best friend Marina,

my family, friends, and mentors who have supported me over the years.

Thank you.

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VITA

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Chapter 1

Outline and Introduction to Polystratalism

1.1 Outline of the Dissertation

Polytonality is a term that has been applied to one type of multi-layered music. In this dissertation, mulit-layered music will be referred to as "Polystratalism"; Polytonality, as will be shown, is one *type* of Polystratalism. This dissertation aims to identify the compositional techniques present in the polystratal repertoire and show how these techniques benefit the *perception* of polytonality. In order to accomplish this, I will first determine what polytonality is in theory, and then determine how we might perceive it in practice. Bringing these two theoretical threads together will provide a foundation for my approach to examining polytonal pieces and help us determine their potential for perception.

In Chapter One I will consider the existing definitions of polytonality, and engage with the problematic nature of the term and its use. In section 1.3, I will offer my own definition and suggest the use of a new term, *polystratalism*, in order to incorporate many of the different uses of superimposition in the 20th-century repertoire. I will then suggest that there is a potential for many different types of strata ready for superimposition in a polystratal texture. This breadth in *type* of strata suggests a robust combinatorial nature for polystratalism. In section 1.5, I will distinguish between polytonality and polychordalism. Here, I will explore how the horizontal and vertical aspects of composition influence our perception of music and warrant specific terminology.

Chapter Two explores the question of perception by examining what psychoacoustics tell us about *stream segregation* in music listening (section 2.1). Along the way, I will suggest parallels between this understanding of cognition and the compositional techniques discussed in Chapter Three. In sections 2.2 and 2.3, I will review the recent psychological studies and surveys on polytonality and consider questions pertaining to perception and cognition. With the findings and questions that arise from this summary of research, I will suggest a hypothesis for how listeners might perceive polystratalism.

In Chapter Three I will approach the polystratal repertoire with a focus on the following aspects of composition: texture, melody, harmony, rhythm, meter, time, timbre, and physical space. Chapter Three will show how the use of each aspect may support the *independence of layers* within a polystratal texture. We will look at compositions by Adams, Britten, Corigliano, Danielpour, Ives, Mahler, Milhaud, and Ravel. It will be helpful for us to compare these pieces with the previously mentioned aspects of composition in mind, where applicable.

Chapter Four will explore polystratalism's potential for *meaning* in music. Several of the compositions from Chapter Three will be revisited with this focus in mind (section 4.1). In section 4.2, I will reflect on where polystratalism is today, and how we might continue with its study in cognition and its application in music. The final portion of Chapter Four is a brief introduction and analysis of this dissertation's accompanying orchestral composition: *Millennial Lullabies*.

†

1.2 Introduction to Polytonality

"Polytonality" is a problematic term in the realm of music theory. Its name literally contradicts itself. If "tonality" is the projection of *one* tonic atop a hierarchy of tones, how then, can multiple tonalities exist in simultaneity? Logic suggests that this is impossible,[1] yet many composers throughout the 20th century have written music we describe as "polytonal."

What is Polytonality? What constitutes a "polytonal" musical texture? To answer these questions, we must consider a multitude of definitions prompted by its application over the past hundred years. Many of these definitions describe polytonality as a compositional technique rather than a sonic phenomenon, which mitigates reservations about polytonality's practical—as opposed to theoretical—validity. With the utmost scrutiny for its perceptibility, polytonality is a compositional technique in which multiple keys or tonal centers are simultaneously juxtaposed; however, this definition limits the scope of polytonality both in terms of theory and practice. I believe it is possible for a listener to recognize multiple layers within a musical texture and for the listener to determine, over time, that those layers do not belong to the same tonality. I believe there are several works by prominent composers that enable and encourage this kind of listening experience.

Polytonality has been the subject of debate both in terms of its theoretical soundness in composition and its perceptibility.[2] Both the monograph and orchestral composition that comprise this dissertation approach polytonality as a viable compositional technique and a perceptible psychoacoustic phenomenon. It is beyond my purview to *prove* the latter, but I

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[1] Allen Forte, *Contemporary Tone-Structures* (New York: Bureau of Publications, Teachers College, Columbia University, 1955) 24.

[2] For instance, see the works of Van den Toorn (2003) and Tymoczko (2002).

nevertheless point toward a growing body of psychoacoustic work that engages with polytonality as it pertains to auditory cognition and apperception. I will also examine an emerging body of compositions that feature polytonality to illuminate the techniques used in polytonal textures.

Through examination of the polytonal repertoire, I aim to show how compositional techniques can support the perceptibility of polytonality through use of *independent layers*. We will look at how melody, harmony, rhythm, meter, tempo, timbre, and texture are used in polytonal structures and how their use may—or may not—contribute to the independence of layers.

1.3 Definitions

Vincent Persichetti described polytonality as "a procedure in which two or more keys are combined simultaneously,"[3] just as Mosco Carner defined polytonality in his 1944 *Study of Twentieth-Century Harmony* as "two [or] more keys that run simultaneously on different tonal planes."[4] In contrast, Paul Hindemith, called polytonality a "catchword" that is "the game of letting two or more tonalities run along side by side and so achieving new harmonic effects…" and is "to be sure, very entertaining for the composer, but the listener cannot follow the separate tonalities, for [they] relate every simultaneous combination of sounds to a root—and thus we see the futility of the game." He claimed that "every simultaneous combination of sounds must have one root, and only one; one cannot conceive of additional roots somewhere above, belonging to

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[3] Vincent Persichetti, *Twentieth-Century Harmony: Creative Aspects and Practice* (New York: W.W. Norton & Company, 1961), 255.

[4] Mosco Carner, *Study of Twentieth-Century Harmony 2nd Edition* (London: Joseph Williams Limited, 1944), 48.

other tonal spheres," and concludes that "polytonality is not a practical principle of composition."[5]

One of the more interesting definitions belongs to Alfred Casella, who wrote that polytonality is "nothing more than *modulation in simultaneity*."[6] Casella is alluding to the 19th-century compositional trend of increasingly frequent modulation.[7] He's suggesting that the time between tonal centers had grown less and less until the point that they were bound to eventually occur simultaneously.[8] Describing polytonality as "modulation in simultaneity," however, assumes a necessary harmonic or intervallic relationship between tonalities, i.e., one triadic tonality modulating a certain distance to another. While it is intriguing to evaluate the intervallic relationships between tonalities in polytonality, for the purposes of this paper it will be limiting to think of polytonality as *requiring* a harmonic relationship between layers of tonality and/or atonality.[9]

For the sake of dialogue, let us consider "polytonality" *the simultaneous occurrence or layering of multiple streams of contrasting tone-structures*. I posit that these streams need not solely be tonal, in the traditional sense. They can be diatonic, pentatonic, modal, pandiatonic, atonal, and 12-tone. This creates a terminological problem as pandiatonicism, atonality, and

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[5] Paul Hindemith, *The Craft of Musical Composition* (New York: Associated Music Publishers, Inc., 1945), 156.

[6] Casella, Alfred. 1924. 'Tone-Problems of Today', Musical Quarterly 10: 159–71.

[7] Horace Alden Miller, *New Harmonic Devices* (Philadelphia: Oliver Ditson Company, 1930), 100.

[8] An effective analogy may be to consider two tones in oscillation: at a slow tempo we hear two tones oscillating; gradually increase the tempo and eventually we hear the two tones in simultaneity.

[9] Intervallic relationships will still be discussed on a surface level and draw from Persichetti's theory of polytonality. See Persichetti, *Twentieth Century Harmony*, 255–261.

serialism eliminate or modify the hierarchy of tones critical to diatonic tonality, i.e., they are each fairly antithetic to tonality. Can we call something poly-*tonal* if part of it is *anti-tonal*? Perhaps we should not, unless we mean to use "tonal" or "tonality" in the broader senses of their meanings. Instead of referring exclusively to the triadic-based tonality of the 18th and 19th centuries, we can consider tonality in reference to many other systems of tonal hierarchies or relationships in existence. In this way, tonality can be thought of as a spectrum of various tone-relationships in which there are *types* of tonality.[10]

†

1.4 Centricity, Tonality, and Polystratalism's Combinatorial Potential

A significant aspect of diatonic tonality is the hierarchical importance of one tone: the tonic. The tonic is characterized by a strong "centricity": the condition in which "one note is heard as being more prominent than the others." This "note" may possibly "[appear] more frequently and [serve] as a goal of musical motion."[11] It is possible for pentatonic, modal, serial, and atonal pitch sets to exhibit a center. Centricity in one form or another can be found in abundance in 20th-century post-tonal music (Figures 1.1 & 1.2).

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[10] Dmitri Tymoczko describes a similar view, one meant to "provide general categories for discussing music that is neither classically tonal nor completely atonal." -Dmitri Tymoczko, *A Geometry of Music: Harmony and Counterpoint in the Extended Common Practice* (New York: Oxford University Press, Inc., 2011), 3.

[11] Tymoczko, *A Geometry of Music*, 4.

Fig. 1.1 Ginastera Sonata no. 1 mvmt 2, 12-tone row projecting D as center.

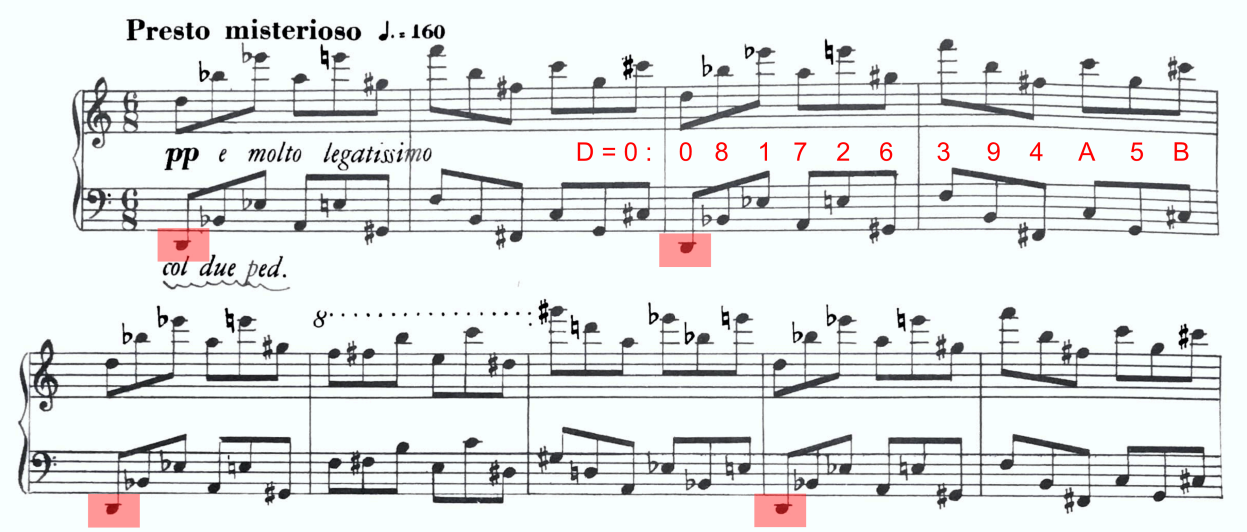
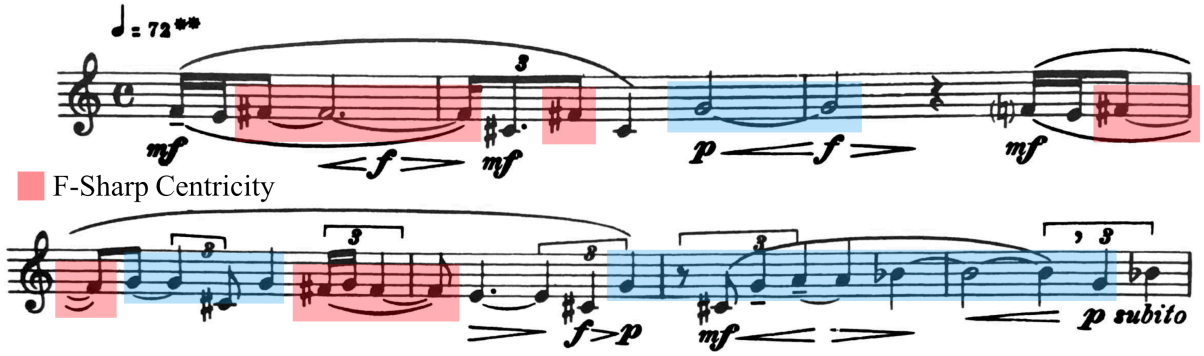


Fig. 1.2 Varèse "Density 21.5" projecting F-Sharp (red) or arguably G (blue) as *center* through measure 5.



Keeping in mind a broad definition of tonality that includes the centricity of non-diatonic pitch-class sets, it is certainly possible to *conceive* a "polytonal" texture in which at least one of the streaming layers consists of serial, atonal, or pandiatonic music. But should such textures be termed "polytonal"? If the serial, atonal, or pandiatonic layers project a sense of center, as the serial and atonal excerpts above do, and if we insist that centers create a sense of *centricity* but not *tonality*, then perhaps "polycentricity" is a more fitting description?

There is sufficient need to suggest a new term to encompass the broad array of tone-structures present in the strata of "polytonal" textures. I will use the term *polystratalism* rather than polytonality throughout this paper to incorporate the potential *atonal strata*. Furthermore, despite the majority of the "polytonal" repertoire exhibiting the simultaneity of only *two* strata, I will use *poly*-stratalism to acknowledge the potential for more than two. I intend to use the term in a way that encompasses a constellation of related terms—bitonality, bimodality, polytonality, polymodality, tritonality, and polycentricity all fall under the umbrella of polystratalism.

Polystratalism may also incorporate layers that do not project a clear center or tonality: having strata project distinct collections of tones is *sufficient* for supporting a polystratal texture, but may not be *necessary*. However, if two strata are both serial, atonal, or of the same diatonic scale, it is likely they will be perceived as a single stratum of atonality or tonality, respectively.[12] Similarly, if both strata are of the same tonality, they will be perceived as a single stratum. With this monograph, *polystratalism* is *multiple streams*; these streams can be tonal in the traditional sense, modal, pandiatonic, atonal, or serial, and can either project a *center* or not. However, it may be easiest to perceive polystratalism if at least one stratum projects a center or tonic.

I will often use "tonality" in a *broad* sense that encompasses modality, pentatonicism, and other "not completely atonal" music. Following this logic, I will use "polytonality" to refer to any form of bi-tonality, bi-modality, or poly-modality. All polytonality is polystratal, but not vice versa. Thus, it is possible to have a polystratal texture that does not depend upon the distinctness

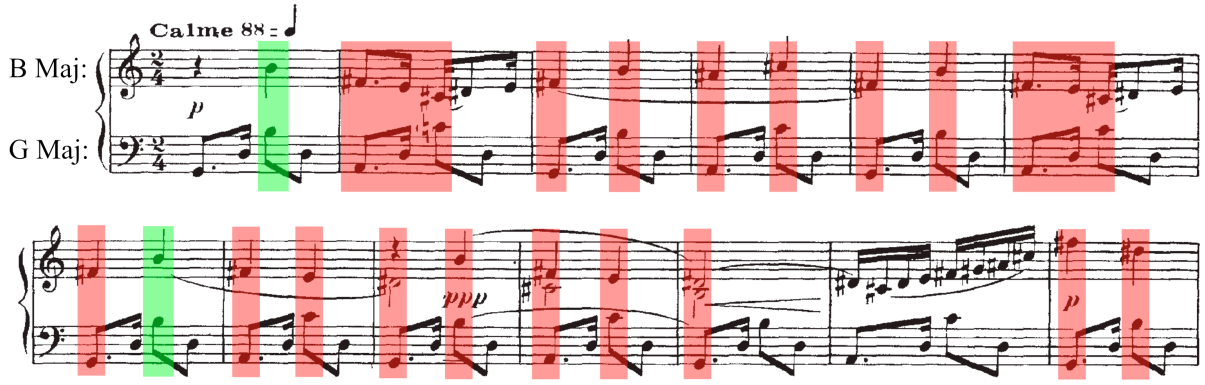
[12] Complementary pairs of pitch-class sets (Z-pairs), however, may be sufficiently effective in creating a sense of independence between strata despite being considered atonal. This may owe to whether or not a sense of *center* is projected by either set.

of pitch-class content between layers, as long as the layers are distinct in other aspects of the music. I will also use "strata" and "layers" interchangeably.

1.5 Polychordalism vs. Polytonality

Several discussions of polytonality use Stravinsky and Milhaud's compositions as examples. Milhaud popularized the technique in the early 20th century, and Stravinsky employed polytonal techniques in two of his famous ballet scores. There are limitations, however, with judging the merits of polytonality through Milhaud's or Stravinsky's works, especially when their polytonal writing is often limited to textures that juxtapose tonal layers in homophony or near-homorhythmic monody (Figures 1.3 and 1.5).

Fig. 1.3 Darius Milhaud, "Copacabana" from *Saudades do Brazil*, opening measures. Red highlights the abundance of homorhythm. Do we hear the B-Natural (green) as "Mi" in G major or "Do" in B major?

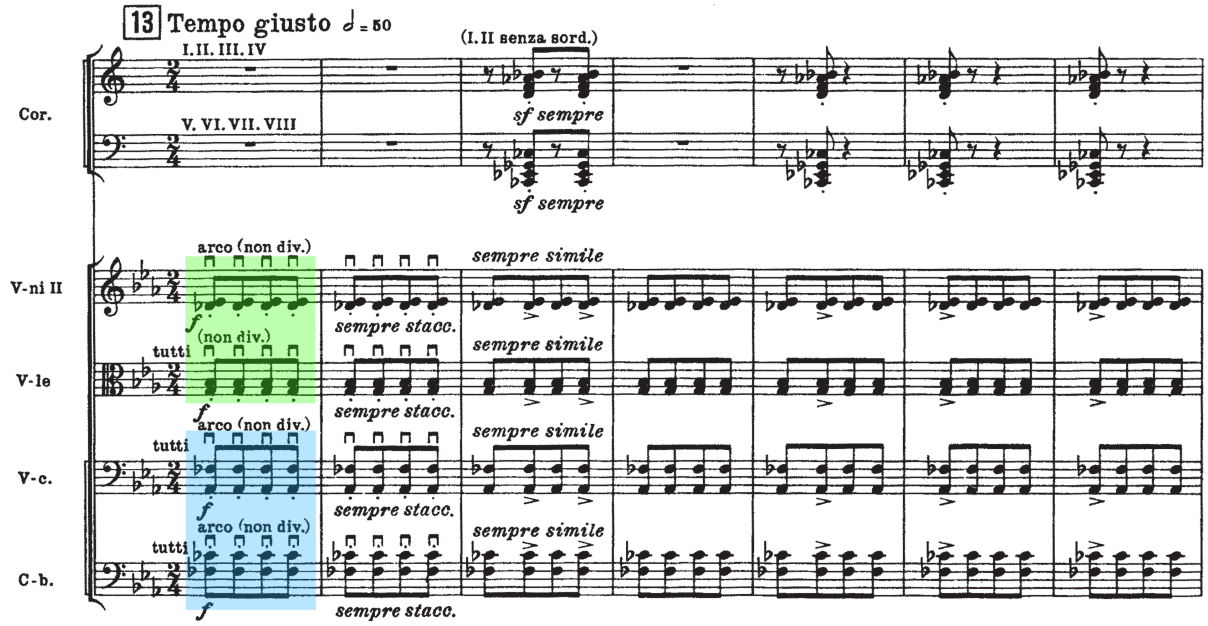


The heavy E-Flat 7 over F-Flat chord in *The Augurs of Spring,* and the C over F-Sharp chord in the *2nd Tableaux* of *Petrushka* are both largely homophonic and, as such, are likely heard as single entities rather than a combination of multiple entities. Still, a juxtaposition of triads from distant keys is clearly present and warrants debate over how to classify this music.[13]

[13] See, for instance, Van den Toorn (2003) vs Tymoczko (2002).

If the tonal layers are combined within a single homophonic texture—such as the *Rite of Spring* chord in *The Augurs of Spring*—then it may be best to describe the music as "polychordal." The chord appears to be two triadic structures of distant relation, *but the homophonic texture does not offer the E-Flat dominant a chance to establish a sense of tonal center (A-Flat) separate from the F-Flat in the bass*. Instead, the two conflicting chords combine to create a complex but single composite harmony. Furthermore, there is substantial evidence that Stravinsky composed his music primarily at the piano, which suggests that the E-Flat Dominant Seventh over F-Flat major was the result of the pianist's "physical impulse"[14] and agreement with the resultant complexity in sonority rather than an intent to create two independently functioning tonalities.

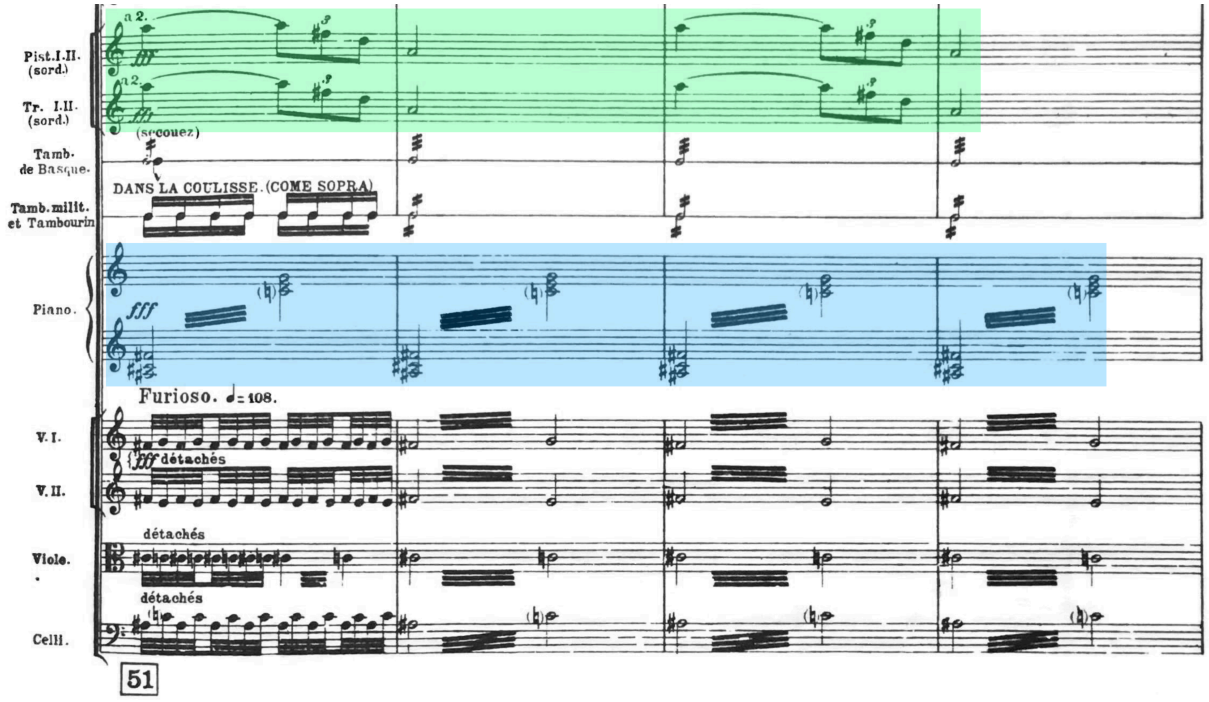
Fig. 1.4 Stravinsky: "The Augurs of Spring" from *The Rite of Spring*, Rehearsal 13. E-Flat Dominant (green) over F-Flat major (blue).



[14] Kenneth Glendon Brown, "Those Great Inspirers: The Tactile Compositional World of Igor Stravinsky" (PhD diss., University of California, Los Angeles, 2021), 26–37.

Discussions of the *Petrushka* chord have often been too narrow. Instead of focusing on the vertical structure, we might focus on how the *Petrushka* chord is superimposed with a trumpet melody in D Major (Figure 1.5). The superimpositions that exhibit a type of counterpoint between layers manifest my approach to distinguishing polystratalism from polychordalism or homophonic "polytonality" (Figure 1.3). Ludmila Ulehla writes: "Tonality is created by the *movement* of sound."[15]

Fig. 1.5 Igor Stravinsky, *2nd Tableau* from *Petrushka*, Rehearsal 51. Trumpets outlining D major (green). Piano C major over F-Sharp major composite chord (blue).



Polystratalism is characterized by a texture that supports the *independence* of each tonality, modality, centricity, etc. Therefore, I separate "polystratal" and "polytonal" from

[15] Ulehla, 284. (my emphasis)

"polychordal" music—the former two aim to create *independent tonal layers*, while the latter is concerned with the progression of complex vertical sonorities.[16]

Polystratalism should give the listener *an opportunity to recognize the separate layers of music that are placed in simultaneous juxtaposition.* Music that is polychordal—like the examples in *Augurs* in *Rite of Spring* and *Petrushka*—is often more concerned with the quality of a vertical sonority than with the horizontal flow of simultaneous tonalities. This results in the sense of a single, complex tonality.[17] The upper and lower structures of a homophonic stacking of triads from distant keys—such as in Figure 1.4—are difficult for us to hear as independent from one another, and, therefore, we are *unlikely* to "hear two keys at once." Such textures may even promote atonality, since the complexity of pitch material in a single verticality can obscure any sense of centricity or tonic. In a "true" *polystratal* texture, the horizontal motion through strata over time may allow the listener to switch between the upper and lower layers of sound. I believe it is the *horizontal* progression of melody and harmony through time that make polytonality and polystratalism more perceptible, rather than the *vertical* sonorities that result from singular moments in time.[18] Ideally, polystratal music aims to support the *independence* of each layer rather than undermine independence through coalesced layers.

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[16] Ludmila Ulehla makes a point to distinguish "bichordal writing" from polytonality in her 1966 theory textbook *Contemporary Harmony: Romanticism through the Twelve-Tone Row*.

[17] (see section 2.2)

[18] The *real (chromatic)* doubling-at-the-12th and doubling-at-the-17th in Ravel's *Bolero*, despite being entirely synchronous, may have more perceptual potential than polychords because of its passage through time, which arguably gives listeners a chance to "solve a problem in auditory scene analysis."

1.6 Questions and Thesis

In addition to questions of compositional technique and terminology, there are questions surrounding psychoacoustic perceptibility: How do we perceive polytonality in practice? Is it possible to "hear two keys at the same time"? How should we measure a listener's ability to recognize polytonality? In other words, to what *degree* can a listener recognize and identify the multiple *streams* within a polytonal texture?

This paper shows how the adherence—or lack of adherence—to a set of principles in compositional technique affects the clarity, and therefore perceptibility, of polytonal and polystratal textures. The right use of rhythm, meter, time, timbre, texture, melody, and harmony may clarify a sense of *independence between layers* and therefore support the recognition of polytonality or polystratalism.

Chapter 2

Perception

"In all cases the ear is the final arbiter"[19]

2.1 Auditory Scene Analysis

Studies on music perception often point back to the work of psychologist Albert Bregman, who coined the term "auditory scene analysis." In his book of the same name, Bregman defines *perception* as "the process of using the information provided by our senses to form mental representations of the world around us."[20] Auditory scene analysis is the process in which we, after perceiving stimuli and forming representations, separate unrelated sounds from one another and combine related sounds together.[21] Our ability to do this is critical in music listening, as it is the foundation for how we make sense of everything we hear.

An extension of auditory scene analysis is *auditory streaming* or *auditory stream segregation*. These describe our ability to organize pitch material into two separate streams of sound.[22] A basic example of this is when we hear a series of tones, we tend to separate higher tones from lower tones and group them according to register. This is how we are able to follow individual lines in multiple voice counterpoint: we are able to separate the individual lines from one another.

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[19] Allen Forte, *Contemporary Tone-Structures*, 24.

[20] Albert S. Bregman, *Auditory Scene Analysis: The Perceptual Organization of Sound* (Cambridge MA: The MIT Press, 1990), 3.

[21] Bregman, Auditory Scene Analysis, 3.

[22] Bregman, Auditory Scene Analysis, 9–19.

Many studies on auditory streaming focus on the effects of different variables on streaming. These studies often involve participants listening to a sequence of tones that is altered in various ways. Different conclusions are made about how streaming works with regard to an altered parameter. Perhaps the most basic conclusion is the *proximity principle*, which suggests that stream segregation "is stronger not only when [a] cycle of tones is played more rapidly but also when the high and low tones are farther apart in frequency."[23] This principle was the foundation for experiments by L.P.A.S. van Noorden, whose data suggests that listeners group notes based on how close they are to one another in both *time* and *frequency* (pitch). The closer the tones are to one another, the more likely we are to group them together. The further away the tones are from one another, the more likely we are to segregate them.[24] Thus, streaming is likely supported by differences in rhythm, tempo, meter, and register.

When the *timbre* of the tones was manipulated in similar studies, "it was found that tones which were close in pitch would segregate from one another when they had sufficiently dissimilar spectral envelopes (i.e., formant structures)."[25] In other words, tones with different timbres may segregate into streams despite proximity in frequency (Figure 2.1). Conversely, tones that are "similar in formant structure [will] segregate when even their fundamentals, whether present or 'missing,' [are] sufficiently far apart."[26] These results are confirmed by Rhodri Cusack and Brian Roberts, who found that "the observed effect of timbral contrast is not

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[23] James K. Wright and Albert S. Bregman, "Auditory stream segregation and the control of dissonance in polyphonic music," *Contemporary Music Review* 2, no. 1 (1987): 63–92.

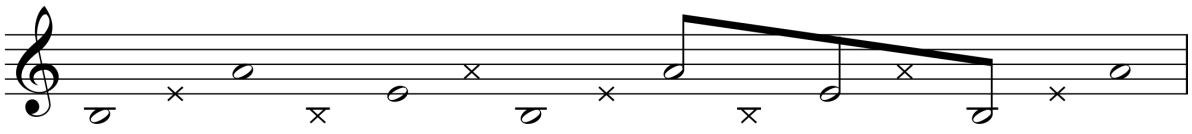
[24] L.P.A.S. van Noorden, "Temporal coherence in the perception of tone sequences" (Thesis, Institute for Perception Research, Eindhoven, 1975), 39.

[25] Wright, James K., and Bregman, "Auditory stream segregation and the control of dissonance in polyphonic music," 66.

[26] Wright and Bregman, 66.

of a different order to that seen with a frequency contrast."[27] Thus, streaming is likely supported by timbre.

Fig. 2.1 "Figure 2. Ascending pitch patterns in 'three' with two alternating timbres ('O' and 'X'). If the timbral difference between adjacent notes is large, then one tends to perceive interleaved descending lines formed by the notes of the same timbral type."[28]



Additionally, timbre "can be computed by the auditory system from the energy contributed by each [sound] source taken in isolation, independent of the other energy present in the mixture which has been contributed by concurrently sounding sources." This suggests that timbre and dynamics can still cause stream segregation when sources are sounding synchronously.[29] Repetition may also support stream segregation. Bregman found that in all of his experiments, "it was noticed that segregation effects increased with the number of repetitions of the pattern, i.e., that the repetition itself contributed to stream segregation."[30]

These findings on stream segregation may be combined to support the *similarity principle*, which describes how the auditory system tends to "put together auditory streams in such a way that the individual streams are formed of elements in which there is the least amount

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[27] Rhodri Cusack and Brian Roberts, "Effects of differences in timbre on sequential grouping," *Perception & Psychophysics* 62, no. 5 (2000): 1116.

[28] David L. Wessel, "Timbre Space as a Musical Control Structure" *Computer Music Journal* 3, no. 2 (1979): 49.

[29] Wright and Bregman, 66.

[30] Wright and Bregman, 88.

of change in some acoustic property from one element to the next."[31] This may suggest that combinations of parameters contribute simultaneously to support stream segregation.

The studies above dealt with fairly straightforward pitch sequences, but I posit that these aspects of auditory streaming may function similarly with the multi-layered textures in polytonality.

2.2 Probe Tone Studies and Polytonality

One way that psychologists study our perception of tonality is through the "probe tone method."[32] Participants are asked to listen to an excerpt of music followed by a single tone from the chromatic aggregate. They are then asked to rate the degree to which the "probe" tone fits the excerpt. These ratings are then compared to determine pitch hierarchy within a given context.

Since its introduction in a 1979 paper by Carol L. Krumhansl and Roger N. Shepard, the probe-tone method has been a primary method in studying the perception of polytonality. In one such study, Krumhansl & Mark A. Schmuckler examined listeners' perceptions of the *Petrushka* chord. Their chosen stimulus was the clarinet duet at the opening of the *Second Tableau* where C major and F-Sharp major triads arpeggiate simultaneously (Figure 2.2). They found that listeners were "unable to perceive two abstract keys," as a result of *stream fusion*—the opposite of stream segregation. They concluded that the "two voices [were] presented close together in pitch and

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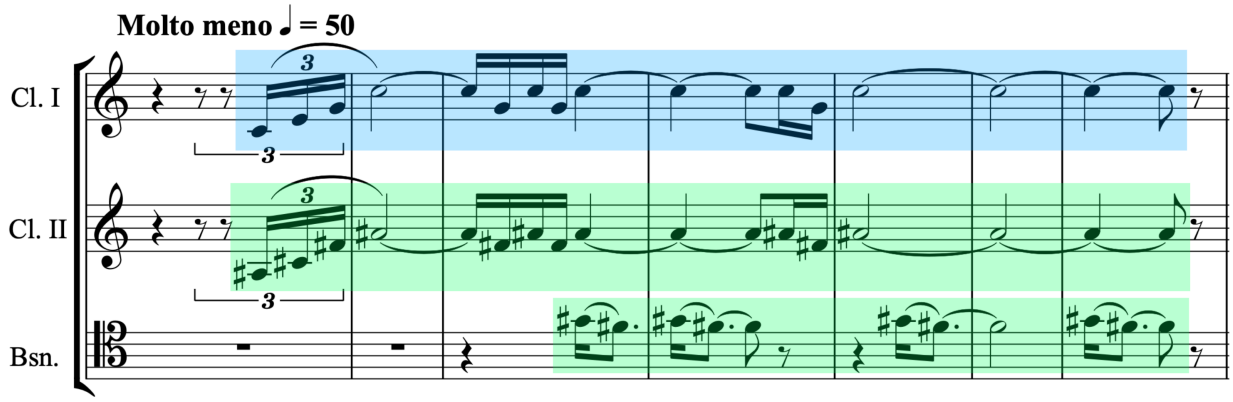
[31] Wright and Bregman, 88.

[32] Carol L. Krumhansl and Roger N. Shepard, "Quantification of the Hierarchy of Tonal Functions Within a Diatonic Context" *Journal of Experimental Psychology: Human Perception and Performance* 5, no. 4 (1979): 579–594.

have virtually identical rhythms," leading to their "perceptual fusion."[33] This finding is consistent with previous studies (Dannenbring & Bregman, 1978; Bregman & Pinker, 1978; Rasch, 1978) that support the idea that "temporal synchrony," or the simultaneous onset of sound, promotes fusion.[34]

Fig. 2.2 Igor Stravinsky, *Second Tableau* from *Petrushka,* Rehearsal 49. Clarinet I in C major (blue) over Clarinet II in F-Sharp major (green). The addition of bassoon may add to the strength of F-Sharp's centricity.



Thompson and Mor

A later study conducted by William Forde Thompson and Shulamit Mor expanded on this finding. Unlike the approach of Krumhansl and Schmuckler, Thompson and Mor hypothesized that by conveying two separate keys in manners different from each other, listeners would "be able to perceive two distinct keys, and [would] base their probe-tone ratings on long-term knowledge of the tonal structure associated with the component keys rather than on the distribution of tones in the immediate context."[35]

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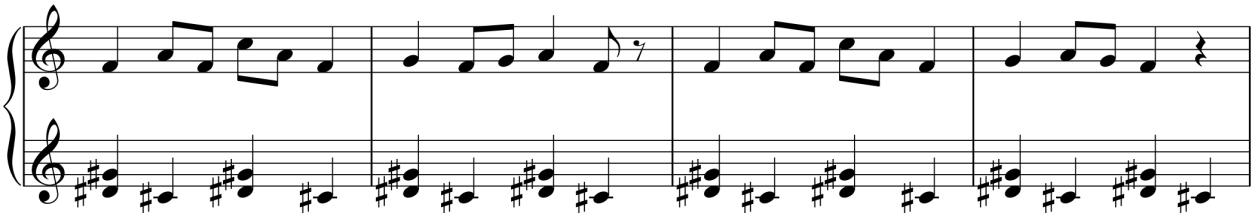
[33] Carol L. Krumhansl, *Cognitive Foundations of Musical Pitch* (New York: Oxford University Press, Inc., 1990), 236.

[34] Krumhansl, *Cognitive Foundations*, 236.

[35] William Forde Thompson and Shulamit Mor, "A Perceptual Investigation of Polytonality," *Psychological Research* 54 (1992): 61.

The first two of four experiments conducted in this study utilized a repetitive, homophonic piano excerpt from Théodore Dubois's *Circus* (Figure 2.3). Experiment 1 collected probe-tone ratings for the excerpt played normally. Experiment 2 collected ratings for each staff *played separately*. The results from both experiments suggested that listeners were able to sense the presence of the two keys involved, C-Sharp major and F major, but that the *lower* key "appeared to exert a stronger pull on the tonality of the excerpt than did the upper stave."[36]

Fig. 2.3 Théodore Dubois, *Circus*. F major over C-Sharp major (or D-Sharp mixolydian?).



The third and fourth experiments were structured similarly to the first and second, respectively, but this time Thompson and Mor used an excerpt from Milhaud's *Sonata No. 1 for Piano* as a stimulus. Significantly, the Milhaud is characterized by an ambiguity of tonality in the lower staff. The F major over C-Sharp major in the Dubois is quite clear,[37] while the oscillation between second inversion B-Flat major and C major triads in the Milhaud is arguably more ambiguous in terms of tonality projection (Figure 2.4).[38]

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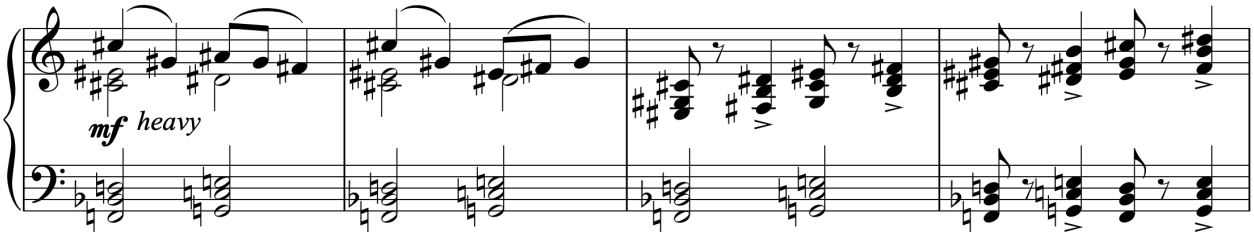
[36] Thompson and Mor, 65.

[37] The lower layer of the texture is very simple and repetitive to the point of becoming background, while the upper layer is more rhythmically active and has a melodic contour. These conditions may combine to support a clarity between layers.

[38] This ambiguity arises from the parallel motion of second inversion triads—a gesture that undermines clear tonal functions (in diatonic tonality).

Fig. 2.4 Darius Milhaud, *Sonata No. 1 for Piano*, mm. 60–63. C-Sharp major over (?).



Additionally, the Milhaud exhibits a significant separation in register between layers when compared with the Dubois. For this reason, Thompson and Mor used probe-tones spanning the three distinct octaves present in the excerpt, as opposed to ratings based on pitch class like the first two experiments,[39] in an attempt to show that "different key representations may be applied to specific registers in the perceptual process."[40]

The results from Experiment 3 showed strong probe-tone ratings for C-Sharp major, as well as "significantly higher" ratings for the highest octave, suggesting that "listeners perceived the key of C-Sharp major most clearly in the register between F4 and E5," the location of most of the upper staff's pitch material.[41] The lower octaves showed little differentiation between probe-tones, suggesting that no clear influence of key was present.[42]

The lower staff dominated participants' perceptions of tonality in Experiments 1 and 2, which aligns with conventional theories of bass-dominant audition,[43] while the upper staff

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[39] Probe-tone studies, like Krumhansl and Schmuckler (1986), use *circular tones*: a multiple octave unison in which the timbre of each octave is manipulated to create a poorly-defined pitch height in the resultant sound.

[40] Thompson and Mor, 65.

[41] Thompson and Mor, 66.

[42] Thompson and Mor, 68.

[43] Hindemith, *Craft*, 156.

dominated in Experiments 3 and 4, likely due to the lack of tonal clarity in the lower staff. The Milhaud is an interesting case in this regard because it involves the juxtaposition of tonally *clear* with tonally *ambiguous*.

My own hypotheses are similar to Thompson and Mor's. I, too, believe that perception of polytonality will be more likely if the two layers are distinct in some way. To maximize stream segregation, the layers would be considerably distinct in rhythm, meter, register, and timbre, in addition to the prerequisite distinctness in tonality. The musical excerpts chosen by Thompson and Mor are lacking in this regard, as they are too homorhythmic, too monotimbral, and too close in register to support the independence of each layer in the way I describe in Chapter Three. Thompson and Mor also hypothesized that *time* plays a role in perceptibility—this too will be explored in Chapter Three.

†

2.3 Surveys on Polytonality

Hamamoto, Botelho, and Munger

In 2010, Mayumi Hamamoto, Mauro Botelho, and Margaret P. Munger published a survey on musicians' and non-musicians' perception of polytonality. The results of their survey confirmed the findings of a similar survey published by Rita S. Wolpert in 2000.[44] Wolpert's most notable finding is that non-musicians lack the vocabulary to properly describe

[44] This study involved detuning either the voice or accompaniment in recordings of popular jazz songs for voice and ensemble and asking participants to freely describe their impressions.

polytonality.[45] Musicians, however, are highly capable of describing the phenomenon—some musicians in the study requested to be "excused from listening to the excerpts in their entirety!"[46]

Hamamoto et al. expanded on Wolpert's survey by including an educational unit after the initial listening session to see if non-musicians could identify polytonality upon a second pass.[47] The training session involved musicianship, where participants practiced identifying tonal centers. Results showed that non-musicians were as equally capable as musicians in identifying polytonality after the training session.[48]

Reinhard Kopiez and Friedrich Platz

Another survey published in 2010 by Reinhard Kopiez and Friedrich Platz improved upon the Wolpert survey in several ways. Firstly, the participant pool in the Wolpert survey was considerably biased, with 40 non-musicians and only 10 musicians, while Kopiez and Platz enlisted a total of 248 participants distributed more equally between non-musicians and musicians. Secondly, Kopiez and Platz fixed the sound quality issues of the original sound stimuli from Wolpert that may have affected the data. Thirdly, they expanded the breadth of *style* in their survey to include classical, pop, and rock-n-roll, whereas Wolpert had only used popular jazz standards. Lastly, Kopiez and Platz divided the participants into directed (instructed to listen for certain features) and non-directed listening groups.[49]

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[45] Rita S. Wolpert, "Attention to Key in a Nondirected Music Listening Task: Musicians vs. Nonmusicians," *Music Perception: An Interdisciplinary Journal* 18, no. 2 (Winter, 2000): 228.

[46] Wolpert observed several musicians' distaste for the detuned audio samples. Wolpert, "Attention to Key," 229.

[47] Mayumi Hamamoto, Mauro Botelho, and Margaret P. Munger, "Non-Musicians' and Musicians' Perception of Bitonality," *Psychology of Music* 38, no. 4 (2010): 434.

[48] Hamamoto et al., "Non-Musicians," 439.

[49] Reinhard Kopiez and Friedrich Platz, "The Role of Listening Expertise, Attention, and Musical Style in the Perception of Clash of Keys" *Music Perception* 26, no. 4 (2009): 323.

The results of the survey confirmed three of their four hypotheses: musicians were more accurate than non-musicians in detecting polytonality; directed listening produced a higher number of successful identifications than non-directed listening; and a significant decrease in success was observed between the classical and jazz stimuli in all groups, suggesting that style of music affects the likelihood of identification. The fourth hypothesis—that familiarity with the composition would increase detection—was, counterintuitively, not supported.[50]

The Kopiez and Platz survey, while arguably more robust than the others discussed, lacked a control for intervalic relationships between layers because only one key relationship was tested: the major second.[51] How would their results compare with another experiment adjusted for the key relationship of a minor third? A major third? A tritone?

A logical hypothesis posits that the further away two keys are from each other in the circle of fifths, the more dissonant they will be in juxtaposition. This is precisely what Persichetti believed (Figure 2.5), asserting that "keys that are not closely related according to the circle of fifths will more easily set apart the tonal key spheres."[52] This is unproven, as far as I know, but the logic is sound, and I hope that Persichetti's assertions are tested in the future. Nevertheless, my study involves a majority of non-interval-related parameters, including rhythm, meter, register, type of tonality, and timbre, so cataloguing the intervalic relationships between layers will be of secondary importance in this paper.

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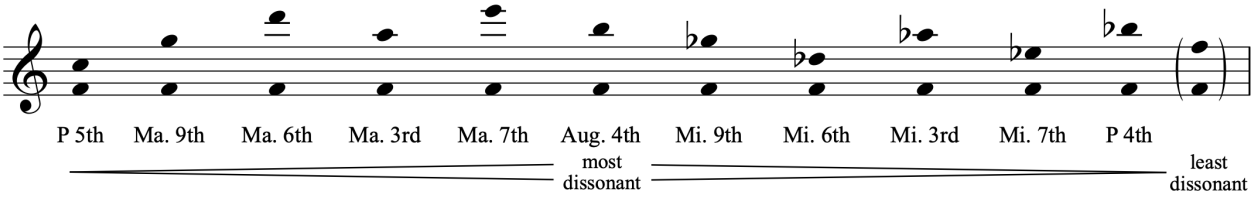
[50] Kopiez and Platz, "Role of Listening," 328.

[51] Kopiez and Platz, "Role of Listening," 324, 329.

[52] Persichetti, *Twentieth Century Harmony*, 257.

Fig. 2.5 Persichetti's "Ex. 12-15" from *Twentieth Century Harmony* (dissonance scale added).



Chapter 3

Analysis of Repertoire

3.1 Mahler and Modulation

One does not usually think of Mahler as an early composer of polytonal music, but there is a peculiar overlapping of motives in the second movement of the 9th Symphony (1912).[1] These motives first appear at the top of the movement, where they are stated in C Major with no substantial harmonic complexity. An ascending scalar motive in the bassoon and viola (Theme 1) is followed by a 3-part, melody-and-harmony theme in the clarinets (Theme 2). Theme 1 provides a harmonic motion of I—V, and the following 3-part harmony of Theme 2 moves from V64—V53—I. This call-and-response style delineation between Theme 1 (antecedent) and Theme 2 (consequent) is rigid and defined, but only here (Figure 3.1), as Mahler composes each return of this opening section with increasing harmonic interest.

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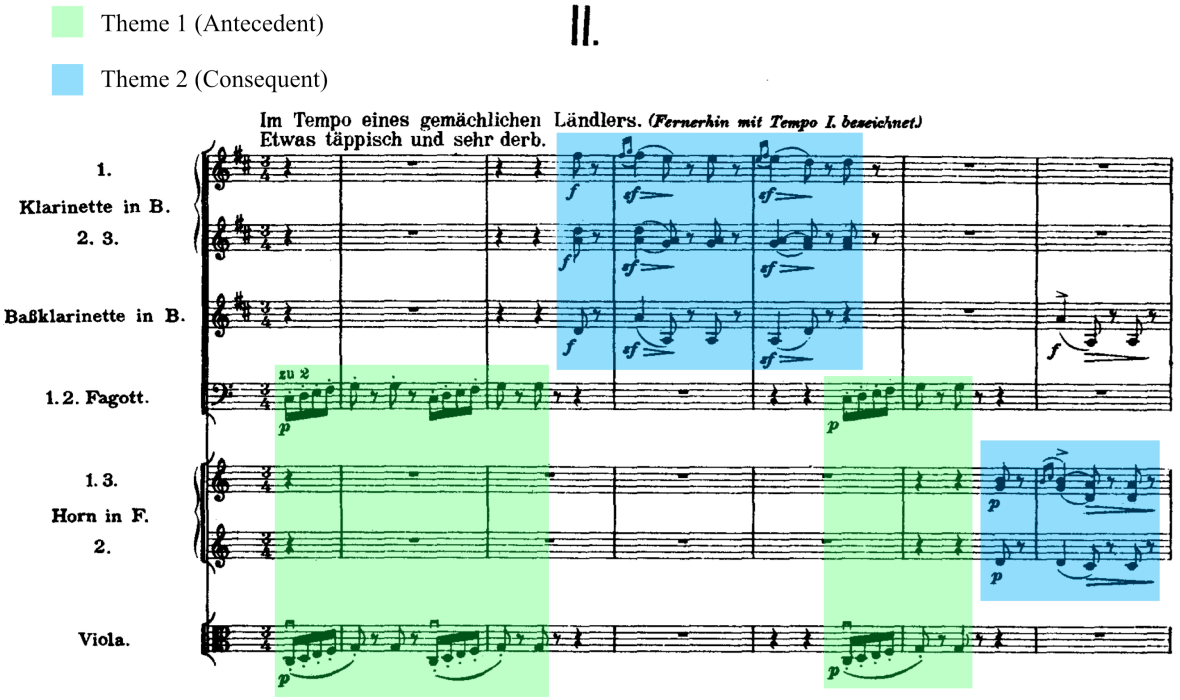
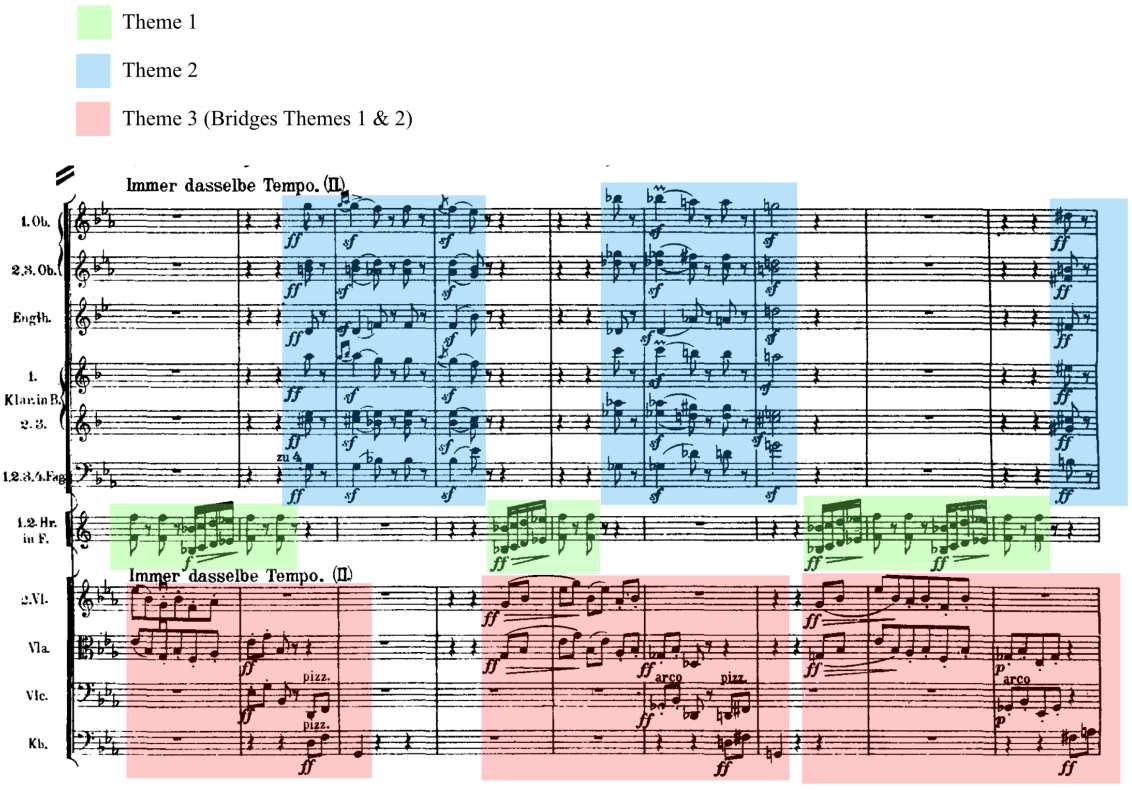
[1] There are several instances in Mahler's oeuvre that display a pulling apart or bifurcation of tonality where scale tones appear in simultaneous cross-relation with altered tones. These bifurcations emerge from a single centricity, whereas the moment in *Symphony No. 9* is more a superimposition of multiple ideas. Examples of this bifurcation include *Lieder eines fahrenden Gesellen*, Nos. 1–4; "Von der Schönhiet" from *Das Lied von der Erde*; and *Symphony No. 10.*

Fig. 3.1 Opening section of Mahler's *Symphony No. 9*, 2nd movement.



When the section first returns at the "Immer dasselbe Tempo" in m. 168 (Figure 3.2.), the harmonic relationship between Themes 1 & 2 begins to change. Here, Theme 1 (played by the horns) remains rooted in Eb Major in all instances, but Theme 2 (mixed winds)—after an initial response in the same key of Eb Major—abruptly moves away from Eb and progresses through the following chords in two consequent phrases: G-Flat—D7—G and B—G7—A-Flat. Each consequent phrase of three chords is preceded and followed by the scalar theme in Eb; thus, the antecedent and consequent of each period structure are in two different keys. While the result is merely a series of quick, direct modulations, the consistent return of Eb Major throughout the long-term structuring of these phrases may emphasize the juxtaposition of keys in a way that points toward a sense of simultaneity.

Fig. 3.2 Mahler: *Symphony No. 9*, 2nd movement, m. 168 "Immer dasselbe Tempo."



Mahler inserts a third thematic element in this instance (the strings), which allows the tonality of Theme 1 to extend, via Theme 3, into the space of Theme 2. Mahler progresses clearly from simple, rigidly defined statements of motives toward less-rigid, overlapping motive statements in different keys.

Fig. 3.3 Timeline of key relationships between Themes 1 & 2 at m. 168 "Immer dasselbe Tempo."

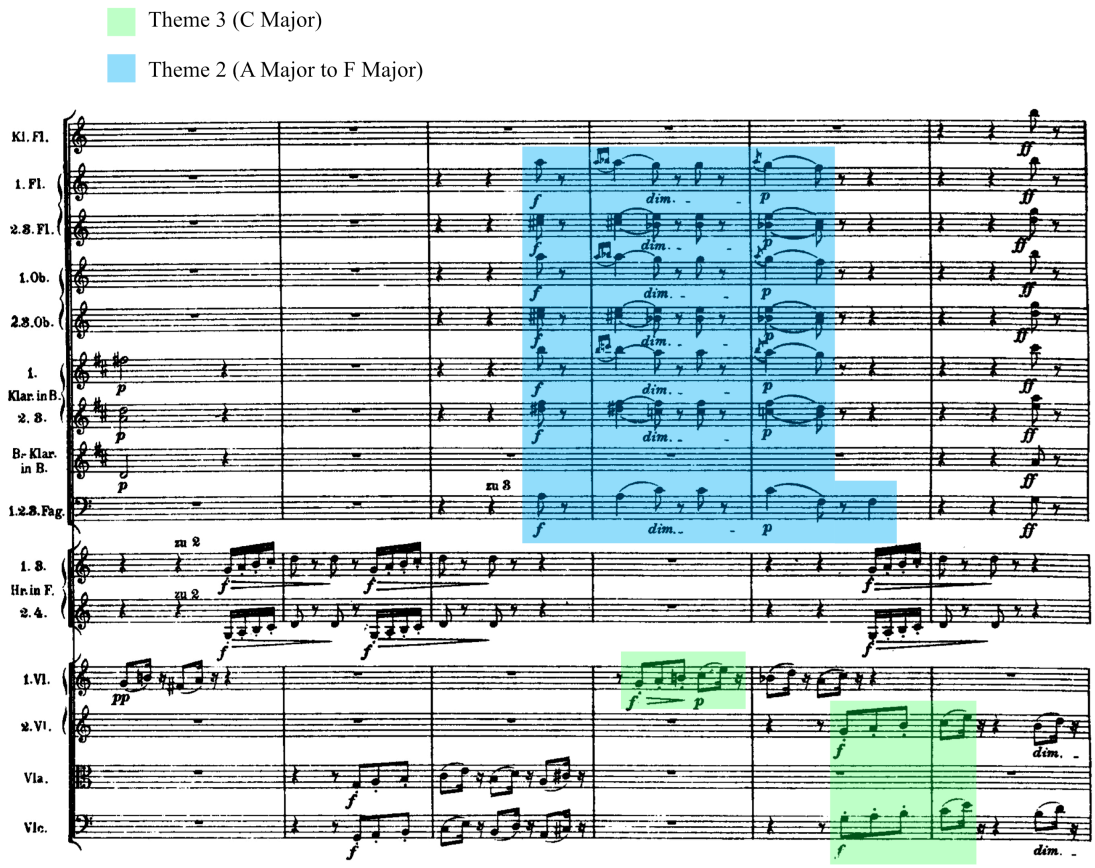
Theme 1:	Eb Major	Eb Major	Eb Major	Eb Major
Theme 2:	Eb Major	G Major	C Minor (Ab)	

————Time———>

The fourth and final occurrence of this material (m. 523) behaves a bit differently. It *is* similar to previous instances in that Theme 1 remains a static, scalar motive outlining I to V. But

this time, Mahler tampers with the temporal relationship between the three motives. Twice, Theme 3 extends from the antecedent half of the phrase into the consequent half, where Theme 2 is in a different key from that of Themes 1 & 3. The overlap is brief, but nevertheless present.

Fig. 3.4 Mahler: *Symphony No. 9*, 2nd movement, mm. 529–534.



While brief on the page, the consistently recurring C Major of Themes 1 & 3 lingers in our ears as Theme 2 is presented in its differing keys. Similarly, Theme 2's cadence in F Major lingers beyond its short 8th-note duration while Themes 1 & 3 continue with C Major (Figure 3.4).

When listening to this passage of Mahler we may experience a fleeting moment of polytonality. We recognize Themes 1 and 3 as belonging to a single tonality (C Major). These themes repeat and repeat, producing a stable, constant stream of a single tonality. We then hear Theme 2 presenting itself in a different key from Theme 1. This distinction between themes

becomes only more pronounced with each iteration of Theme 2 as it moves from key to key—Themes 1 and 3 essentially act as a tonal pedal above which the melodically and harmonically clear Theme 2 presents a second tonality.

We hear this section of music four times throughout the movement, which helps us grow familiar with its thematic material. The music gives us ample time to comprehend these themes in their simplest arrangement, which may help us recognize Theme 2's divergence in key from that of Themes 1 & 3. Repeating material to prepare the listener for a moment of polytonality may be effective, as some cognitive scientists suggest that "familiarity allows the listener to progress from the observation of readily accessible 'surface' features…to a deeper focus on thematic and structural features of the music."[2]

The likelihood of our separating these themes into audio streams may be further supported by the timbral differences between them (the woodwind choir versus the strings and horns).[3] This raises an interesting question: What affect does timbre have on our perception of dissonance as it pertains to recognizing differences between simultaneous tonalities? For instance, if we split a sustained polychord, say A Major 7 over C Major 7, into its four-note halves and orchestrate this with the A Major 7 in the horns on bottom and the C Major 7 in the winds on top, does this produce clarity in color between the halves? Does that clarity of

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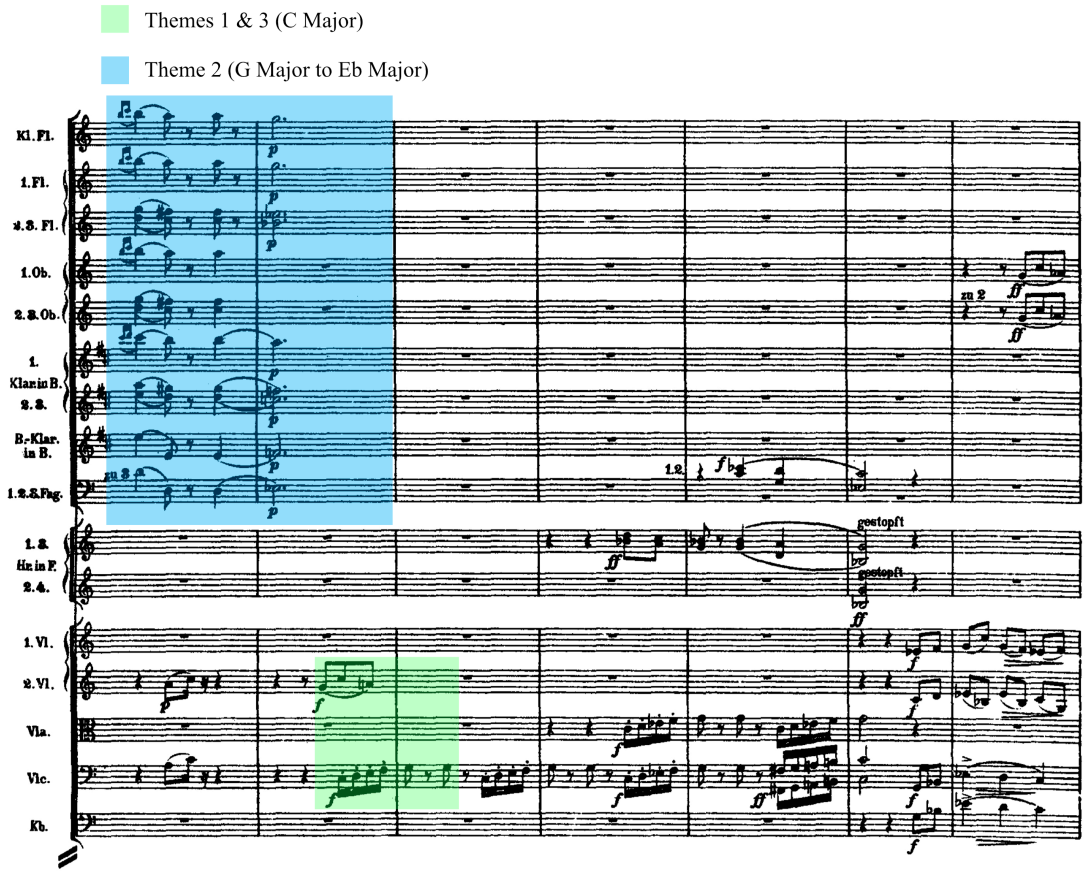
[2] Helen M. Prior, "Familiarity, Schemata and Patterns of Listening," *Music and Familiarity*, ed. Elaine King & Helen M. Prior (Surrey, UK: Ashgate Publishing Limited, 2013), 34.

[3] Rhodri Cusack and Brian Roberts, "Effects of Differences in Timbre on Sequential Grouping," *Perception and Psychophysics* 62, no. 5 (2000): 1112–1120.

difference encourage stream segregation? Some research suggests that this is possible with multiple single-voice melodies[4]; but what about multiple-voice chordal structures?

Mahler's juxtaposition owes more to the classical convention of direct modulation than to a more explicit, prolonged superimposition of multiple tonalities. The moments of vertical overlap between themes are brief, and the juxtaposition of keys are presented in a phrase structure that suggests Mahler simply dovetails the beginnings and endings of the halved period structure. If the simultaneity were more pronounced, by sustaining the overlap between the two themes for a significantly longer period, perhaps through more repetition, then this could be a

Fig. 3.5 Mahler: *Symphony No. 9*, 2nd movement, mm. 535–541.



[4] William Morris Hartmann and Douglas Johnson, "Stream Segregation and Peripheral Channeling," *Music Perception: An Interdisciplinary Journal* 9, no. 2 (Winter, 1991): 160.

prime example of what I believe to be a polytonal experience. Nevertheless, I believe this passage expresses some of the fundamental compositional techniques for creating a polytonal experience. Such an experience enables the listener to recognize the conflict between tonal centers within the musical texture.

3.2 Tonal Indicators

Important among these techniques is the implementation of strong tonal indicators. The easier it is for a listener to identify a tonal center within a polystratal texture, the sooner the listener may recognize that the tonal center conflicts with other parts of the musical texture.[5] Ideally, in a polytonal texture, the melodic and harmonic content within each tonal layer exhibits more common, tried-and-true voice-leading norms. The Mahler is a strong candidate in this regard, as each theme is comprised of very basic, commonly used tonal idioms. For example, Theme 1's "Do-Re-Mi-Fa-So-So," projects a strong sense of a major tonality through emphasis of the first 5 tones of the diatonic major scale. This motion from "Do" to "So" (I to V) also emphasizes the Tonic-Dominant relationship: the bedrock of tonality. Meanwhile, Theme 2's "Mi-Fa-Mi-Re-Re-Mi-Re-Do-Do" follows expected tonal voice-leading norms: scale-degree 4 resolves downward to scale-degree 3, followed by scale-degree 2 resolving to scale-degree 1.[6] Both themes possess strong tonal indicators that allow for trained listeners to easily identify their tonal centers. From an experienced listener's perspective, it is obvious when Theme 2 diverges from Theme 1's tonal center—especially given that these themes have been presented several

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[5] This process is known as "tonality induction." See footnote 20 in this chapter.

[6] Robert O. Gjerdingen, *Music in the Galant Style* (New York: Oxford University Press, 2007), 144.

times within the same key prior to the moment of simultaneous juxtaposition. This many-fold repetition within the same key helps fix the themes' tonal indicators within the listener's tonal memory.

3.3 Outline of the Chapter

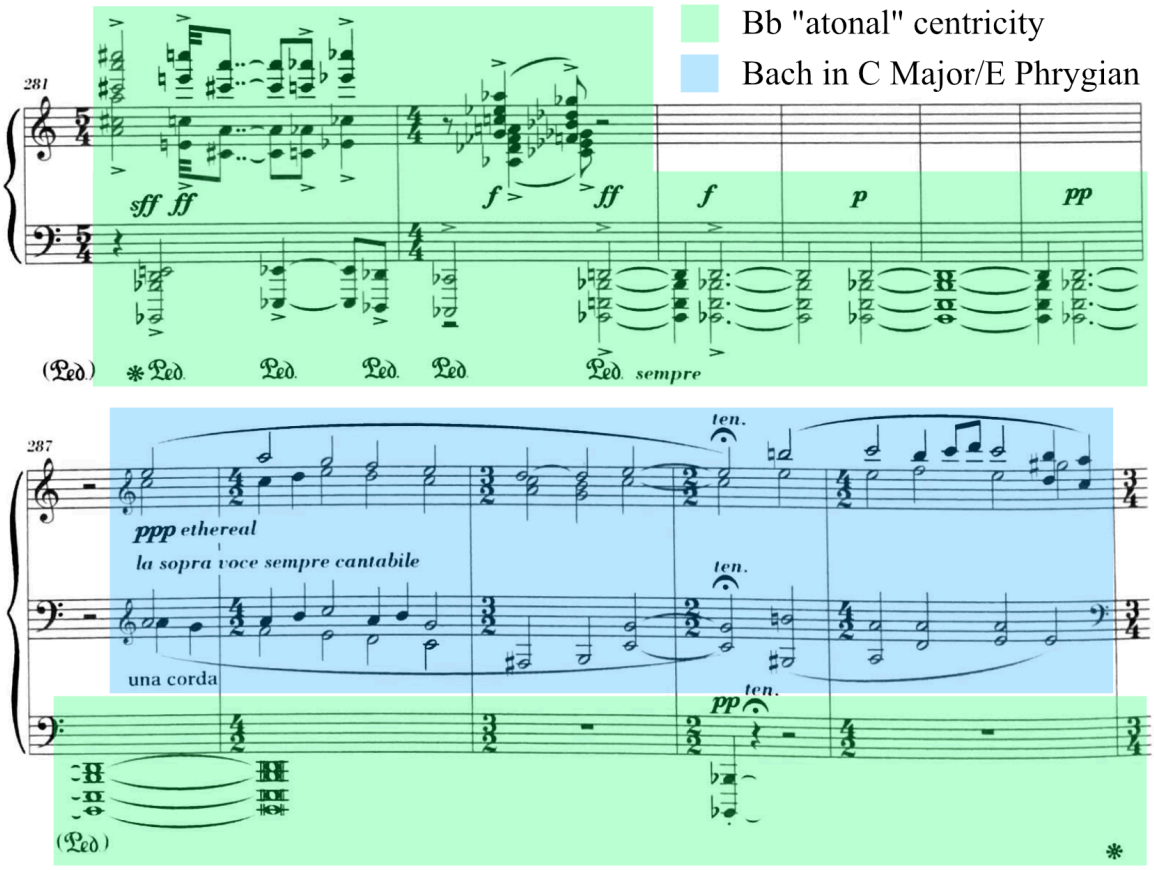
The goal of this chapter is to better understand how compositional techniques support polystratalism. We will examine an array of polystratal compositions and identify which techniques are working to support the *independence of layers* within each texture. Since each example draws support from multiple techniques, we will examine each *piece* one-by-one as to avoid revisiting pieces each time they are relevant. We will keep stock of which techniques are working to support polystratalism and summarize conclusions at the end.

3.4 Danielpour: Bach, Familiarity and Tonal Indicators

The time spent repeating themes in the Mahler enables the listener to recognize differences in tonal centers more easily upon their return. Quotation of previously composed tonal music within a polystratal texture may serve a similar purpose, assuming the musical quotation is known to the listener. If one of two layers in a polystratal texture consists of a recognizable melody, its tonal identity may be apperceived as being distinct from the "tonality" of the other layer. I believe this occurs with Richard Danielpour's *Piano Fantasy* (2008). Toward the end of this 16-minute work for solo piano, Danielpour quotes the famous chorale "Wenn ich einmal soll scheiden" from J.S. Bach's *St. Matthew Passion*. After a climactic atonal section reduces to a soft, low, repeating Bb chord, the opening phrase of the Bach chorale is quoted in C

Major/E Phrygian in the mid-high register of the keyboard (Fig. 3.6). The low Bb chord sustains through the presentation of the chorale, thus superimposing the two layers of music. The first phrase of the chorale is then interrupted by a continuation of the atonal material before proceeding with the second phrase. This back-and-forth continues, with each remaining phrase of the Bach chorale framed by the atonal music.[7] In both the Mahler and Danielpour, there is a consistent, foundational layer of music, "Do-Re-Mi-Fa-So" and Bb pedal, respectively, that does not align with the tonality of the musical layer above it.

Fig. 3.6 Richard Danielpour, *Piano Fantasy ("Wenn ich einmal soll scheiden")*, mm 281–291.



[7] All but one phrase of the Bach is juxtaposed with a residual low sustaining chord or note from the atonal music.

With the Mahler, the foundational layer is strictly tonal in the traditional sense: an ascending fragment of the major scale, repeated as a quasi-ostinato. With the Danielpour, however, the foundational layer is tonally less clear—the low B-Flat is preceded by an extended section of atonal—at times polychordal—music that yields its tonal ambiguity to the B-Flat only in the moments just prior to superimposition with the Bach chorale. The B-Flat is relatively stable only by virtue of the cadential nature of the moment: sheer repetition combined with a reduction in volume and rhythmic activity. I believe it would be a stretch to say this music is in a B-Flat tonality. To me, the music is clearly atonal, suggesting that we have an instance of *polystratalism* in which *tonal and atonal* layers are superimposed.

Like the Mahler discussed earlier in this chapter, the Bach chorale provides clear tonal indicators that support the listener's ability to recognize tonality: simple triadic harmony with smooth voice leading and clear dominant-to-tonic progression. The chorale itself helps us hear its tonality. Though the first few chords are less clear, by the end of the phrase—and with the help of a short chain of dominant functions leading to a tonic—we are clearly in a C Major tonality. As a counterpoint to this, I believe that the atonality of the previous section clarifies the sense of tonality at the moment of the Bach chorale's entrance—simply moving from atonality to tonality highlights the sense of tonality upon its arrival. Further still—for those who have listened to the *St. Matthew Passion*—at the moment the chorale arrives there is the mysterious sensation of recollection in which we think, "I *know* this music."

Knowing the Bach means that, on some level, we understand its tonality. Understanding its tonality may help us determine that the upper layer's chorale does not "belong" to the lower layer's B-Flat sonority. Could a trained musician unfamiliar with the Bach still recognize the

superimposition of "tonalities"? Of course—the chorale still possesses the strong tonal indicators capable of teaching us its tonality. Therefore, I do not believe it is *necessary* for the chorale to be known prior to the moment of juxtaposition, only that familiarity with it may help us more easily make sense of what is happening.

If the Bach possesses strong tonal indicators, does prior knowledge of it matter? In this case, perhaps not. The atonal layer, while *sustaining* through the Bach chorale, is not *rhythmically active* during the chorale. This lack of additional attacks in the atonal layer means that there is little obstructing our ability to process the chorale's tonality and its relationship to the sustain of the atonal layer. If, in a different polystratal texture, the layers possess a higher level of activity (rhythmic, harmonic, melodic, etc.), then perhaps previously known material will play a more significant role in aiding our ability to segregate layers.

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3.5 Ives: Timbre, and Register

This may be the case in Charles Ives' *Variations on "America"* for organ solo (1892), where we hear the very well-known *My Country, 'Tis of Thee* in canonic and tonal juxtaposition with itself. The texture at the moment of polytonality in *Variations* (Figure 3.7) does not make it easy to distinguish the two superimposed layers of tonality. It is largely homophonic; use of the dotted-quarter-note-to-eighth-note rhythm helps in separating the layers rhythmically, but there are still many synchronous attacks between layers, pushing the music toward the realm of polychordality rather than segregable layers in polytonality.

The difference in registration (organ timbre) between the layers may help us segregate them, but the layers are less than an octave apart from one another in a relatively low register, making stream segregation challenging. Further complicating things, Ives has marked the lower layer at a *pianissimo* dynamic level, so it can be difficult to hear in the first place. What helps the perception of polytonality, in my opinion, is how use of a known melody, juxtaposition of *distant* keys, canonic imitation, and subtle timbral differences work together in supporting some degree of independence between layers. This can be further supported by the organist's choice of registration and disregard for Ives' *pianissimo* dynamic marking.

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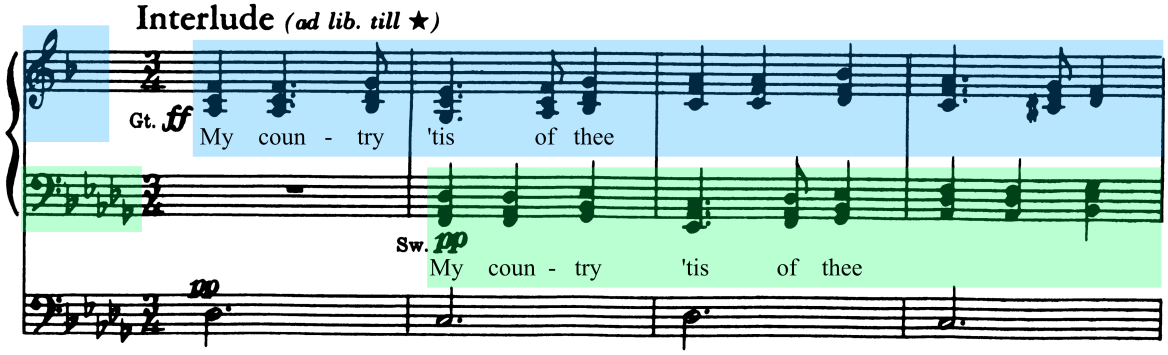
Fig. 3.7 Charles Ives, *Variations on "America,"* mm. 76–79.



In a performance that supports the separation of polytonal layers, where the organist *has* chosen a helpful registration and dynamic balance, the iconic melody will have a chance of being heard in the lower layer. Assuming this is the case, we can better track the following voice in this canon and determine after a few measures that it is not in the same key as the leader. The homophonic texture still works against the perception of different layers, but the timbre and canonic imitation of a well-known melody may prove enough to help listeners segregate the tonalities.

If Ives wanted us to hear the two entrances of the theme in different keys, he did not make it easy. Fellow American composers William Schuman and William E. Rhoads may have done Ives (and the rest of us) a favor in orchestrating the piece. In this version of the work, the leading voice in the canon is taken by the violins, winds, and trumpets (marked *fortississimo*) and followed by trombones, horns, and violas (marked *fortissimo*). In this version there is a very clear difference in *timbre*, and register, between the violins and the horns (the two primarily heard instruments in this setting). The result is significantly greater independence between the two layers compared with the original organ solo version.

Fig. 3.8 Ives Arr. Schuman: *Variations on "America,"* Rehearsal I. F major (blue) against D-Flat major (green).

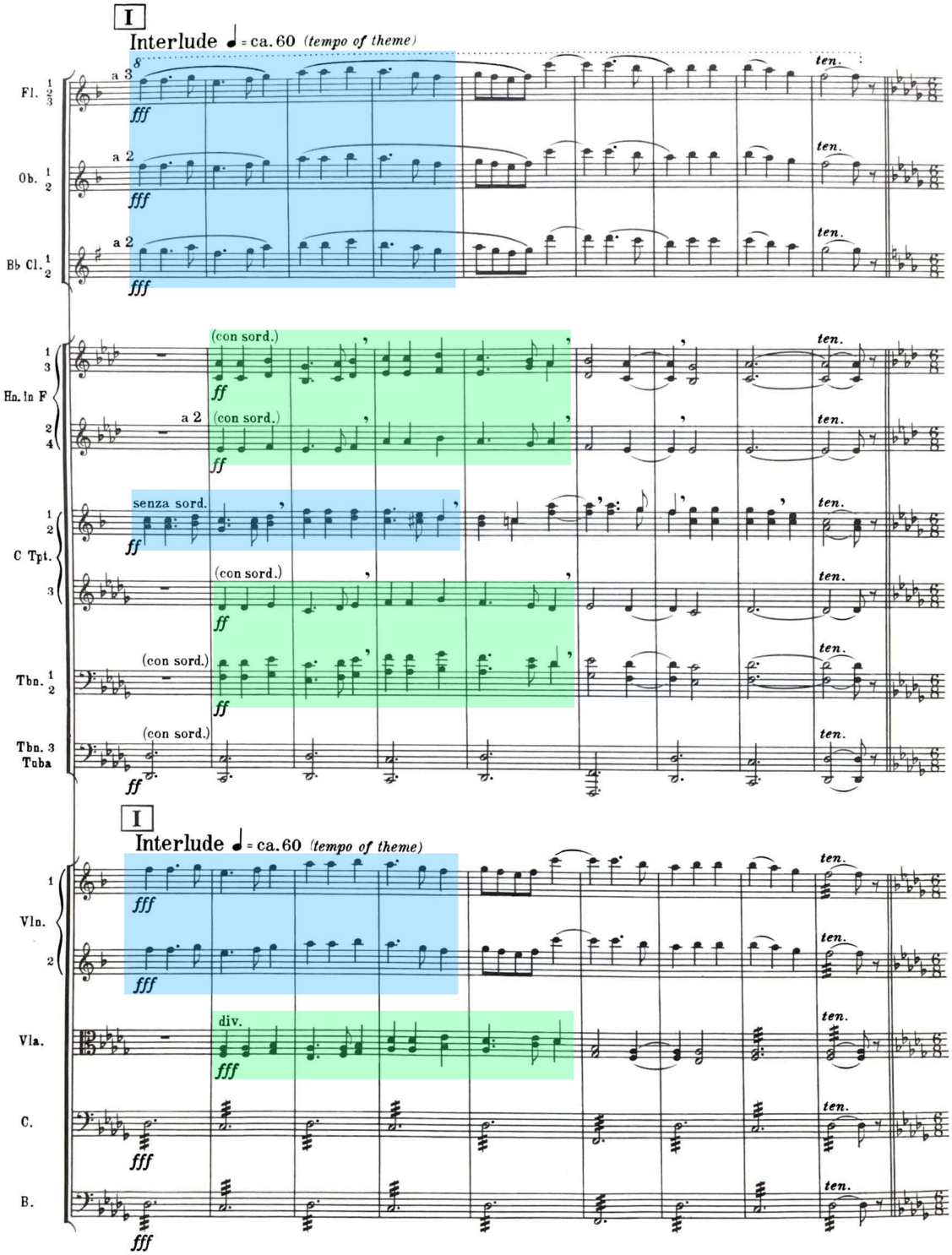
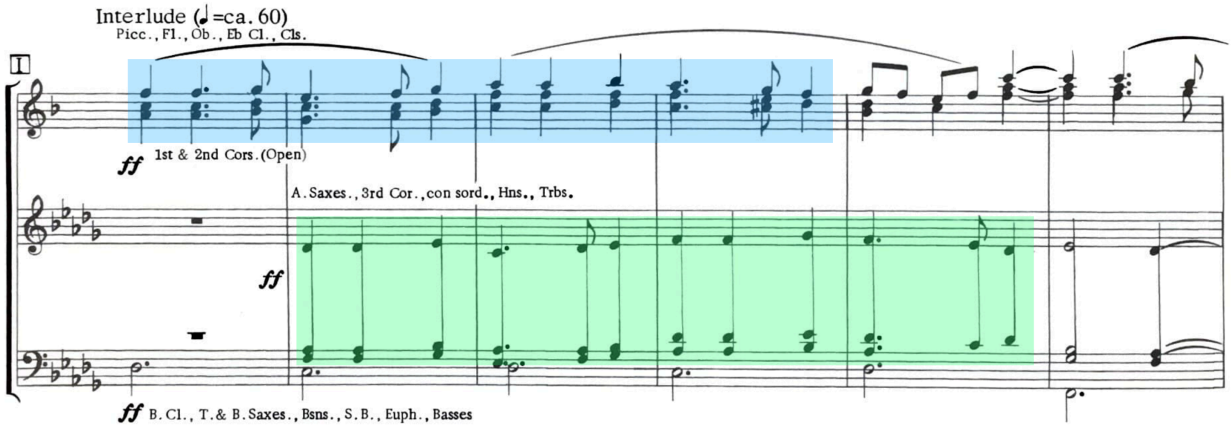


Fig. 3.9 Ives Arr. Rhoads: *Variations on "America,"* Rehearsal I, Winds in F (blue) against Horns in D-Flat (green).



A fair amount of 20th-century "polytonal" repertoire was written for the quasi-mono-timbral instrument that is the piano.[8] As we see with the Danielpour, it *is* possible to create a sense of both simultaneity and independence between layers in a solo piano texture. However, I believe this success is due to how *rhythmically* different it is from the early 20th century repertoire. As discussed in Chapter 1, much of the juxtaposing of keys during the early days of polytonality came in the form of homophonic, chordal textures, which struggle to support the independence of tonal layers. The Ives falls into this category, but it is helped in part by Schuman and Rhoads mitigating its issues with register and timbre. The Schuman and Rhoads arrangements, when compared to the original, show how polytonal textures can be heard more clearly when a marked timbral difference exists between the separate tonalities.[9] Psychoacoustic studies support the idea that timbre affects the listener's ability to segregate layers of musical texture into separate auditory streams.[10]

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[8] Milhaud, Ginastera, Prokofiev, Bartok, and several others have used the technique in their piano music.

[9] Increased separation in register also may play a role. As we saw in the Singh study, participants found it more difficult to separate layers of different timbre when layers were too close in register.

[10] Rhodri Cusack and Brian Roberts, "Effects of Differences in Timbre on Sequential Grouping," *Perception and Psychophysics* 62, no. 5 (2000): 1112–1120.

3.6 Britten: Peter Grimes

In composing a polystratal passage, one may opt to highlight the difference in layers by making specific choices in orchestration. One way to achieve this is to group instruments of a similar timbre in one layer, and instruments of a different timbre, yet similar amongst themselves, in another layer. Benjamin Britten's opera, *Peter Grimes* (1945), does exactly this, with three distinct themes played by three distinct timbral groups.

While the famous duet between Peter Grimes and Ellen Orford in the *Prologue* is written explicitly in two different keys, the result is closer to a single extended tonality or atonality up until the moment of convergence in E Major (Figure 3.10).[11] The following *Interlude I* and its transformation into *Act I* display what could be one of the most perceptible uses of polytonality. The first moment of simultaneous juxtaposition occurs three measures before Rehearsal 10, where the violins and flutes, after establishing an A Minor/E Phrygian modality (Theme 1), sustain an A5 (Figure 3.11). Below this sustained pitch, the clarinets, harp, and violas present a scurrying 16th-note figure in F Lydian (Theme 2).[12] The brass choir then enters with low chords in A Major (Theme 3). Each of the three themes dovetail with one another. This interweaving of three themes—each with their own timbral color and tonal/modal center—continues well into *Act I*, as each occurrence strengthens the listener's tonal memory for each of the three themes.

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[11] The aural indication of polytonality is weak in this instance due to the minimal amount of overlap, as well as the centricity of G#/Ab shared between the two vocal lines and keys. There is little supporting the independence of each written key.

[12] With the violins' A5 being in common with F Lydian, we may not think much of this first juxtaposition.

Fig. 3.10 Benjamin Britten: *Prologue* from *Peter Grimes*, Rehearsal 9, Peter & Ellen sing in two different "keys."

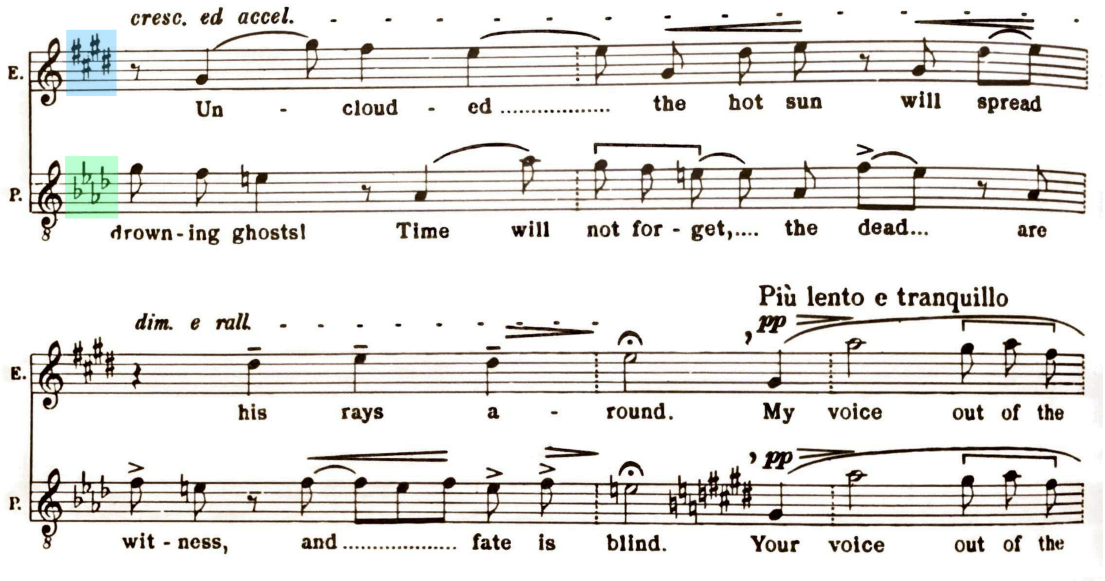
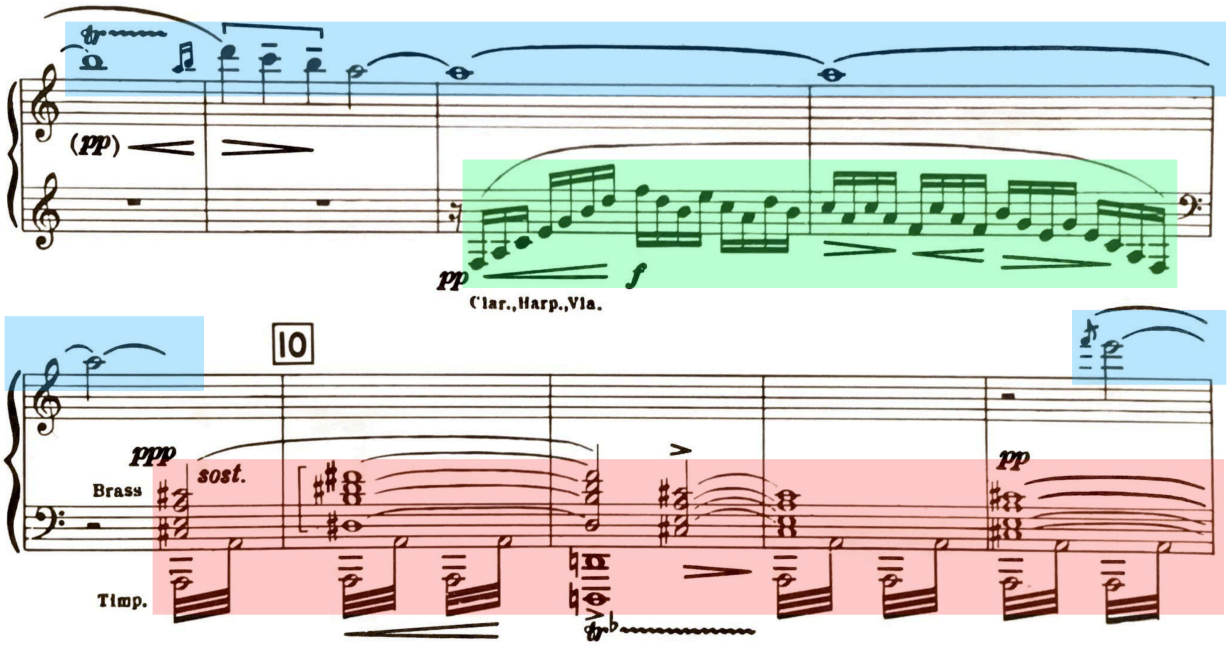


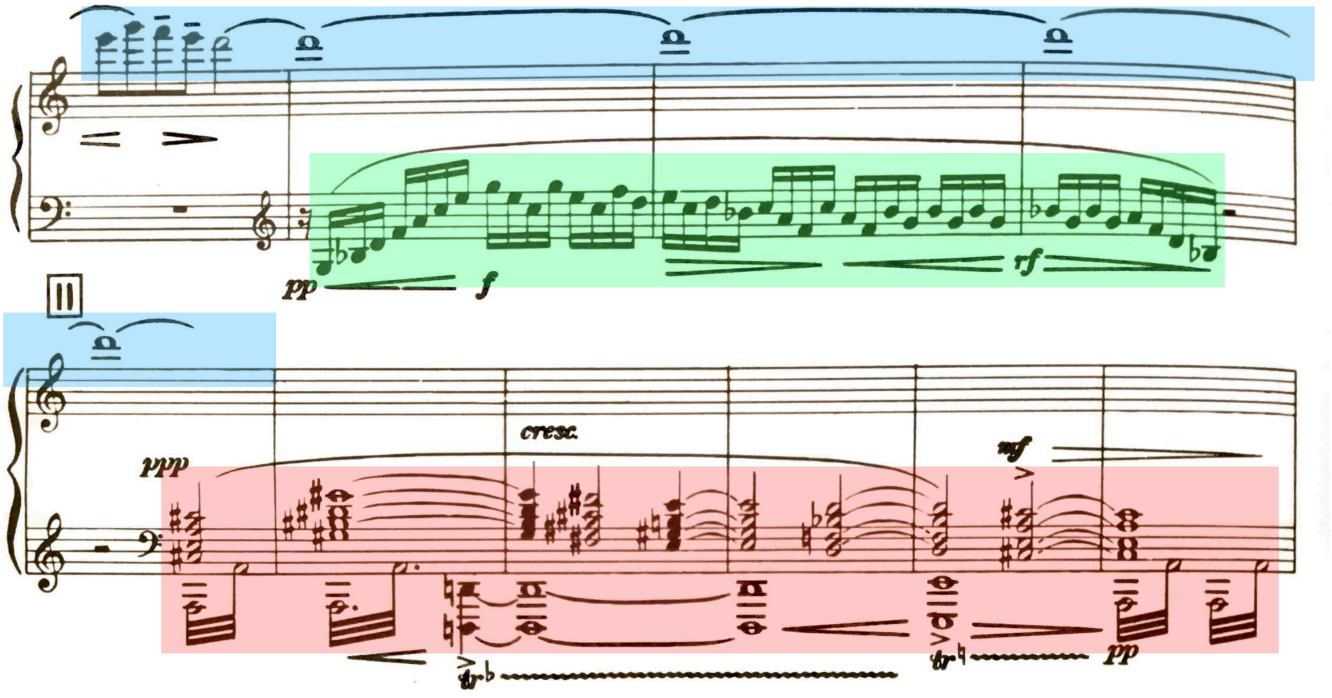
Fig. 3.11 Britten: *Interlude I* from *Peter Grimes*, Rehearsal 10, A minor (blue) x F Lydian (green) x A Major (red).



While it is possible that the listener will not hear the first moment of overlap (at Rehearsal 10) as polytonal due to the common tones, the next moment of juxtaposition will more likely be heard as polytonal despite the presence of a common tone. Three measures before

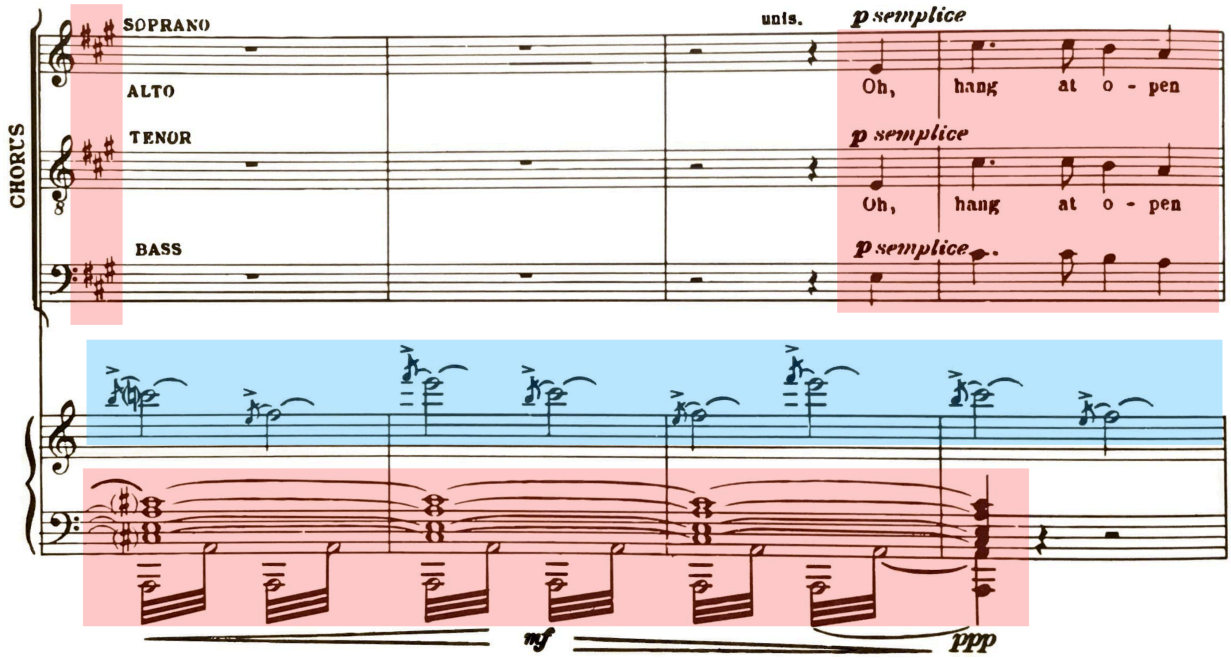
Rehearsal 11, the violins and flutes—after further establishing their A minor tonality—sustain a D6 while clarinets, harp, and violas play the scurrying 16th-note figure in G Dorian. This is essentially the same gesture as at Rehearsal 10, but the stability of the violins and flutes' sustained pitch is significantly different this time around. At Rehearsal 10, the A5 was a stable pitch in A minor (scale-degree-one). At Rehearsal 11, the sustained D6 (scale-degree-four in A Minor) is unstable and tends to resolve downward to C, potentially followed by B and A to complete the minor scale. This sustained tendency tone heightens the sense of tonality in the upper layer of the texture. When the clarinets, harp, and violas enter in G Dorian—while the violins and flutes' D6 sustains—the difference in tonality between the two layers is considerably more pronounced than at Rehearsal 10. The sense of independence between layers is further bolstered when, moments later, the horns enter again in A Major while the violins and flutes' D6 remains sustained. The opening moments of *Act I* further solidify this superimposition of

Fig. 3.12 Britten: *Interlude I*, Rehearsal 11, A minor (blue) x G dorian (green) x A major (red).



independent themes. Theme 1 (A Minor/E Phrygian) establishes a constant rhythm while Themes 2 (F Lydian) and 3 (A Major) trade statements. The chorus then enters, singing very clearly in A Major, against the backdrop of the other themes.

Fig. 3.13 Britten: *Act I*, 10 measures after Rehearsal 13, Chorus in A major (red) x Violins in A minor (blue).



Act I's primary polytonal juxtaposition is Theme 1 against the chorus-plus-Theme 3. Here, Theme 2 enters in between chorus phrases with minimal overlap, and sounds more like a chord-change rather than a simultaneous juxtaposition of tonalities. What is most likely to stand out as simultaneous juxtaposition, therefore, is the A Minor/E Phrygian of Theme 1 against the A Major of the chorus and Theme 3. This is somewhat vulnerable to critique in the context of polytonality as A Minor and A Major share the same root pitch. Nevertheless, it is arguably possible to interpret the harmony of the moment as an extended A Major tonality. However, these themes have established themselves as separate entities by *Act I*—grouping them into a single complex betrays their nature. Instead, *Interlude I* sets a foundation of distinction for these

themes, through differences in modality, timbre, and register, so that when *Act I* arrives the themes maintain their independence despite the more complex texture of superimposed layers. The difference in modality and register between the layers may be enough to recognize the polytonality, but this perception is likely further supported by the differences in timbre as a result of the instrumentation[13] and the time that enables the listener to categorize the themes tonally.

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3.7 Milhaud, Ravel, and Textural Complexity

It is problematic to label as "polystratal" works that, while appearing polytonal or polystratal visually, fail both to support the independence of layers and to give the listener the opportunity to understand the texture through the use of time and repetition. Milhaud's *String Quartet No. 5* (1920) is one such piece. The work drops the listener into a four-part texture consisting of separate tonalities in each of the four parts. It is nearly impossible to make sense of the texture upon a first listening as the layers coalesce into a soupy atonality.

Complexity of texture does not signal the failure of polystratalism, however, and it is possible to aide in the parsing of layers through use of time, rhythm, meter, and register. Ravel's little-known gem, *Frontispice* (1918), for two-pianos-five-hands, creates a degree of clarity and

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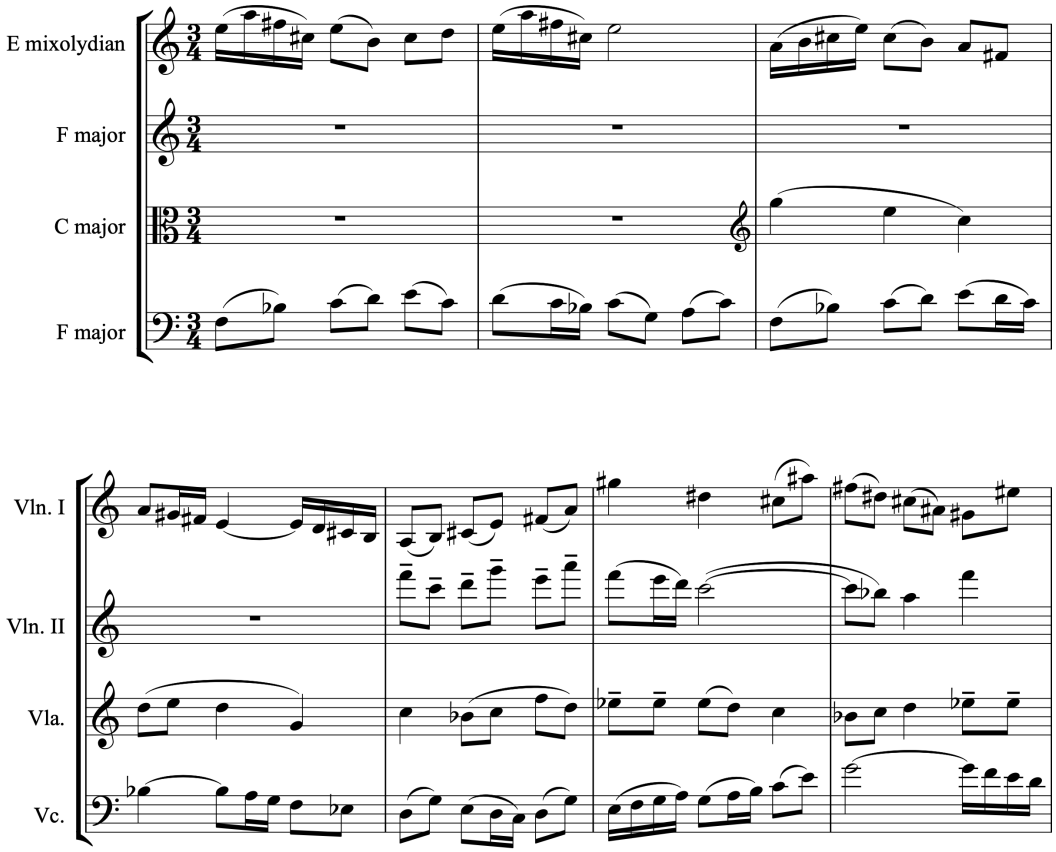
[13] Wright, James K., and Bregman, "Auditory stream segregation and the control of dissonance in polyphonic music," *Contemporary Music Review* 2, no. 1 (1987): 66.

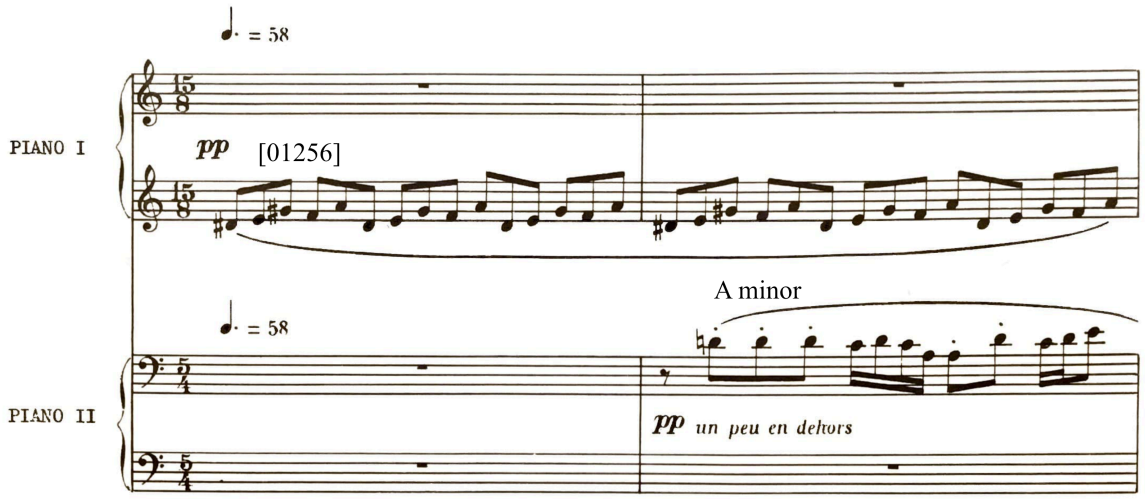
independence among layers despite both its complexity of texture and monotimbral instrumentation. This is achieved through careful use of the above-mentioned parameters.

Fig. 3.14 Darius Milhaud: *String Quartet No. 5*, mvmt. 1, opening measures.



Frontispice is constructed of six independent motivic lines that gradually enter the texture and remain constant until the end of the piece, save for the coda. This *Bolero*-like additive construction and repetition allows time for listeners to sit with each of the new elements as they are added to the texture. This makes it easier for us as listeners to notice, focus on, and interpret each layer against the whole in real time.

Fig. 3.15 Maurice Ravel: *Frontispice* mm. 1–2.

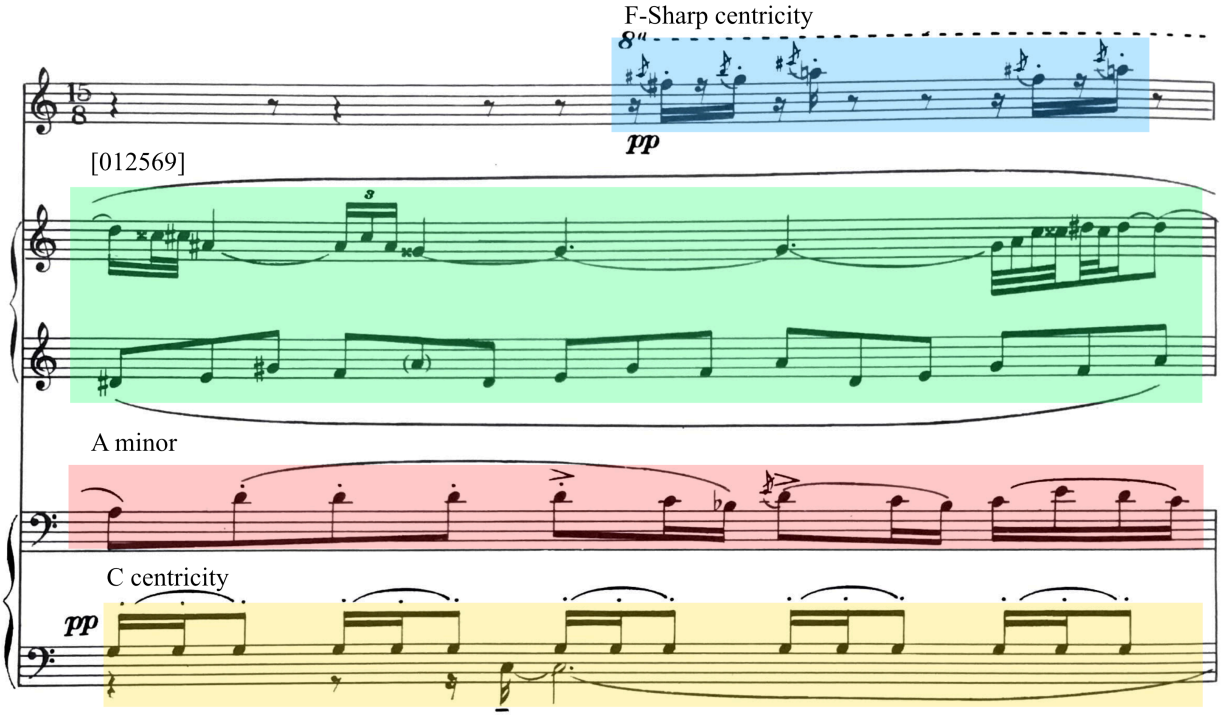


While we are given time to understand themes, we are also helped by how distinct each theme is from one another. The first layer to enter is an atonal, five-note ostinato, set class 5-6 [01256], followed by a second layer in A Minor. The first layer is in an irregular 15/8 meter where the five-tone ostinato betrays the compound metric groupings, while the second layer is in a steady 5/4 meter with standard duple pulses. The two layers are considerably different in both their pitch material and rhythm/meter, which supports their independence from each other. Ravel treats the remaining layers similarly, as all maintain a degree of independence through differences in rhythm, meter, and periodicity.

The third layer is a melody comprising set class 6-44 [012569] (an expansion of set class 5-6 (layer 1)). The third and first layers may coalesce into a single layer as both share a D# centricity in the middle register of the keyboard. The fourth and fifth layers are drones on G3 and C3 respectively; these two layers may be said to blend into one. The sixth and final layer is a soprano-range birdcall in an F# tonality. This conglomeration of pitch structures manifests the

problem of terminology discussed in Chapter One. It may be best to describe this texture as polystratal rather than polytonal.

Fig. 3.16 Ravel: *Frontispice*, m. 6.

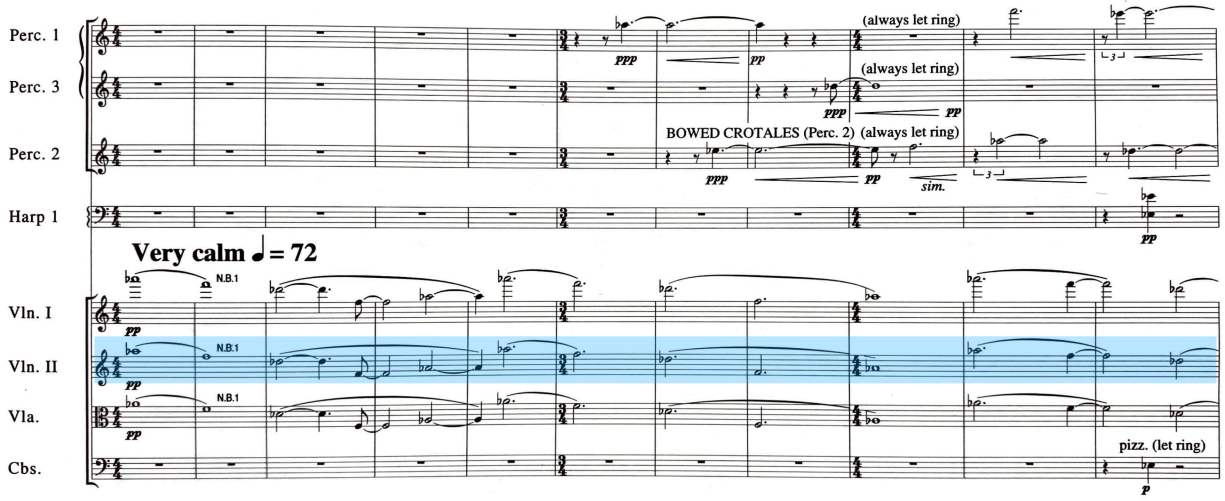


The strata are neatly spaced across the lower-middle to higher-middle range of the piano. This registral spacing combined with differences in tonality, rhythm, meter, and periodicity make it possible for the listener to recognize the layers. Since the separation of layers is supported by the textural, registral, and rhythmic aspects of the composition, the listener is more likely to also recognize that the layers differ in centricity and/or pitch-class collection. Furthermore, once all layers have entered, the repetition allows us even more time to switch focus between layers and make evaluations of their relationships. I believe that, despite its many active layers, the polyphonic-yet-separable texture of the Ravel is ideal in this regard (Figure 3.16).

3.8 Adams: Time and Texture

Another similarly ideal texture is John Adams' *Mother of the Man* from *Naive and Sentimental Music* (1999). The middle movement of this symphonic work begins with a simple triadic melody played by violins in D-Flat Major (So-Mi-Do-Mi-So-So-Mi-Do, etc.). The music lacks a G-Natural or G-Flat at first, so it could be heard as having a D-Flat or possibly an A-Flat centricity. A G-Natural eventually creeps into the texture via the clarinets, but the constant outlining of the D-Flat Major triad in the violins makes a strong case for D-Flat. At times this opening section feels like D-Flat Lydian, F Minor, A-Flat Major, or even pandiatonicism due to this ambiguity. Nevertheless, the D-Flat triad is a strong feature of this music as the triadic melody repeats many times throughout the course of the first seven minutes. The prolonged exposure to this theme helps us to internalize its tonality.

Fig. 3.17 Adams *Naive and Sentimental Music, II. Mother of the Man*, opening measures, D-Flat triad in blue.



After a climactic, contrasting middle section, the opening triadic melody returns in its original form and pitch content. The sparse accompaniment of percussion, harp, and bass

pizzicato from the opening section is replaced with sustained chords in the winds and brass. As the violins play their long tones of the D-Flat triad, the winds and brass play a slow oscillation between A-Flat Major and F Minor sonorities. These chords (A-Flat or F centricity) do not match the expectation of tonality that the violins have established (D-Flat centricity). So, at the moment the brass enters, there is a slight discordance between the two layers (Figure 3.18).

It is not clear how best to analyze this moment. It may feel like polytonality to the listener who is actively looking for polytonality, but the D-Flat triad easily fits into both the A-Flat Major and F Minor scales. It may be better analyzed within a single tonality. This type of juxtaposition may simply be a moment of "polyvalency," where multiple chord *functions* overlap with one another within a single tonality.[14] The lack of traditional dominant-to-tonic chordal function could further lead us to believe that this section of music is pandiatonic. Assuming either of these analyses to be sound, why consider this moment in regard to polytonality?

While it may not be polytonal, the music exhibits all of the qualities previously seen in examples throughout this chapter.[15] The triadic melody has a strong tonal indication. We are given time to understand the tonality of the melody. At the moment of juxtaposition, the layers are distinct from one another in timbre, rhythm, meter, periodicity, and register.[16] The polystratal texture exhibits a high degree of independence between layers and may support stream segregation as a result. It may not be *polytonal*, but it is *polystratal*.

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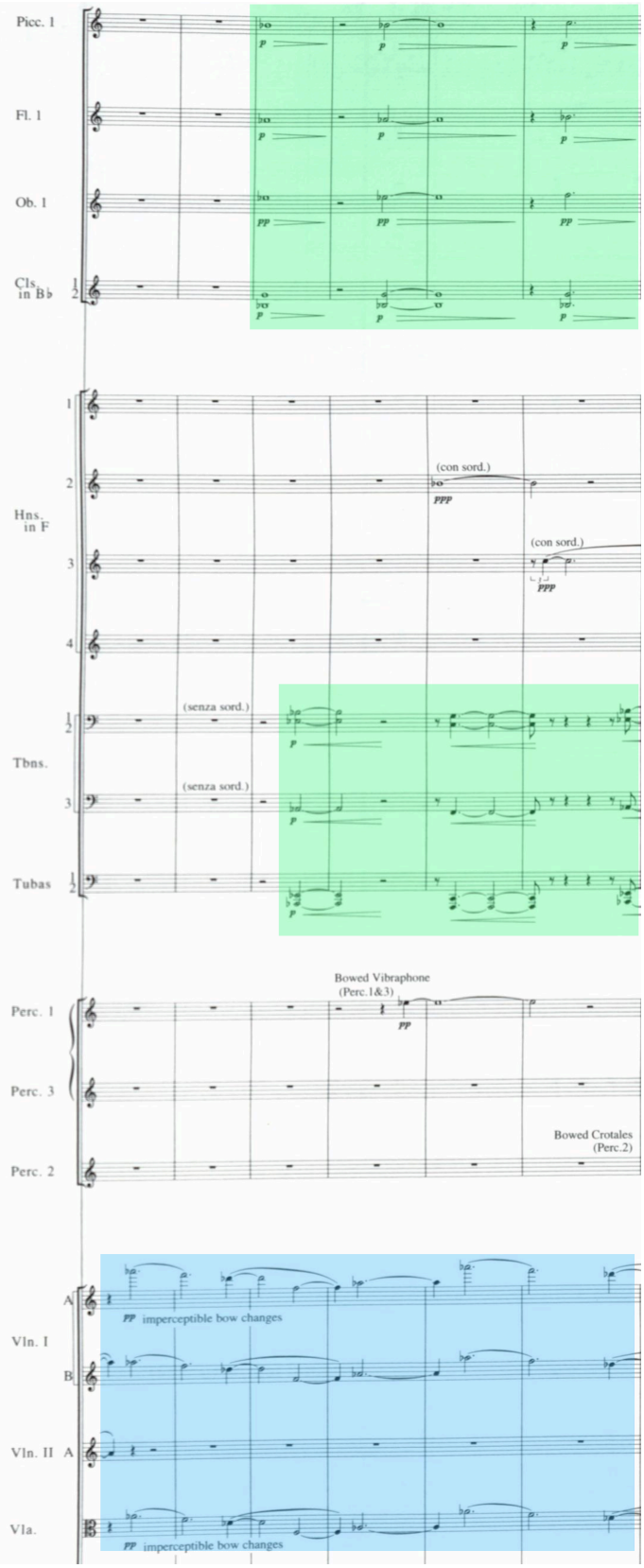
[14] Ton De Leeuw, *Music of the Twentieth Century: A Study of its Elements and Structure* (Amsterdam: Amsterdam University Press, 2005), 87.

[15] It would be interesting to hear this excerpt with the winds and brass playing chords in a more distantly related tonality, thus making the juxtaposition more tonally obvious.

[16] This example exhibits a considerable distance between the upper (violin) and lower (brass) layers. This may help in producing a clear texture.

Fig. 3.18 Adams *Naive and Sentimental Music, II. Mother of the Man*, mm. 211–219.



When listening to *Mother of the Man*, it feels as though the violin melody cycles through the D-Flat triad for an eternity. The repetition evokes a certain permanence or timelessness. It is noticeable when the brass and winds enter with chords that clearly do not project a D-Flat Major tonality. In this moment I feel a sensation similar to when a more explicit polytonal relationship unfolds. An analysis that accepts the upper violin layer as functioning independently from the lower brass and winds layer may point to a fleeting moment of polytonality that transforms into a single tonality or pandiatonicism. In this analysis, D-Flat Major is superimposed with a not-so-distant A-Flat Major and/or F Minor, only for the lower layer to eventually pull the upper layer into the lower tonality.

3.9 Corigliano: Time and Space

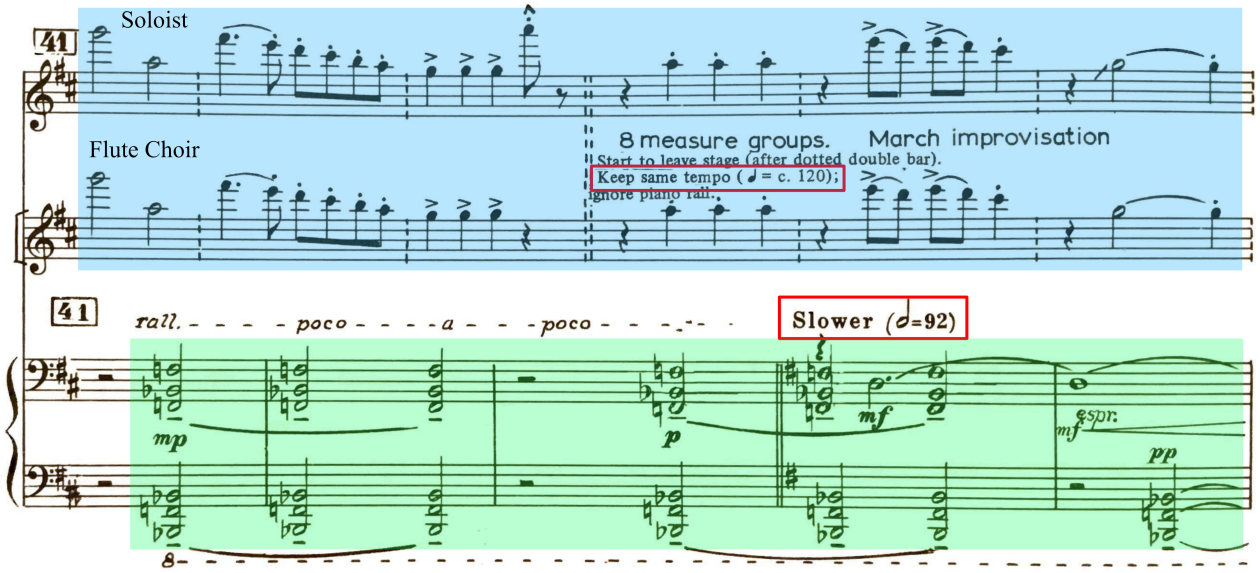
Polystratalism is often preceded and followed by textures that are not polystratal. There may be preparation—or lack thereof—leading up to the moment of juxtaposition, and the juxtaposition may be followed by a "resolution" of sorts. With polystratalism, multiple layers of music are in a dialogue—the ways in which layers enter and exit the dialogue affect the meaning of the music. John Corigliano's *Pied Piper Fantasy* (1981) offers a "resolution" to such a dialogue that supports the chilling conclusion to its story.

Corigliano's multi-movement orchestral work is a programmatic setting of Robert Browning's *The Pied Piper of Hamelin*, a poetic version of the German folk tale.[17] *Pied Piper Fantasy* is scored for full orchestra, flute soloist, and children's flute choir. By the end of the

[17] The *Pied Piper* legend tells of a man who is hired to deal with a town's rat problem. The man uses his magical flute to lure the rats outside the town limits. The townspeople refuse to compensate the man, prompting him to use his magical flute to lure the town's children deep into the forest, never to be seen again.

sixth movement, the flute and orchestra are engaged in a battle of violent, rhythmic attacks. The orchestra jabs with low open 5ths on B-Flat and F, while the flute persists with a repeating high A. The flute eventually wins, and the music propels into the seventh and final movement: *The Children's March*. At this point, the soloist introduces a hauntingly cheerful and catchy melody in A Mixolydian that is eventually mimicked by the children's flute choir and repeated as they gradually recess through the auditorium and out of the concert hall. The orchestra continues to play through rich harmonic progressions as the flute choir slowly fades into the distance.

Fig. 3.19 John Corigliano: *Pied Piper Fantasy* (Rehearsal 41) A mixolydian (blue) x B-Flat centricity (green).



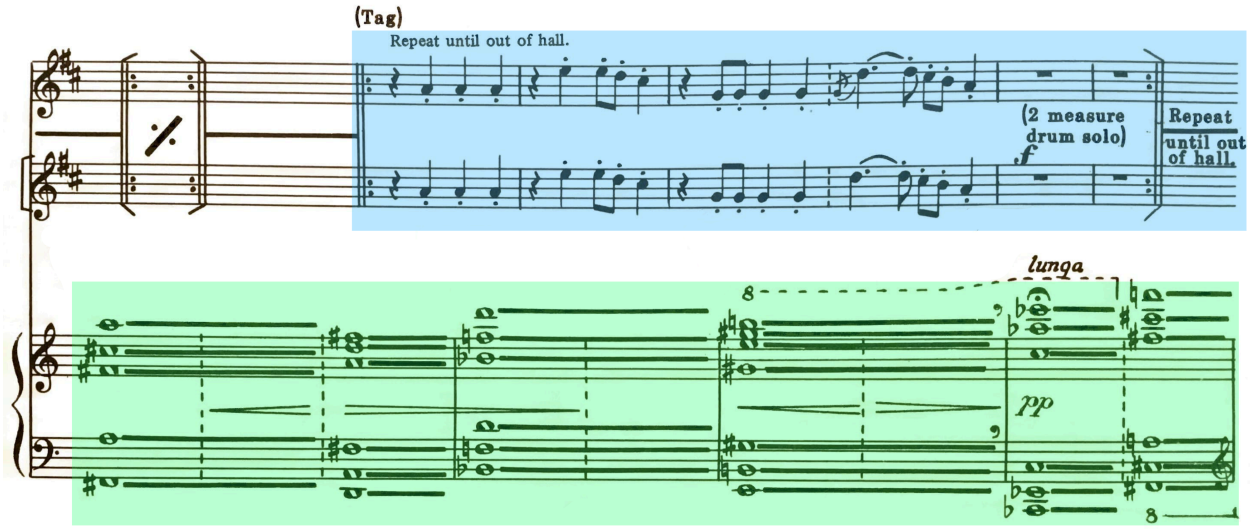
The orchestra explores several pitch centers while the flute choir's A Mixolydian continuously repeats. The orchestra's music is loosely "tonal," and often supportive of the A Mixolydian through the opening of the movement, but toward the end it moves clearly through the following centricities: B-Flat Major, E Major, A-Flat Major, F-Sharp Minor, and G Major. The effect is haunting and beautiful as the orchestra adjusts its relationship with the flute melody. The relationship vacillates between considerably dissonant and more consonant. Regardless of

where the layers are in their harmonic relationship, they maintain a level of independence as they move through time and *space* at their own distinct pace (Figures 3.19 and 3.20).

The score for *Pied Piper Fantasy* explicitly directs the flute choir to move through the auditorium to exit the hall. While antiphonal writing that utilizes physical space is not necessary for polytonal textures to succeed, it may lend support to the independence of musical layers. Polystratalism is like antiphony because two or more groups of voices are in dialogue with one another. It may work well to have one of these groups emphasize their separation by actively moving away from the other(s). Depending on where listeners are seated in the auditorium, they may notice subtle differences in dynamics and color as the offstage instruments pass by and exit the hall, further clarifying independence from the onstage instruments.

There is a noticeable difference in the quality of sound once the flute choir has reached the back of the hall and lobby—the sound is softer in dynamic and less bright in color, as higher frequencies struggle to make their way through various walls and partitions, while lower frequencies manage more easily. Corigliano's orchestration reflects an understanding of this issue, as the onstage instruments are reduced in dynamic and brightness to allow for the flute choir to still be heard. It is at this point that muted brass play through long, softly sustained chords based on the centricities from earlier (B-Flat Major, E Major, and F-Sharp Minor). The last few repetitions of the flute choir (A Mixolydian) are heard against these chords before a shimmering B-Flat Major chord emerges in the strings to mark the end of the juxtaposition.

Fig. 3.20 Corigliano: *Pied Piper Fantasy* (Rehearsal 43) A mixolydian (blue) x many changes in centricity (green).



3.10 Conclusions Drawn From the Analyses

Polystratal textures are complex by nature and potentially difficult to understand in real time. Several aspects of composition may combine to make the task easier. The *degree* to which each aspect is *necessary* for the perception of polytonality is unproven, yet I suggest that proper use of *time—repetition, the use of distinct temporal planes, etc.—rhythm, meter, register*, *tonal indicators*, and *timbre* all play a role in creating a clarity of independence between tonal layers, and that this clarity of independence may support stream segregation.

Time spent with specific material can give us the opportunity to analyze and understand complexity. Many of the pieces examined in Chapter Two give us this opportunity through manipulation of time. The Mahler, Britten, Ravel, Adams, and Corigliano use repetition and/or periodic return of themes throughout the form of their compositions. This presentation of themes over time grants *time* to the listener to recognize material and better understand its juxtaposition with other material.

The Danielpour and Ives[18] also engage with our *sense of time* through memory recall. Similar processes occur in the Mahler, Britten, and Adams as well, as a significant amount of time passes between the monotonal and polystratal presentation of themes in these pieces. It is reasonable to think that the average listener can realize something is different about the polystratal moment in comparison with their memory of the theme in monotonality. Polystratalism can be much like reharmonization in this way, where memory of melody and harmony interact with a new sound experience.

Rhythm, meter, tempo, and form are the musical elements involved with our perception of time in music listening. Put another way, the speed and regularity of pulse and of periodicity affect how we perceive the flow of music across time. Most of the pieces I have discussed engage with these elements to emphasize the independence of strata. In *Piano Fantasy*, Danielpour suppresses one layer's rhythmic activity, giving space for the other layer to be heard (Figure 3.6). In *Mother of the Man*, Adams uses irregularity of periodicity within each layer to create a lack of perceived rhythmic and metric cohesion between layers (Figure 3.18). In *Frontispice,* Ravel assigns distinct rhythms, meters (written and perceived), and periodicities to each layer, which creates pockets of space for the individual rhythmic attacks of each layer to stick out of the texture (Figure 3.16). In *Pied Piper Fantasy*, Corigliano employs differences in tempo, rhythmic activity, and periodicity between layers to create two separate temporal planes (Figure 3.19). Corigliano further emphasizes this separation of layers through use of physical space, thus engaging with both time *and* space.

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[18] The Ives also engages with time through canonic imitation.

With polystratalism, temporal manipulation may prove important in creating a sense of independence between strata. There is a basis in cognitive research for this hypothesis, as studies suggest that synchrony (simultaneous rhythmic attacks) affects the likelihood of stream *fusion* (grouping together of notes).[19] Put another way: asynchrony (lack of simultaneous rhythmic attacks) supports stream *segregation*. Textures that feature high levels of asynchrony support independence of layers. In contrast, it may be difficult for listeners to segregate layers of music into separate auditory streams when those layers feature a high amount of synchrony, or homorhythm, as we saw with Ives' *Variations on "America."*

Use of *register* is another important factor in the successful separation of tonal layers. Both Schuman and Rhoads' orchestrations of *Variations on "America"* utilize increased registral separation between layers to great effect. The Danielpour, Britten, Adams, and Corigliano feature similar registral separation between layers. The Ravel exhibits a minimal amount of separation, putting it on the cloudier end of the texture spectrum, along with the original version of the Ives. In both cases (Ravel and Ives), the lack of registral spacing between layers is countered with distinctness of tonality and time.

Strong tonal indicators—the common harmonic progressions and voice-leading norms that help establish a sense of diatonic tonality or modality—are helpful in "tonality induction."[20] These may not be a necessary feature of polytonal or polystratal writing, but may nevertheless make the parsing of layers easier in both context. Inherent in tonal indicators is the linear aspect

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[19] Wright, James K., and Bregman, "Auditory stream segregation and the control of dissonance in polyphonic music," *Contemporary Music Review* 2, no. 1 (1987): 72.

[20] "Tonality induction is the process through which a listener identifies the key of a piece of music, that is, what the tonic is and whether the key is major or minor." (Krumhansl, 2000): 461.

of music. We understand the tonality of a piece through how tones move to other tones and the relationships between these tones.[21] I believe the same applies to understanding polytonality because it is the *horizontal* progression of tonal melodies and harmonies across time that make polytonality more perceptible, rather than the *vertical* sonorities that result from singular moments in time.

By definition, distinctness in *tonality* between layers is a necessary qualification for polytonality. With polystratalism, distinctness in tone-structures is a sufficient but not necessary qualification. Nevertheless, the greater the difference in pitch content, the more obvious it may be that a superimposition of pitch content is present. This may be achieved through superimposition of distinct diatonic tonalities, modalities, synthetic scales, and atonal pitch collections. Accepting this breadth of pitch structure creates a terminological problem if we include atonal, serial, or pandiatonic collections in polytonality. *Polystratalism* brings a flexibility to analysis of multi-layered textures in 20th-century music by incorporating all contrasting combinations of pitch-class structures.

While timbre may not be essential in supporting independence of layers, it may still be helpful. I believe timbre to be an enhancer when other aspects of composition undermine the independence of layers. While the high level of synchrony and low-register density in Ives' *Variations on "America"* make parsing the tonal layers considerably difficult, it may be made easier by a choice in organ registration that provides a marked difference in timbre between

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[21] David Butler, "Describing the Perception of Tonality in Music: A Critique of the Tonal Hierarchy Theory and a Proposal for a Theory of Intervallic Rivalry" *Music Perception: An Interdisciplinary Journal* 6, no. 3 (Spring 1989): 234–235.

layers. A similar clarity between layers is achieved in the orchestrated versions of this piece, as the differently colored instruments of the orchestra can be heard distinctly.

Conversely, the degree of timbral cohesion within layers and timbral difference across layers may affect how we perceive the dissonances between layers. If we accept that the attenuation of timbral roughness equates to a certain degree of attenuation of dissonance, does this make the superimposition of tonalities more or less clear, considering that the dissonance between layers makes the superimposition noticeable in the first place? This is an important question for a future dissertation or article. In Schuman and Rhodes' orchestrations of Ives (Figures 3.8 and 3.9), a degree of clarity arises from the timbral differences. There are often other factors at play, however, such as register, rhythm, and the specific intervalic relationship between the tonal centers. I am more inclined to suggest that the parameters addressed above are complexly intertwined in their influence on perception, making it difficult to determine the influence of one parameter without consideration for other parameters.

Time, register, tonality, and timbre each contribute to the independence of layers within a polystratal texture. These parameters may work in tandem to support this independence or fill in for one another to support independence where the others are lacking. For instance, while the strata in *Frontispice* lack a distinctness of timbre and registral spacing, they are more distinct in time and "tonality." Where the strata in *Mother of the Man* lack distinctness of tonality, they are more distinct in register, timbre, and time.

It is hard to say which parameters of composition are most important in supporting the independence of layers, as they all contribute in one way or another. I suggest that independence

or distinctness of layers supports not only the listener's ability to recognize the presence of polytonality, but also their ability to identify its pitch centers.[22]

[22] Hamamoto et al (2010) demonstrated non-musicians' and musicians' ability to recognize the *presence* of polytonality, but excluded whether or not participants were capable of determining centricities.

Chapter Four

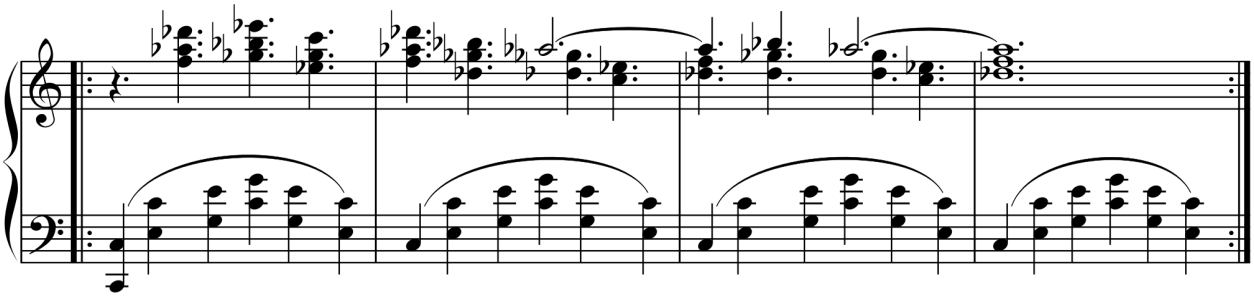
Implications, A Look Forward, and Millennial Lullabies

I believe that compositions guided by *purpose* are more likely to achieve meaningful outcomes. My training in composition has taught me always to be intentional with *what* I write, as well as *how* and *why* I write it. With that in mind: Why compose music that is polystratal? We could just as soon ask: Why compose music that uses any of the myriad techniques available? We each may answer that question differently, but a common thread may be that each technique serves a role in communicating *meaning*. For myself, and other like-minded composers, polystratalism can be a technical means to an emotional or programatic end, with social, political, or philosophical implications.

On a basic level, polystratalism may convey a sense of conflict or tension. This is hardly a revelation given that superimposing musical ideas from different tonalities or pitch-class sets has the potential to produce a high degree of dissonance, and the association of dissonance with conflict or tension is nothing new. The majority of western music flows from consonance to dissonance to consonance, just as the plot of many stories flows from normalcy to conflict to resolution. With polystratalism, however, dissonance can be pervasive in ways that challenge the expectation of resolution. The classic leading-tone-to-tonic or chordal-7th-down-by-step resolutions, if presented within a layer, will likely not be accompanied by their usual sensation of release. Instead, dissonances or tendency tones may "resolve" within their own layer only to create new dissonances against other layers in the process (Figure 3.1). Therefore, dissonance

can be a nearly constant feature of polytonality. This consistent presence of dissonance may translate to a sustained sense of conflict or clash of ideas.

Fig. 4.1 Resolution of dissonance *within* a layer leading to dissonance *between* layers. The upper layer in D-Flat major "resolves" on the downbeat of the 4th measure within its own layer but is dissonant against the lower C major.



4.1 New Context and Meaning

More specific meanings may be achieved with polystratalism, though this is dependent on what the melodic and harmonic ideas are and how they relate to one another. The meaning of their juxtaposition also depends on *how* ideas are juxtaposed as well as how the moment of juxtaposition fits into the narrative arc of the composition. As we saw with Danielpour's *Piano Fantasy*, the moment of polystratalism is preceded and followed by intense, dissonant music. The softly played Bach chorale against the lingering dissonant bass may suggest a daydream or flashback of a distant memory. It could also be a moment of deep, spiritual reflection amid chaos. Whatever subjective or programatic meaning we assign to the music, use of quotation in a polytonal texture can bring the associations of that quotation into a new context, and thus support a *new* or *compound meaning.*[1]

[1] In outlining a "theory of meaning" in music, Marc Leman offers that "the meaning of a perceived object changes depending on the context in which the object appears." Marc Leman, "The Theory of Tone Semantics: Concept Foundation, and Application," *Minds and Machines* 2, no. 4 (November 1992): 358.

The same may be said of Ives' *Variations on "America,"* where the reverent and patriotic "My Country 'Tis of Thee" is treated in an irreverent way. The dissonance arising from the polytonality is considerably harsh and seems to portray conflict. This could be a reference to the American civil war, or even a mature understanding of the division inherent in American social and political spheres.[2] Ives *was* an active citizen in his lifetime—his strong protestant values and regular engagement in American society may have fueled passionate ideas about his country,[3] which could point to why he chose to compose such a dissonant version of a national symbol.

In the *Prologue* of Britten's *Peter Grimes*, the plot begins with an investigation of the mysterious death-at-sea of Grimes's young fishing apprentice. Peter declares his rightful innocence, yet the townspeople are convinced he is a murderer. An extreme bias on the part of the townspeople persists throughout the opera. At the end of Act 2, when Grimes's new apprentice accidentally falls to their death, the town's bias against him grows, forcing Grimes to flee. During the final act, in a fit of madness and under pressure from his colleague, Grimes sets sail to the sea and sinks his boat, taking his own life.[4]

Our focus in Chapter Two was on the first *Sea Interlude* (following the *Prologue*) and its transition into *Act I*. It was here that we noted the emergence of three distinct themes and their

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[2] With the fair amount of doubt placed on the validity of the dates of Ives' compositions (see Alex Ross, "Pandemonium: Charles Ives") an interesting theory would be that *Variations,* dated 1892 (at 18 years old), was revised at a later date to include polytonality. The only polytonal moments in *Variations* are in two *Interludes* that are placed in between variations.

[3] Carol K. Baron, "Efforts on Behalf of Democracy by Charles Ives and His Family: Their Religious Contexts," *The Musical Quarterly* 87, no. 1 (Spring 2004): 6.

[4] Benjamin Britten, *Peter Grimes* ed. Erwin Stein (London: Boosey & Hawkes Music Publishers Ltd., 2003).

eventual superimposition with the chorus in *Act I*. This music, arguably foreshadowing the tragic conclusion of the opera, returns in *Act III* after Grimes sets sail for the very last time. As the sun rises, the chorus of townspeople sing once again in A major against the A minor/E Phrygian in the strings.

Considering Britten's sexuality in combination with his own description of the opera as a "struggle of the individual against the masses,"[5] it becomes clear that Britten is commenting on his struggle as a gay man in society and the vicious behavior of heteronormative members against homosexuals.[6] In light of this, the bright and tuneful A major in the chorus is extremely eerie. The polystratal juxtaposition may serve to convey the surface level facade of everyday people (A major) who harbor subconscious biases or serious ill-will (A minor/E Phrygian) toward those who are different.

A similar eeriness arises from the polystratalism in Corigliano's *Pied Piper Fantasy*. At first, the flute melody is cheerful and exciting, as it is meant to be fun and engaging for the unsuspecting children. In these initial moments, while the flute melody is in the foreground, the listener may also fall for the trickery of the tune. The flute melody takes on new meaning, however, as the orchestra gradually overtakes the foreground, and the flute choir fades into the background. In this way, polystratalism has fascinating potential for telescoping layers in the foreground-background relationship.

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[5] "The individual against the masses," Composers: Britten, Classic FM, accessed March 2, 2022. https://www.classicfm.com/composers/britten/pictures/peter-grimes-classic-productions/peter-grimes-1945/.

[6] Acclaimed music critic and author Alex Ross expresses a similar position in an essay on *Peter Grimes* in *The Rest is Noise*.

At the start of this section (Fig. 3.19) it becomes clear that something is amiss. Deep B-Flat open-5ths pulse in the orchestra, signaling the approaching terrible reality.[7] There is nothing stable or safe about the relationship between the layers, as the juxtaposition of B-Flat against A Mixolydian is a noticeably dissonant major 7th. The pulses turn into long, sustained triadic harmonies-of-distant-relation (B-Flat — E — A-Flat — F-Sharp) that glacially progress in the low register.

These dissonant relationships unfold over the course of a minute or so until finally reaching a D dominant pedal. This modulation dramatically changes the impression of the music, because the close relationship of A-Mixolydian x G-major (D Mixolydian?) is less dissonant than the previous relationships. This is the most consonant moment in the movement,[8] and as a result, may evoke a more positive meaning than the previous polystratal relationship. To me, the moment feels optimistic or hopeful. The following move to B minor turns the positive into the melancholic, perhaps to mourn the children marching to their doom. The shift to B major may bring a sense of peace and acceptance. Again, whatever subjective associations the listeners make, a dialogue unfolds between the layers, and this dialogue can convey meaning.

If one layer in polystratalism is relatively stable and consistent (like the upper layer of A mixolydian) it may be that the other *evolving* layer conveys how the composer, listener, or programatic character *feels about* or *is connected to* what the stable/consistent layer represents.

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[7] The moment might be a nod to the transition of "Agnus Dei" into "Beat! Beat! Drums!" from Vaughan Williams' *Dona Nobis Pacem*. In this transition the 3-pulse motive (also low open 5ths) signals the approach of war (death).

[8] Despite this, I would argue that the A mixolydian may still be heard as a separate tonality and that this is helped by the temporal, registral, and timbral separation between layers.

In the case of the *Pied Piper Fantasy*, the unfolding polytonal relationship may guide the listener through stages of thought or emotion directed toward the lives of the innocent children. This process is not unlike reharmonization of themes within an instrumental piece or transformation of leitmotif throughout an opera.

We see something similar in Adams' *Mother of the Man*, where the opening theme (an upper layer) is reintroduced alongside a new lower layer, changing the meaning of the opening theme. The title of the symphony, *Naive and Sentimental Music*, is a juxtaposition in itself. Adams explains in his notes for the work that the title points to Friedrich Schiller's "On Naive and Sentimental Poetry," in which "naive" and "sentimental" refer to Schiller's observation of two kinds of creative people: "those who are not conscious of any rift between themselves and their milieu, or within themselves; and those who are so conscious."[9]

Adams describes *Mother of the Man* as "a gloss on Busoni's *Berceuse élégiaque*." Busoni's subtitle reads, "cradle song of the man at the coffin of his mother." Adams clarifies his inspiration by adding, "not only does the very choice of title by Busoni epitomize the clash of 'naive' and 'sentimental,' but it also summons an archetypical scene that lies deep in the subconscious of every person, the death of the mother and the man or woman's desire to return to the uncorrupt state of infancy."[10]

The intended meaning of the polystratal moment in *Mother of the Man* becomes clear when considering this program note. The slow triadic melody in the upper layer is the cradle

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[9] "Naive and Sentimental Music," Works, John Adams Earbox, accessed March 3, 2022, https://www.earbox.com/naive-and-sentimental-music.

[10] John Adams Earbox, "Naive and Sentimental Music."

song, which, in the opening, is pure and "naive." New meaning is given to this melody upon its superimposition with the introduction of different harmony in the lower layer. We can glean from Adams' program note that this moment reflects the "sentimental," in which the "Man" simultaneously mourns the death of his mother and grapples with his own mortality.

We've seen how "darker" lower layers influence "brighter" or "more cheerful" upper layers, but what about the opposite? Perhaps, just as the lower tonality in a polystratal texture may have more influence over our perception of center,[11] the lower tonality may dominate the overall impression of the music. As discussed with the polystratal examples above, it may be that the lower layer influences how we perceive the upper layer and assign meaning to the texture as a whole. Whether or not there is a tendency for the top or bottom layer to dominate, at the very least, we can say that the layers are engaged in a dialogue that has the potential to convey complex meanings.

I believe polystratalism requires careful construction on the part of the composer to produce a balanced composite texture. Creating balance between layers may bring clarity to the texture. This clarity may help increase the perceptibility of polystratalism and convey the intended meaning of the work.[12] I believe there is potential for polystratalism to portray a breadth of ideas in musical form and that the broad combinatorial nature of polystratalism lends well to the portrayal of ideas involving *layers of meaning* or types of *pluralism*.

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[11] Thompson and Mor, 65.

[12] The opposite may be possible, i.e., a *lack of clarity* may support the meaning of the work. See, for instance, Adès' *America: A Prophecy* in the Annotated Appendix.

4.2 Questions Moving Forward

What effect does a simple, tonal lower layer have on a complex or heavily chromatic upper layer (or vice versa)? What effect does a complex or heavily chromatic lower layer have on a simple, tonal upper layer (or vice versa)? Or perhaps the question should be: Which types of layers dominate in our perception of polytonal music and why? Assuming all the parameters contributing to the musical texture—rhythm, meter, register, etc.—affect how the layers relate to one another, which parameters or combinations of parameters are most important in creating perceptible polystratal textures? These questions fascinate me and inspire me to continue composing polystratal textures.

While it has not been the focus of this paper, the possibilities in pitch-class combination are exciting to consider, as an array of different pitch-class collections, chord progressions, and melodies, originals or quotations, can be superimposed in a polystratal texture. Expanding on Persichetti, we may posit that, based on the level of dissonance, certain intervallic relationships are more likely than others to trigger the perception of polystratalism (Fig. 1.10). Relating this to the focus of this paper prompts the question: How well can *temporal*, *timbral*, and *spatial* manipulations support perception of polystratalism with less-dissonant intervallic relationships?

My hope for the future of polystratalism is that more composers and psychologists will explore these questions. I hope for more studies and surveys to be conducted. I believe there is a

need to address certain issues in previous studies.[13] There is room for many more variables to be tested, such as: timbre, time (rhythm, meter, tempo, and periodicity), degrees of separation between tonal or atonal layers, and the number of active tonal (or atonal) layers. All these variables, to the best of my knowledge, have yet to be tested for their influence on perception. I hope to collaborate in such studies in the future.

I am hopeful the use of temporal and timbral manipulations will yield interesting results. I am also curious to know how repetition over lengths of time affects perception of polytonality with a control on synchrony and asynchrony. Specifically, I wonder how long it might take musicians to identify two distinct tonal centers in a strictly homorhythmic texture like the melodic doubling-at-the-12-and-17th in Ravel's Bolero. In a recent online "Duet" video performance, the melodic line of Bach's E major violin partita is synchronously played by *four* musicians in *real* transposition at the minor 3rd, perfect 4th, and major 7th (E-G-A-D#).[14] This type of synchrony might be the right control for exploring how repetition affects perception of polytonality.

I also plan to compose more polystratal music and hope that others will, too. With its potential for altering the meaning of previously heard material, I find polystratalism to be well

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[13] Kopiez and Platz (2010) found "familiarity" to have a negative effect on perception, suggesting that familiarity with pieces "seems to make one less sensitive to mis-tunings" and that "listening to a familiar piece of music seems to be largely guided by expectancy and less conductive to close attention than is listening to a novel piece" (328). Their findings (based on materials and procedure that involve mistuned-by-200-cents versions of Jazz, Pop, Rock 'n Roll, and Classical) report decreased success with familiarity in all directed/non-directed and experts/non-expert participant groups for Jazz, Pop, and Rock 'n Roll (326). Not accounting for the significantly misproportioned participant responses providing this data, their finding may be explained by the improvisatory nature of these genres in which singing "out of key" is much more common and thus less likely to be perceived as "off." Another potential issue is the detuned audio samples that were used—what effect does this have on our perception?

[14] Ariel (@formyflounders), "the delays from the headphones are messing up our [stars]ensemble[stars] #musician #violin #bach" (Video), TikTok, https://www.tiktok.com/@formyflounders/video/7071634927195868459?is_copy_url=1&is_from_webapp=v1.

suited for supporting plot and character arcs in opera, ballet, film, and other dramatic mediums. I believe there is much to be learned from the repertoire in Chapter Two in this regard.

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4.3 Millennial Lullabies

Inspiration

One of my goals as a composer is to write music that reflects the world around me. I think a defining characteristic of my world is how we share our daily lives, cultures, and perspectives with a global community on the internet. I believe our human experience has bifurcated into internet and non-internet realities, and, while separate, the two seem to interact in increasingly important, interdependent ways. As a result, our well-being is now tied to how we express ourselves on these *two* planes of existence. I believe this to be the source of much cognitive dissonance. This sort of dualism may lend itself well to being portrayed through polystratalism.

In *Millennial Lullabies*, I use polystratalism to convey several of my own personal conflicts: Primarily, my inner battle between facing the terrible realities of our modern world and pacifying myself through nostalgia or escapism. This problem is both exacerbated and helped by my access to the internet; social media aggravates the problem, but the endless streaming of Bach's music, available on YouTube, acts as my escape and inspiration.

Polychordalism

I hope that in distinguishing polytonality and polystratalism from polychordalism I did not convey an opposition to polychordal music; I find it just as fascinating a technique, but for different reasons. One interesting facet is how voice-leading functions in the progression of polychords. *Millennial Lullabies* begins with monolithic, pulsating polychords that shift over time in a long, drawn-out chorale (Figure 4.2). Throughout the work I explore how the various parts of a given polychord can emerge from the texture and shift the color of the sonority (Figures 4.3 & 4.4).

Fig. 4.2 Nicholas Carlozzi: *Millennial Lullabies*, opening four chords (spelling adjusted).

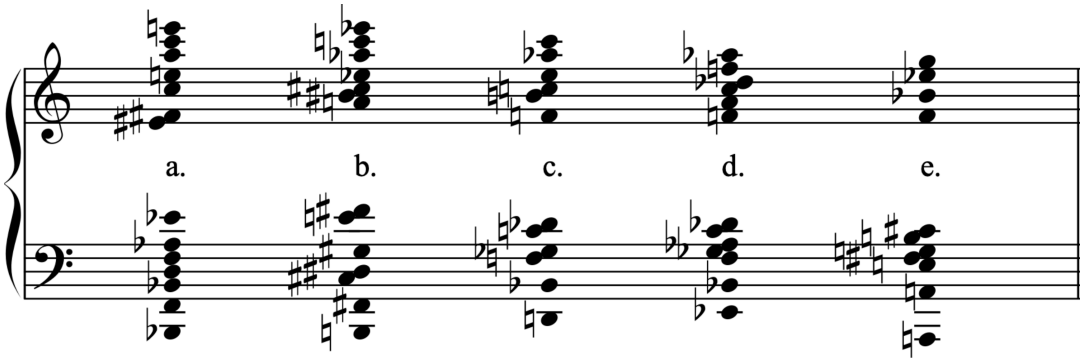


Fig. 4.3 Carlozzi: *Millennial Lullabies*, reduction of mm. 22–28. Upper triadic structure's voice-leading.

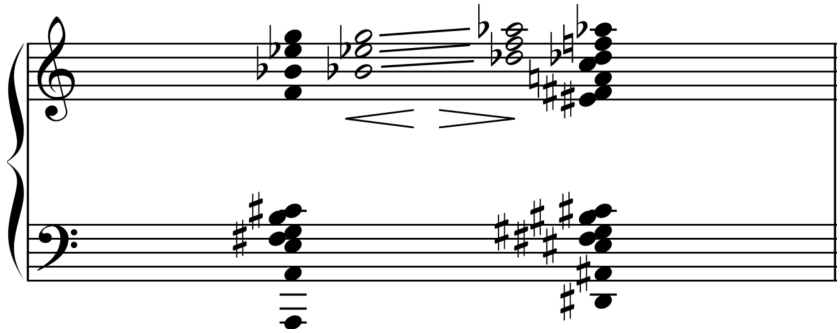
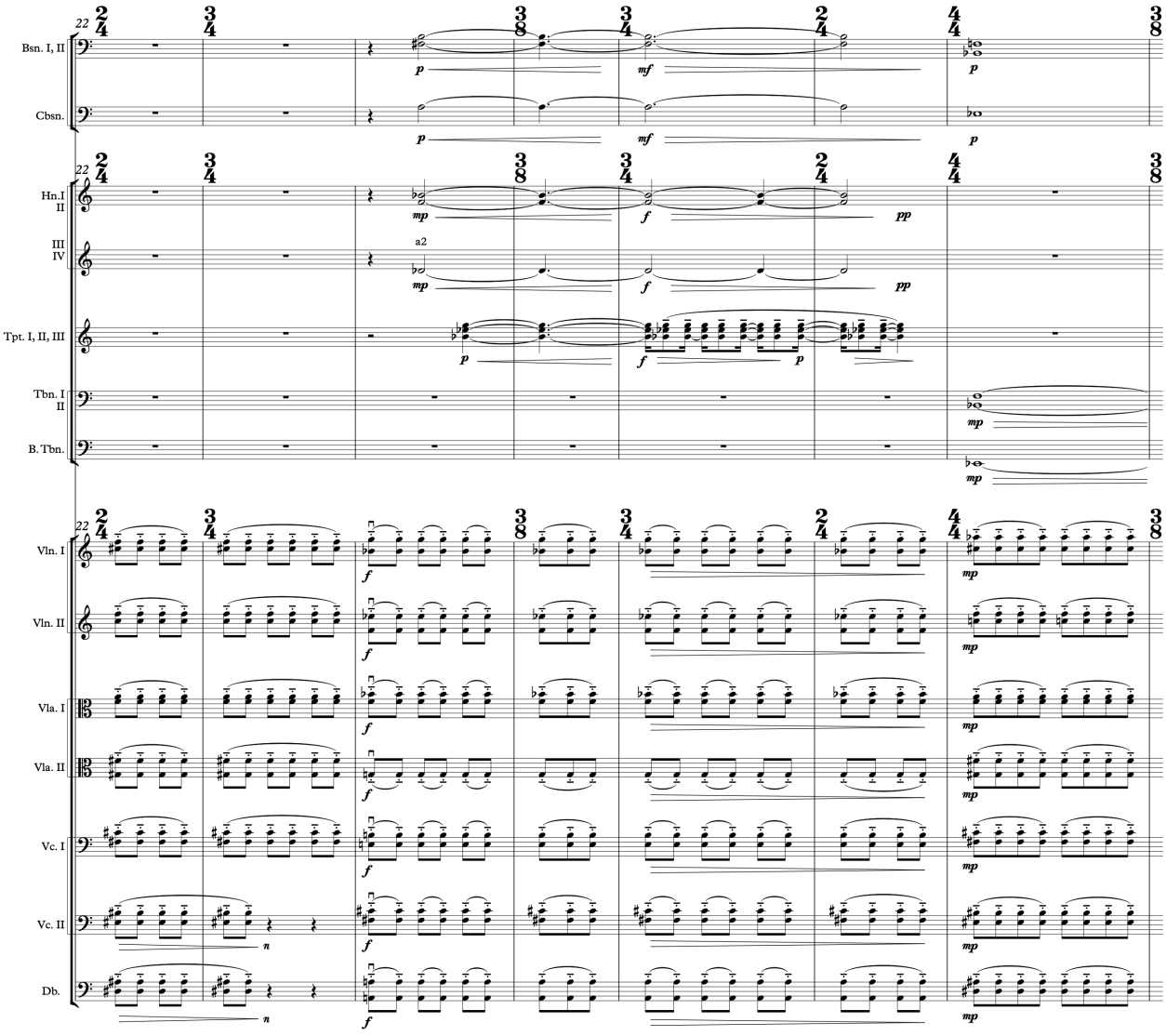


Fig. 4.4 Carlozzi: *Millennial Lullabies*, mm. 22–28. Upper triadic structure emphasized in Trumpets I, II, III.



Polystratalism

Polystratalism is introduced with the entrance of Philipp Nicolai's hymn tune, "Wachet auf, ruft uns die Stimme" (1599). I disguise the melody in its first appearance by distributing the notes among different orchestral instruments. A single polychord ("e." from Figure 4.2) pulses underneath the first two phrases of the chorale tune, creating a tonal-over-atonal relationship.

The next entrance of "Wachet auf" is in the form of Bach's chorale harmonization from the closing movement of BWV 140, "Gloria sei dir gesungen," now in F major, pulsing lightly in

the woodwinds. This is superimposed with a pandiatonic, original melody-in-tenths in the strings (Figure 4.5). Bach's chorale harmonization and my melody-in-tenths are the two primary themes placed in various polystratal relationships throughout the remainder of the composition.

The phrases of the Bach quotation appear in order as they would in the final movement of BWV 140, save for a few repetitions of certain phrases. I experiment with the temporal aspect of this material in two additional ways: I elongate the amount of time spent on each note of the phrase by increasing rhythmic values or through repeating pulses (Figure 4.5), and I spread out the phrases across the timespan of the piece, stretching two minutes of music into fourteen.

Because the Bach and my melody-in-tenths are each straightforward in their tonality, the resulting polystratalism throughout the composition features relatively simple pitch content within each layer. The simplicity of pitch and harmony within each layer is meant to highlight the contrast between the layers, E major pandiatonic vs. F major in this instance. I make sure to separate layers across registers to support the clarity of the texture (Figure 4.5). I also distinguish the layers through orchestration by placing the Bach in the woodwinds and the melody-in-tenths in the strings.

Pitch, register, and orchestration (timbre) each factored into my approach, but my focus was creating a sense of independence between layers through use of rhythm and meter. There is very little regularity in the meter or note lengths of both the Bach and the melody-in-tenths (Figures 4.5 and 4.6). My intention is for each layer to float along at its own pace. While there is some synchrony between layers, I also make an effort to stagger the rhythmic placement of note-changes between layers so that melodic movements can be heard in each layer. Rarely do beat emphases or melodic motions coincide vertically between layers (Figures 4.5 and 4.6).

Fig. 4.5 Carlozzi: *Millennial Lullabies*, mm 40–44.“Gloria sei dir gesungen” (blue) x “original melody-in-tenths” (green).

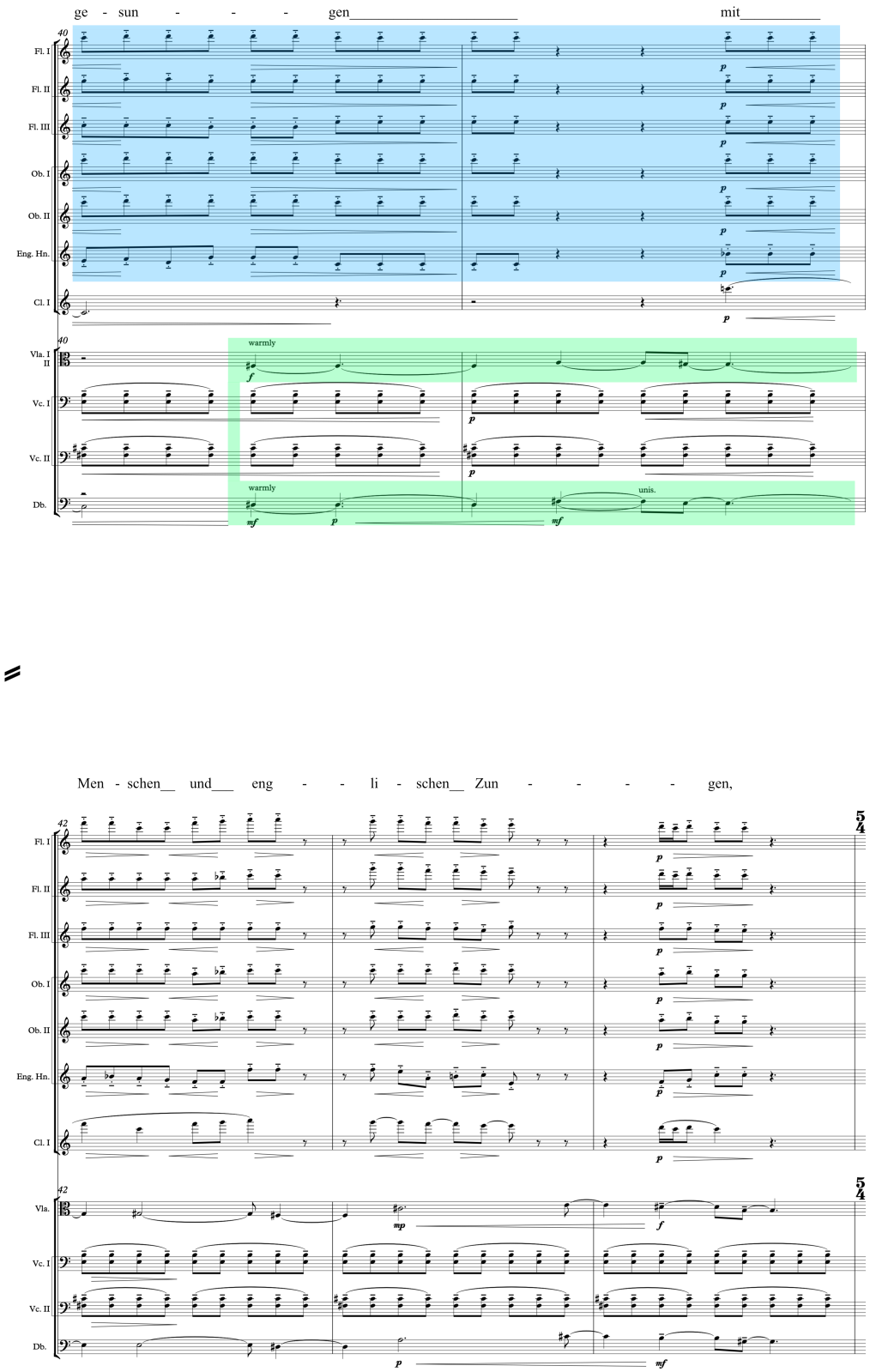
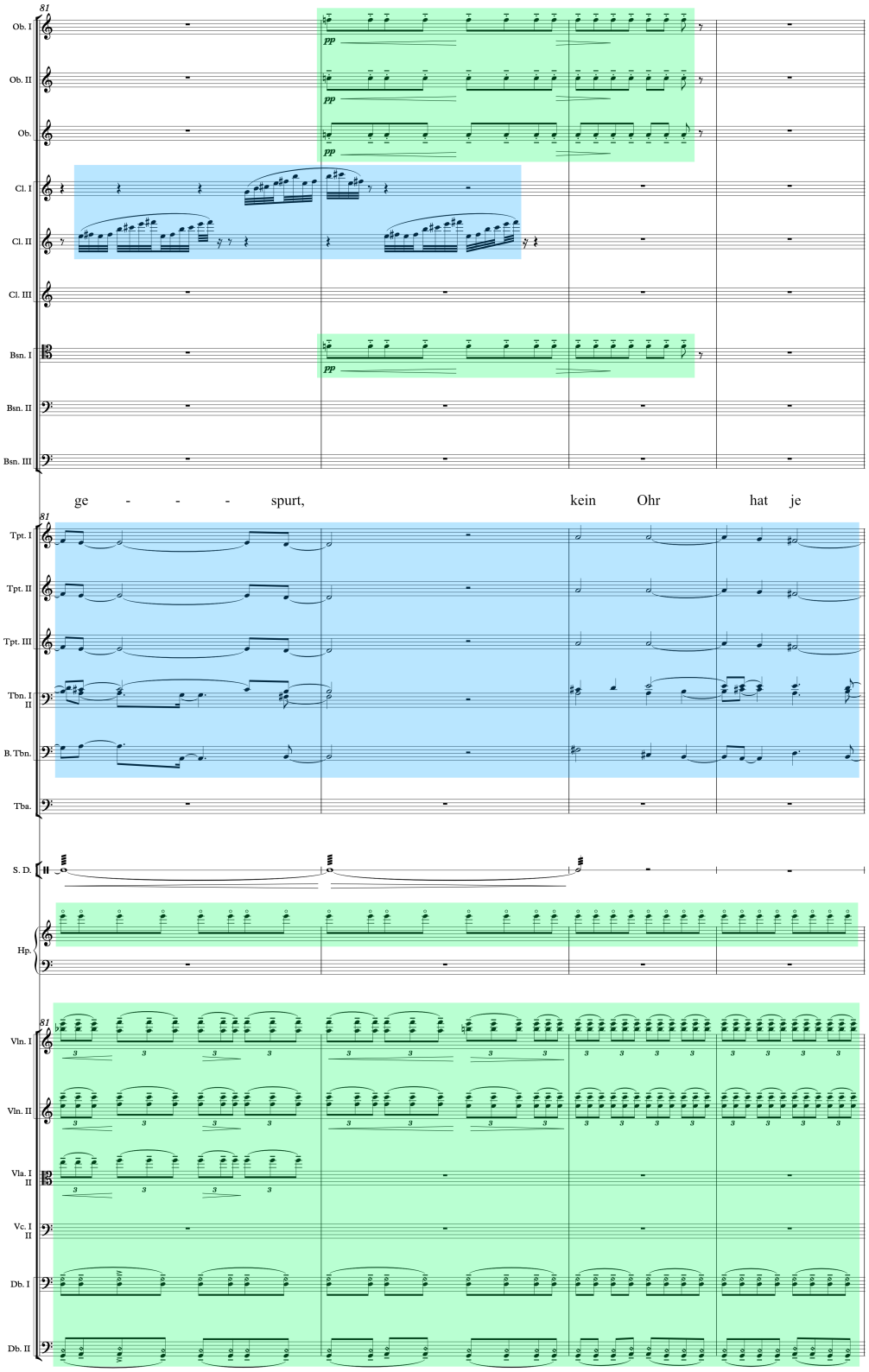


Fig. 4.6 Carlozzi: *Millennial Lullabies*, mm 81–83. “Gloria sei dir gesungen” in D major (blue) x the lingering, static F Major from the previous cadence of the Bach. New woodwind material (blue) fits into the key of the Bach.

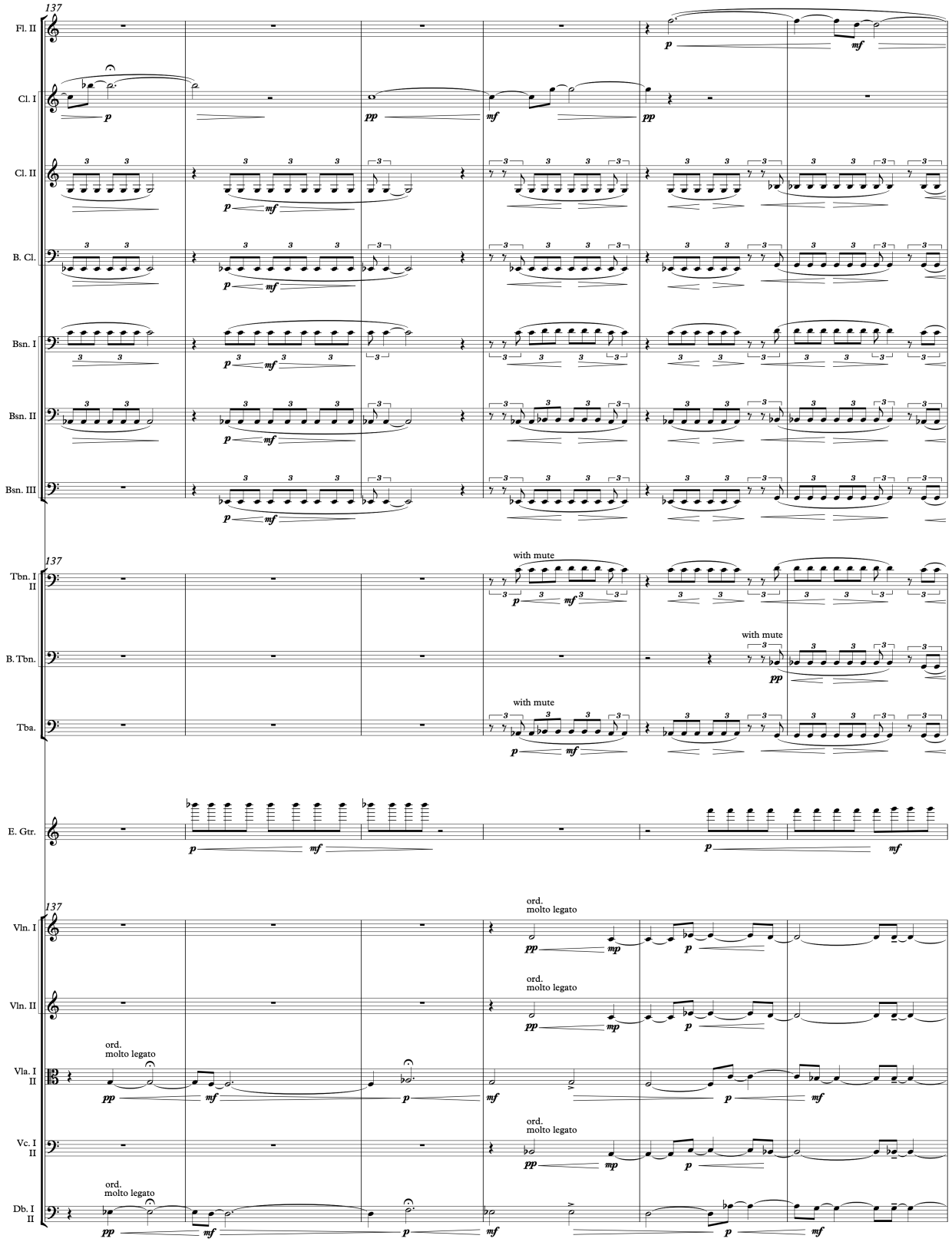


Strict simplicity of texture is not a consistent feature of the work, however, as several of the following polystratal textures feature more complexity and/or additional strata (Figure 4.6). When composing the work, my intention was to create polystratal textures of varying complexity and see which textures were more or less successful. In this way, *Millennial Lullabies* is an experiment in polystratal technique.

A "nested slow movement" sits at the midpoint of the piece. Here, the music begins with a single, pandiatonic stratum (E-Flat major collection) played by the woodwinds. I develop this material by superimposing a second pandiatonic stratum consisting of the melody-in-tenths in canonic imitation with itself at the 5th, *which is also an E-Flat major collection*, played by the strings. Normally I would consider two layers described in this way as coalescing into one layer due to their identical pitch-class material, but there is a degree of independence between layers through the differing orchestration, rhythm, and harmonic rhythm; the harmony in the melody-in-tenths does not always agree with the harmony in the woodwinds (Figure 4.7).

As indicated in Section 3.8 with regard to Adams' *Mother of the Man*, while this music should be thought of more as *polyvalent* than *polytonal* (due to its identical pitch-class content between layers), it is still *polystratal*. The simple pitch content in this section is designed to strengthen the tonal memory of the melody-in-tenths and provide a release from the consistent dissonance of the previous polystratal textures.

Fig. 4.7 Carlozzi: *Millennial Lullabies*, mm 137–142. Note the clash in bass notes between B. Cl./Bsn. III and String Bass in m. 138.



Following the middle section is a return to the more dissonant polystratal textures. Here, percussion combines with woodwind and horn pulses to establish a D-Flat major 7 sonority in the middle range of the texture. This music briefly remains monotonal to allow for recognition of the coming superimposition. Below this, a less tonally ambiguous version of the melody-in-tenths enters in G-Flat major. At this moment, the percussion and winds change from C-natural to C-Flat, creating a D-Flat dominant 7th-chord in G-Flat major. At the same time, however, oboes, horns, and trumpets play a reprise of Bach's chorale harmonization, once again in the key of F major (Figures 4.8 and 4.9). As before, the notes from each melody are staggered rhythmically between the strata to support independence through avoiding synchrony. The rhythmic values of the Bach are elongated more than ever in this passage to distinguish it from the 8th-note and 16th-note pulses of the G-Flat major stratum.

My favorite moment of polystratalism in this piece is toward the end, where the melody for the climactic text "i-o, i-o!" is superimposed with a near-literal quotation of Bach's accompaniment from BWV 140's first movement, "Wachet auf, ruft uns die Stimme," in a conflicting key (Figure 4.10). This moment is meant to be disorienting and surreal. The melody for "i-o, i-o!" sets up an expectation for D major, but the Bach accompaniment for "Wachet auf" enters in D-Flat major, all while the D major of "i-o, i-o!" continues. The texture also features previous snare drum and bass drum material to shroud the moment in a looming sense of darkness consistent through the work. "Wachet auf" quickly falls apart after its entrance, as if it were only a momentary recollection of a past time or place.

I believe this effect would not be successful with a monotonal setting of the same material; it is the distinction in "tonality" that supports the interactions with our sense of time,

space, and memory in the ways that I describe in this paper.[15] Classical recapitulation can be said to feel like a return home, i.e., a journey is made but its trajectory is circular and returns to its starting point. Quotation in polystratalism is an arrival at a *new* destination where the past is recalled and evaluated in a new light.[16]

[15] There is an interesting parallel between this moment in *Millennial Lullabies* and an electronic music composition by Leyland Kirby entitled, "Everywhere at the End of Time" (2016–2019). This massive electronic work gradually distorts recordings of early 20th-century ballroom music over the span of hours to portray the process of worsening Alzheimer's disease. Songs that had been clear at the beginning of the work briefly emerge an hour later, shrouded by digital audio effects. - "Everywhere at the End of Time," Bandcamp, accessed March 16, 2022, https://thecaretaker.bandcamp.com/album/everywhere-at-the-end-of-time.

[16] In this way, polystratalism can be very similar to *Polystylism*. First coined by composer Alfred Schnittke, "polystylism" involves the use of multiple styles or techniques within a single piece. These styles are typically of past eras in music or any artistic form of expression. In a way, however, virtually all modern music is polystylistic, as it cannot help but draw from previous styles and techniques. -Schnittke, Alfred. *Polystylistic Tendencies in Modern Music: A Schnittke Reader* ed. Alexander Ivashkin (Bloomington: Indiana University Press, 2002), 87.

Fig. 4.8 Carlozzi: *Millenial Lullabies*, mm. 170–172.

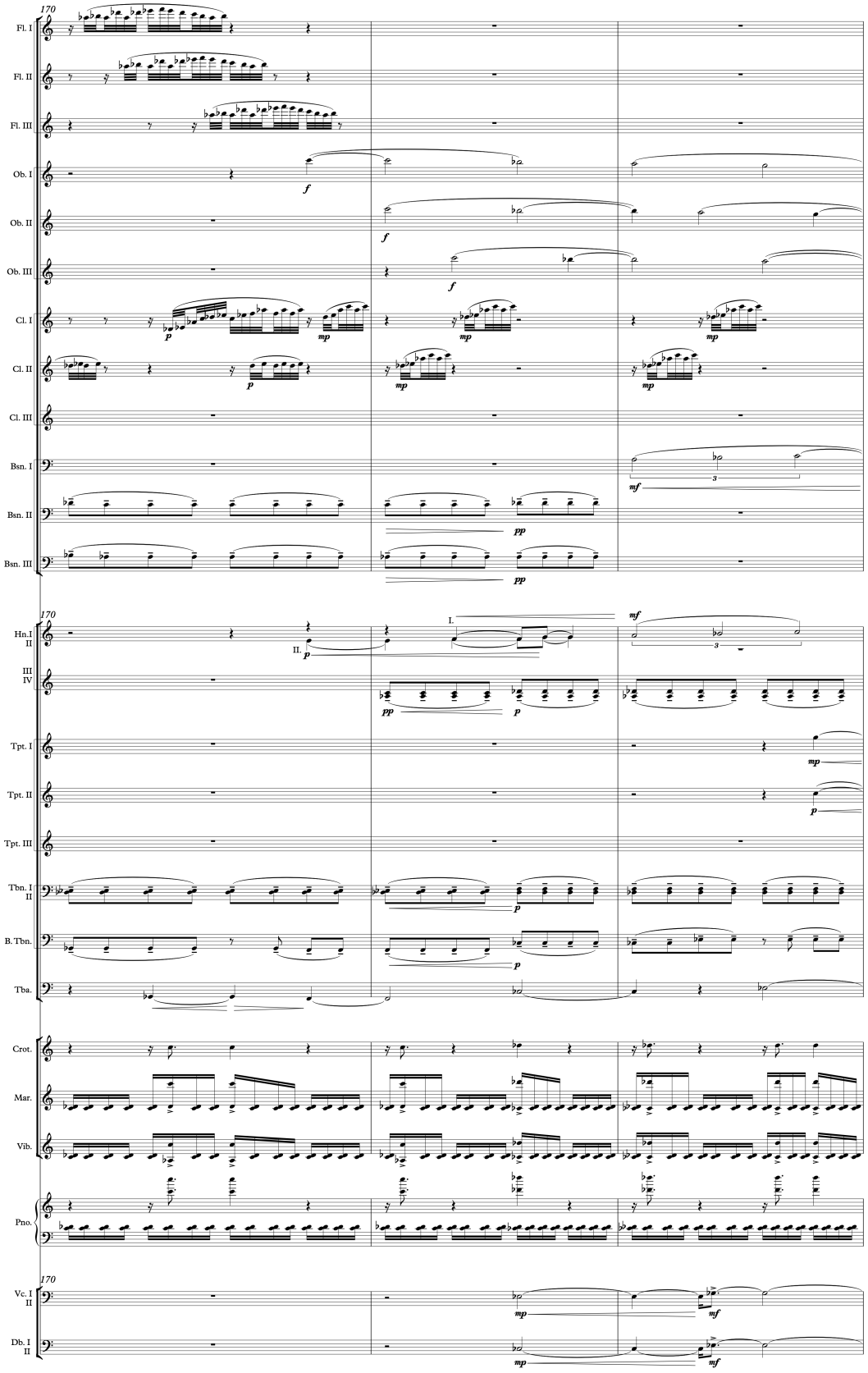


Fig. 4.9 Carlozzi: *Millennial Lullabies*, mm.182–184.

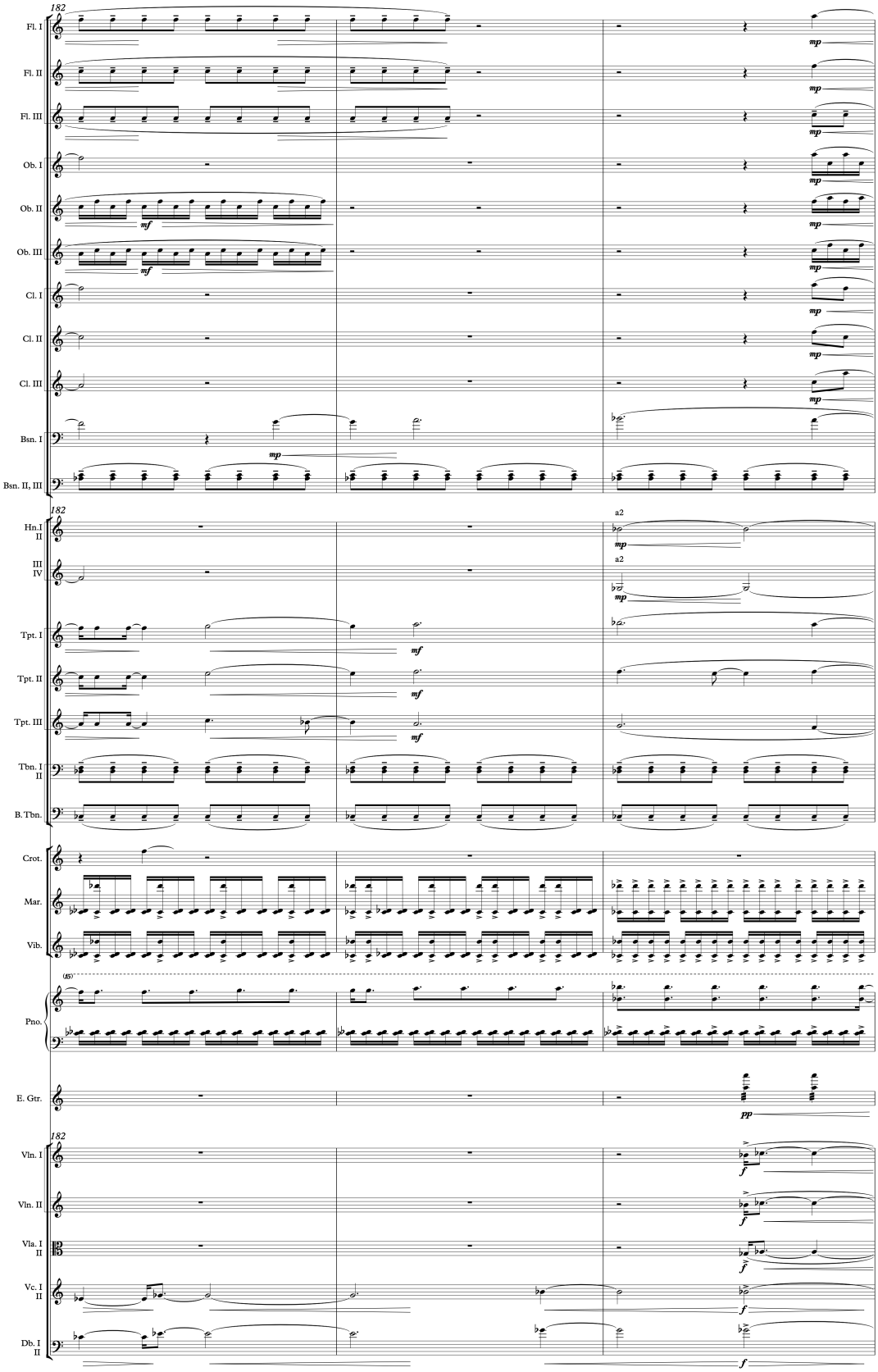
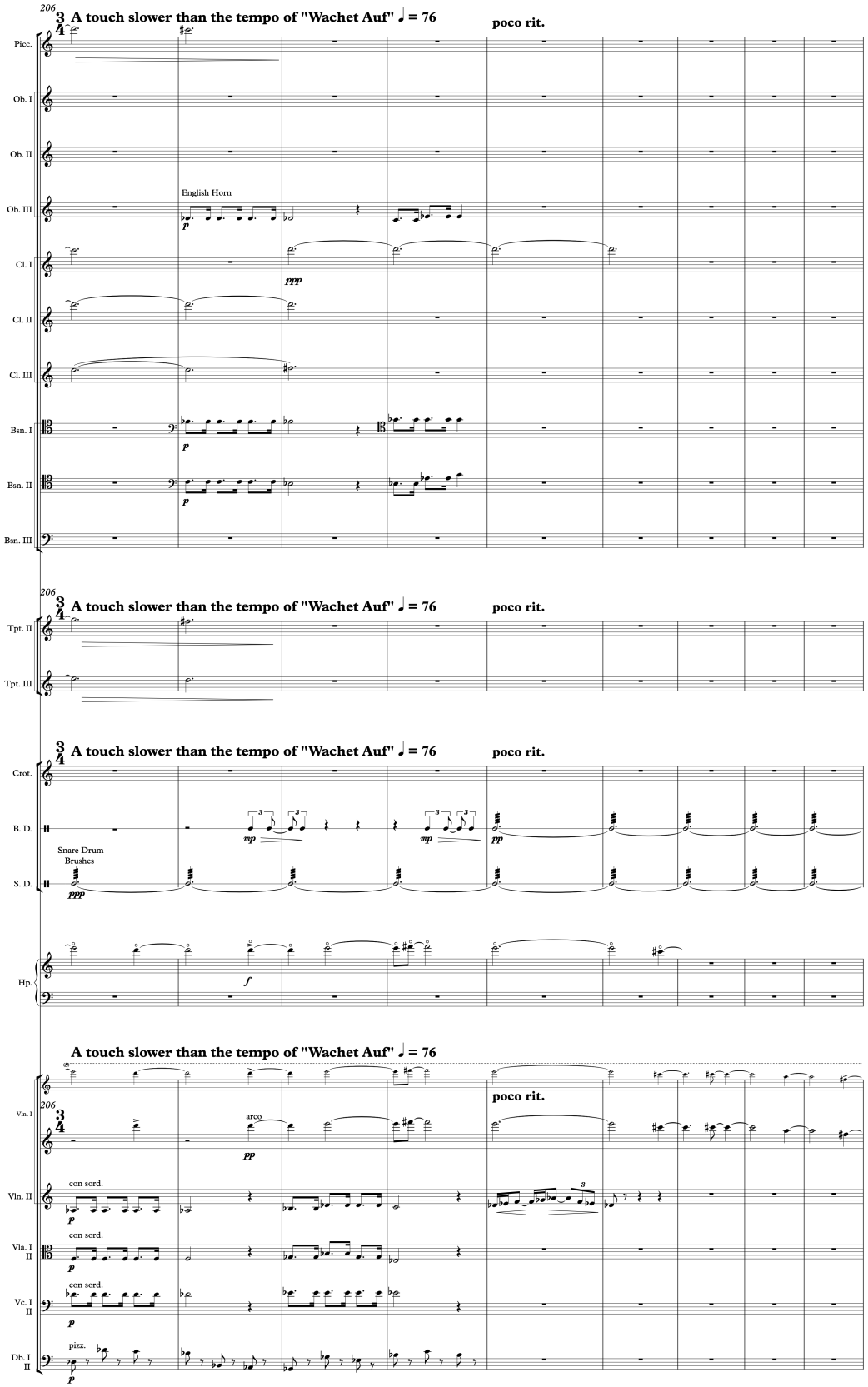


Fig. 4.10 Carlozzi: *Millennial Lullabies*, mm. 206–214.



Annotated Appendix

There are several compositions that display some form of polystratal technique in interesting ways, that could not be examined in depth within the monograph due to time and space limitations; the sheer volume of works in existence is too great. This annotated appendix is an incomplete list of works that display some form of superimposition in "tonality."

Adams, John Luther. *Become Ocean*. Fairbanks, AK: Taiga Press, 2015.

In *Become Ocean* (2013), full orchestra is physically divided into three groups with local, on-stage amplification. Groups outline different cluster-heavy harmonies and scales simultaneously. The work predominantly deals with the superimposition of arpeggiated pentatonic scales with sustained pandiatonic tertian structures and tone clusters. At times, the layers align in their tonality. Other moments feature pentatonic scales that project a different center from the sustained cluster's projection, which is often the bottom or top note of the sustained chord.

Adés, Thomas. *America: A Prophecy*. London, UK: Faber Music Ltd., 2002.

This work for full orchestra, soprano solo, and chorus (1999) sets texts depicting a devastating end to a nation. Full orchestra creates a cacophonous atonal texture above which a full chorus sings, in unison, in an E centricity that is arguably clarified by a B-to-E (V-I) pitch relationship. The programmatic aspect of the work is supported by the superimposition of a *fortississimo* unison chorus with a chaotic orchestral layer.

Biber, Heinrich. *Battalia à 10*. Salzburg, Selke Verlag, 1999.

Perhaps the earliest known use of polytonality, *Battalia à 10* (1673) features an eight-part polyphonic texture written for string ensemble in which several parts are in their own distinct mode. The effect is meant to depict a humorous scene of rowdy, drunk people. The bitonality between the first two instruments to enter is noticeably clear. The *rapid* addition of the remaining layers quickly diminishes the projection of any tonal center. The resultant texture is arguably an early instance of atonality. At times, however, a single voice will pop out of the texture and may project tonality, producing a tonal x atonal polystratal texture.

Berio, Luciano. *Sinfonia*. London: Universal Edition Ltd., 1972.

***Sinfonia* (1968), scored for "eight voices and orchestra," features three distinct strata in the third movement. A quotation of Mahler (tonal) is superimposed with an atonal layer of music in the third movement. Concurrently, a third layer is comprised of amplified voices that frequently speak in indeterminate pitch. The balance between layers is masterful, though may be largely dependent on proper *mixing* of the amplified voices.**

Bernstein, Leonard. *Mass.* New York: Jalni Publications, Inc., 1971.

The opening movement of *Mass* (1989), "Antiphon: *Kyrie Eleison*," uses four tape tracks positioned at four corners within the concert hall. Each track features a singer with accompaniment. The music in each track is of a different tonality and tempo. There is arguably a tendency for two or more of these layers to coalesce in moments of synchronous common tones. For instance, the G-Sharp in Speaker III

often coincides with the A-Flat of Speaker IV. The score indicates that this is intentional on the part of the composer.

Crumb, George. *Star-child: A Parable for Soprano, Anitphonal Children's Voices, Male Speaking Choir and Bell Ringers, and Large Orchestra*. New York: C.F. Peters, 1977.

In *Star-child* (1977), instrument groups are placed antiphonally across the stage and throughout the auditorium, requiring multiple conductors. A foundational layer of tall quintal chords is established by the strings in the opening movement. These slow, chromatically shifting chords cycle indefinitely in their own tempo until reaching a cued endpoint. There is arguably a sense of center in this layer, albeit frequently shifting, that may be projected by the quintal pitch collection. Various layers of atonal music are superimposed with the string layer, creating an "all-but-atonal" vs. atonal polystratal texture.

Gordan, Michael. *Decasia*. New York: Red Poppy, 2001.

In *Decasia* (2001), full orchestra is divided into groups based on tuning and spaced antiphonally across the stage and auditorium. Instruments are instructed to either tune flat by 1/8th of a tone or tune sharp by 1/8th of a tone.

Honegger, Arthur. *Symphonie pour Orchestre a Cordes*. Paris: Editions Salabert, 1942.

***Symphonie pour Orchestre a Cordes* (1941) features several instances of strata made independent through pitch-class and temporal techniques. The opening measures of the first movement feature a solo viola projecting a C mixolydian tonality, above which violins play a chord that is foreign to the C mixolydian, spelled from the bottom: E4—C-Sharp5—E-Flat5—B-Flat5. This violin chord is rhythmically placed**

on the offbeat as to not "step on" the viola solo. The opening of the third movement features an ostinato in the Violin IIs that projects a D centricity, above which Violin Is arpeggiate F-Sharp major with pizzicato attacks.

Mozart, W.A. *Ein Musikalischer Spass KV 522*. Munich: G. Henle Verlag, 2016.

The final three chords of *Ein Musikalischer Spass* (1787) are written in a polytonal fashion, with Violin I in G major, Violin II in A major, and Viola in E-Flat major. The resultant sound is a string of very dissonant polychords that do not match the music that preceded it. The moment is disorienting and provides a comedic effect to end this "Musical Joke."

Pärt, Arvo. *Credo*. Vienna: Universal Edition A.G., 1982.

***Credo* (1968) is very much in the polystylistic vein. The work juxtaposes Bach's *Prelude in C Major* from *The Well Tempered Clavier Bk. I* with atonality. There are a several moments of superimposition, but mostly, the music displays adjacent juxtapositions between the contrasting layers.**

Prokofiev, Sergei. *Sarcasms, op. 17*. New York: Dover, 1992.

The third movement from *Sarcasms* (1912) is explicitly written in two keys: F-Sharp minor over B-Flat minor. Both strata are in the low range of the piano and exhibit short rhythmic attacks at an Allegro tempo. The upper F-Sharp minor is quite clear because of its constant projection through a repeated F-Sharp/A dyad. The lower tonality is heavily chromatic, and in the deepest range of the piano, obscuring its sense of center, perhaps intentionally, until the final note of the piece: the lowest B-Flat octave.

Ravel, Maurice. *L'Enfant et les Sortilèges*. Paris: Durand, 1925.

There are several moments of superimposed tonalities in *L'Enfant et les Sortilèges* (1925). One section particularly relevant to this dissertation is At Rehearsal 57, where a trio of clarinets play a melody with harmony in D-Flat major above an A major ostinato in the rest of the orchestra. Part of this moment's success in perception may owe to the music that approaches the moment of polystratalism. Rehearsal 56 is firmly rooted in A major, where oboes play a melody above a tonic pedal. This tonic pedal extends into Rehearsal 57 where the trio of clarinets enter in D-Flat major.

Schnittke, Alfred. *Moz-Art à la Haydn*. Hamburg: Musikverlag Hans Sikorski, 1990.

In *Moz-Art à la Haydn* (1977), string orchestra is divided in half and assigned contrasting key signatures simultaneously. The music where key signatures are superimposed is characterized by an abundance of homophony, resulting in highly dissonant vertical sonorities. However, the closing section of the work displays a tonal x atonal superimposition: A dissonant C—F-Sharp—D-Flat—D—E-Flat—E sonority is sustained against eight parts playing pizzicato, ascending, G-melodic-minor scales in micropolyphony.

Tenzer, Michael. *Underleaf (Buk Katah)*. *Let Others Name You.* Michael Tenzer. New World Records 80697-2, 2009, compact disc.

In *Underleaf* (2006), an ensemble of brass, winds, and piano combine with Balinese gamelan instruments in a fascinating juxtaposition of tuning systems. Several

sections of the piece are in rhythmic and scalar "unison," which highlights the not-so-subtle difference in tuning. Several other sections, however, feature superimpositions of modality and atonality: ostinatos in the gamelan that define clear centers are superimposed with more freely atonal music in the western instruments.

Vaughan Williams, Ralph. *A London Symphony*. Mineola, NY: Dover Publications, Inc., 1996.

The opening movement of *A London Symphony* (1913, revised 1918) begins with a depiction of a serene English morning. The orchestra plays soft, sustained lines in a G pandiatonic or E Aeolian pitch collection. At Rehearsal C, three minutes into the work, the harp plays the "Big Ben" clocktower theme in C Major on top the G/E-centric music. The contrast in tonality is subtle, arguably because of the close relationship between C major and G major (or E minor), but nevertheless noticeable.

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