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Music, action, and narrative in film : an energetic and gestural approach to film score analysis

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MUSIC, ACTION, AND NARRATIVE IN FILM: AN ENERGETIC AND GESTURAL APPROACH TO FILM SCORE ANALYSIS

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ABSTRACT

Film music often contains close relationships to filmic and narrative imagery, creating complex relationships that are not always apparent. Many traditional means of musical analysis are not equipped to account for these extramusical associations. Film music analysis may benefit from considering musical gestures a way for understanding these connections to filmic and narrative imagery. Music theorists and philosophers, such as Mark Johnson, Janna Saslaw, Robert Hatten, and Steve Larson, have commented on the value of considering music through one's embodied experiences. Film and music are inherently energetic, as both contain perceivable energies and forces. Analyzing the common energetic qualities of film and music provides an approach for connecting film music to certain filmic and narrative attributes and events.

This dissertation uses models based in physics to reveal the latent constructs that connect music to extramusical associations. Building off of established concepts and models in the work of composers and theorists such as Ernst Kurth, Steve Larson, and Arnold Schoenberg, this dissertation reconsiders several energetic models based in motion and applies them to film music analysis. This study also proposes several original models based in the related branch of continuum mechanics by considering the internal structure and changes of musical concepts and gestures as objects. These concepts and models create a system of analysis that considers and accounts for the connections between film music, onscreen actions, and narrative events.

CHAPTER 1 – INTRODUCTION

Introduction

Film music study is a budding field of music scholarship. Compared to the standard repertoire of works studied in music academia, film music is relatively new. While film music shares some similarities with the common-practice repertoire, the musical connections to extramusical factors such as on screen actions and a film's narrative make it unique. There arises a need to develop a system of film score analysis that integrates these extramusical factors that make it so different from other genres of music.

Music and film are both inherently energetic, as both contain some perceived energies, forces, and motion. Using the metaphor of physical energetics, this dissertation bridges the gap between film analysis and musical analysis. The energetic connections between the aural, visual, and narrative aspects of a film may have thought-provoking and complex implications on analysis of a film and its music. Because of these connections, understanding the score helps one better understand the film and vice versa. Realizing these musical and extramusical connections hopefully enriches one's viewing experience.

The process of composing for film typically involves matching the music to certain cue points relative to particular extramusical events. As a result, film score composers embody visual and narrative aspects of the film into the music. The associative motions and forces serve as common links between the aural, visual, and narrative aspects of a film. In order to understand these relationships most effectively,

one must first realize how motions and forces function in the music and film. This dissertation provides several energetic models that serve as the foundation of a vocabulary for describing and understanding the connections between a film and its music.

Musical energetics borrows the concepts of energies, forces, motions, powers, etc. from physics to describe musical phenomena.[1] Musical energetics has the potential to describe how music functions on various levels of structure from a surface-level analysis down to an exploration of the deepest fundamental structure. At the center of musical energetics studies are the writings and concepts of Ernst Kurth, who focused primarily on pitch structure in his writings.[2] While making use of Kurth's ideas on pitch energetics, this study expands the historical and conceptual boundaries typically associated with pitch energetics to include the work of Steve Larson, and Arnold Schoenberg, among others.[3] A majority of musical energetics scholarship specifically concerns pitch structure, melodic motion in particular. One may also describe other sonic elements of music such as rhythm, meter, dynamics, and timbre using the similar metaphors from energetics. This dissertation presents several energetic models that one may use in particular to analyze film music.

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[1] Lee Rothfarb, "Energetics," *Cambridge History of Western Music Theory*, ed. Thomas Christensen, 927–28.

[2] See Ernst Kurth, *Romantische Harmonik und ihre Krise in Wagners Tristan* and *Grundlagen des linearen Kontrapunkts: Bachs melodische Polyphonie*.

[3] See Steve Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*. Also see Larson's articles listed in the bibliography. See Schoenberg, *Fundamentals of Musical Composition* and *Structural Functions of Music*.

Purpose

The purpose of this dissertation is to propose energetics-based models for analyzing film music and its relationships to extramusical events and narrative structure. The energetic models provide a vocabulary for describing musical gestures. More importantly, however, these models provide a means for understanding the physical embodiment of these musical features. As a pattern of abstract pitches and rhythms, music contains little or no inherent connections to extramusical events. By perceiving these notes as embodied gestures, however, one may more effectively relate a film's music to other factors and events in the film. Such an understanding of the music gives it deeper meaning and significance. The energetics approach in this study provides a means for interpreting and describing one's perception of the music as it relates to the film.

Justification

Energetic qualities are innate in film and music. Motion often serves as the common link between the musical, visual, and narrative aspects of the film. Each of these aspects requires some form of motion to define itself. Musical gestures constitute cognitive motion. The notes themselves do not actually move, but one perceives a transference and change of energy as it passes between the notes.[4] One also perceives such psychic energy in a film. Likewise, musical sound (and all sound for that matter) requires motion. Sound is the product of oscillation—that is, the periodic motion of a sounding body. Film is but a series of still images shown at a rapid rate. The individual pictures do not contain motion, yet we perceive these still images as a *motion picture*.

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[4] Ernst Kurth, *Grundlagen des linearen Kontrapunkts: Bachs melodische Polyphonie*, 3rd ed. (1917), Reprint, (Hildesheim, Germany: George Olms, 1977), 18.

Characters and objects move across the screen, representing a diegetic form of motion.[5] Often, the perspective of the audience is in motion as the cameras move, providing a type of nondiegetic motion. The narrative itself involves metaphorical motion, which propels it forward. The problem at the center of a plot often creates tension or drives the story forward toward its resolution. Climaxes of a story reach peaks, implying a rise toward that goal and descent from it afterwards. Perceived motions and forces such as these are inherent in the onscreen action, narrative structure, audience perspective, film technology, and film music.

Because motion and its associative forces are so foundational in the creative and compositional aspects of film music, action, and narrative, it seems intuitive to analyze these features and embodiments in film music. Besides this literal tie to motion, many theorists often use metaphors of motion, forces, and spatial relation to describe various aspects of music.[6] For instance, one may describe a melody as *ascending* or *descending*. One may describe a musical passage as expanded or extended, each implying physical change of continuum—which in itself implies various forces.

When film composers score a scene, the actions and narrative of the film are large factors in determining the music of the scene. Film composers most often write music that reflects the energetic traits of a film in any given scene. By emphasizing the energetic traits of the music, action, and narrative, such an approach to film score analysis very closely reflects the way the music was composed. Understanding the

[5] Thomas Elsaesser and Malte Hagener, *Film Theory: An Introduction Through the Senses* (New York: Routledge, 2010), 159.

[6] Janna Saslaw, "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the Conceptualization of Music" *Journal of Music Theory* 40, no. 2 (Autumn 1996): 217–43. Saslaw discusses these metaphorical uses to describe music.

energetic traits of the music and film helps one better understand the creative process that was involved in writing the music. In comprehending the creative process, one achieves a fuller and richer understanding of a film as a collaborative artwork.

Many traditional means of musical analysis are only capable of viewing film music as separate from the other aspects of the film. As film music derives much of its meaning from extramusical factors, incorporating these extramusical factors in a meaningful analysis is necessary. Bridging the gap between the music and the film, the energetics approach provides a foundation upon which a deeper analysis may take place.

Many traditional analytical approaches have limitations for describing music. Such systems are often prescriptive and only deal with very specific types of music. The greater film music repertoire, however, consists of a wide variety of styles, genres, and techniques. Through the scope of a traditional analytical system, a film score may appear to be simplistic or poorly written because it does not adhere to certain norms or standards of traditional musical composition. However, such a perspective would not consider the music in the manner in which it was written. Film music may be very effective in relating an emotion or mood to the audience. Such a viewpoint would, to a great part, result from the inadequacies of the analytical system concerning film music rather than the quality or effectiveness of the music in the context of a film. An energetics approach simply opens up a dialogue for discussing film music in a new and different way. Energetics serves as the bond that connects the music to the film. The rules that regulate the notions of many traditional means of analysis are based on the same perceived natural foundation of musical perception, as "energeticists hold to premises asserted as natural

laws."[7] The energetics approach presented in this study provides a foundation for connecting the music and film, upon which a more traditional analysis may take place.

Several styles and types of film music exist for several reasons. Anything from deadline changes to composer changes can affect the final score that accompanies a film. Film composers come from a variety of backgrounds, ranging from a classical training to not being able to read music. The film itself requires that certain decisions be made concerning the final compositional product. The need arises for an approach to analysis that can flexibly handle scores of various styles and types. The energetic approach presented in this study focuses on the perceived musical gesture as an embodiment of an extramusical event. The models simply describe the gestures that exist and do not prescribe the music to certain governing rules. The meaning of each gesture is specific to the film and one's perception of the relationship between musical and extramusical events.

The meanings of musical gestures are based on everyday experiences of the physical world and therefore are not culturally coded.[8] These embodiments may provide a fundamental basis for understanding musical connections to other domains. One's physical experience of such energies and forces makes easier the task of understanding their metaphorical embodiments as musical gestures. The models presented in this dissertation are generally simple; however, their implications for understanding the film are vast. They describe the one's perception of the gesture, sometimes so simplistically that a specific understanding of the notes or their technical relationships is not always necessary. To a degree, these metaphors provide a basic vocabulary for describing music

[7] Rothfarb, "Energetics," in *Cambridge History of Western Music Theory*, 928.

[8] Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 132.

to even those without a formal background in music. Because film is a collaborative art between musicians and non-musicians, a rudimentary vocabulary for describing the film and its relationships is beneficial.

Towards a Taxonomy of Film Music Analysis

Aaron Copland describes three planes of listening to music in *What to Listen for in Music*: 1) the sensuous plane, 2) the expressive plane, and 3) the sheerly musical plane.[9] The sensuous plane is a very passive listening, where one only listens for the "sheer pleasure of the musical sound itself."[10] The expressive plane is an active mode of listening, where the music affects one. In this plane, one often describes the music using adjectives related to a mood. The third plane, the sheerly musical plane is the most active mode of listening, where the music exists "in terms of the notes themselves and of their manipulation."[11] This final plane of listening requires a technical understanding of music, one that most never achieve. Copland admits that the number of listening planes and rough boundaries between them are debatable. Still, these planes of listening are useful, as they illustrate some very important points about the film music listening experience.

One may experience film music in any of these modes of listening. In fact, the active listener probably experiences all three of Copland's planes while watching a film. For instance, when there is a lot of important dialogue in a scene, one hears the music,

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[9] Aaron Copland, *What to Listen for in Music,* rev. ed. (New York: McGraw-Hill Book Company, 1957), 9-19.

[10] Copland, 10.

[11] Copland, 16.

but is not actively listening to it. Their attention is focused on the words being spoken. By contrast, when there is high action, there is likely no dialogue. This frees one up to listen to the music. Still, however, one may be focused on the high action. In this expressive plane of listening, the music perhaps increases a sense of excitement or fear. Unlike the previous planes of listening, however, the average film-viewing experience does not lend itself easily to listening in this third level.

Unless one has perfect pitch or some reference material, the third plane of listening is difficult to achieve with film music. Visual actions, narrative events, spoken dialogue, and sound effects compound this listening experience. These extramusical elements can be distracting. One has to purposefully focus on the music, and even then, it is difficult to achieve the sheerly musical plane. What if, however, one was to consider these extramusical elements as part of the musical experience rather than as distractions? Then, one is able to better focus their attention on the music at hand. The energetic gestural approach bridges the gap between the expressive and sheerly musical planes by placing all of the film's elements into a common context. Focusing on the gesture allows one to feel emotion or characteristics of the music without the need for knowing the actual notes that are written on the page. The basic taxonomy presented in this study, helps those without a technical training in music get one step closer to achieving the sheerly musical plane.

Limitations of this Study

While there is a wide variety of styles and techniques of film composition, some limitations must be set on the scores dealt with in this study.[12] This dissertation primarily concerns recent mainstream Hollywood films that follow the narrative-cuing model to reflect modern compositional techniques and trends. For many traditional systems, these scores include analytical anomalies, such as continuous pitch space and frequent meter changes. These advanced compositional techniques demonstrate the flexibility of the energetic gestural approach to analysis.

Applications of the gestural approach include making musical connections to filmic imagery (e.g., onscreen actions, shot changes) and narrative imagery (e.g., character development, narrative events). This dissertation does not emphasize filmic imagery, as inherent in mickey-mousing, for instance. Instead, the scope of the current study focuses primarily on analyzing more latent musical connections to narrative imagery.[13]

Film scores are scarcely available to the public for study, especially recent scores. Due to copyright limitations, a majority of film music scholarship has primarily dealt with films that are public domain sources or otherwise protected under fair-use laws. Most of the scores studied in this dissertation are protected under copyright, and original

[12] Consider, for instance, the musical (i.e., musical comedy) or films that use preexisting music, both of which entail different scoring methods and practices. Analyzing the implications of such variations on this approach would broaden the focus beyond the scope of this dissertation.

[13] Narrative imagery analysis entails a certain amount of hermeneutical freedom, a conceptual problem with which many—if not all—analytical systems must contend. Still, the energetics models speak to one's experience and embodiment of the music. The experiences may contain some subjectivity, but that does not necessarily mean that system is subjective.

scores are not publically available; therefore, this study largely depends upon the author's transcriptions of the music. To avoid copyright infringement, this study only uses reductions and short excerpts from the scores. Additionally, reduction allow for a more focused analysis of the music.

Methodology

This study consists of two primary parts: the establishment of energetic models and the analysis of film music using such models. The two body chapters of the dissertation are divided roughly along this approach. Chapter 2 describes physical concepts and then creates musical metaphors from those concepts. Next, analysis of primarily common practice music examples function as a proof of concept on a purely musical basis. Then, analysis of short film music examples demonstrates the use of the metaphor for relating the music to extramusical events or factors in the film. Chapter 3 continues the analysis of film music, but on a much larger scale to demonstrate how the music develops in conjunction with plot changes and character development.

Philosophy of Transcription

As stated under the limitations of study section, this study relies heavily on transcriptions of the film scores. Many factors affect transcription quality. Film music shares the sound space with dialogue and sound effects, which compounds this difficult and time-consuming task. When necessary, several techniques are used to transcribe the music as accurately as possible. In some instances, the dialogue and sound effects were reduced in the soundtrack using various digital audio workstations (DAWs) and digital processes. Multiple-channel audio (e.g., 5.1 Dolby Surround Sound) provide options for

hearing different channel mixes of the film soundtrack for more clarity. DAWs also make it possible to considerably slow the music without distorting the pitch or quality to any substantial degree. Lastly, graphic equalizers allow one to isolate certain pitch ranges. These processes greatly aid in creating accurate, informed transcriptions.

While the transcription must be accurate, not every note is always audible in a score. For instance, a volley of gunfire in the sound effects may drown out the score momentarily. This raises questions such as: if the audience cannot hear a note, does it exist or matter? If the material is thematic material or a leitmotif, previous and future statements of the same or similar material provides some insight into the indiscernible music. In other cases, however, there may be no reference material. By in large, this study avoids passages where questions exist concerning the accuracy of the transcription.

The perception of the music changes significantly from situation to situation. Many factors may affect the quality of the playback. Variations in the types and qualities of the playback equipment (e.g., DVD player, television, speaker setup, headphone quality) used greatly affect the sound. If speakers are used, an endless number of room acoustic variations may affect the perception of the music. Another significant limiting factor is the audio source and playback medium—two-channel commercial audio soundtrack (e.g., CD), two-channel video track (e.g., DVD), or 5- or greater-channel surround sound (e.g., Blu-ray). There is simply no way to account for each unique situation. All transcriptions were completed in the same room using the same equipment. Commercial CD soundtracks were not consulted in the transcription process, as these often vary significantly from the film audio. When available, Blu-rays were used for transcription because they provide the highest audio quality possible and provide multiple

channels provide more options for clarity. The source used for transcription is the same as the source used to provide playback timings.

Dissertation Outline

Chapter 2 – Musical Energetics Concepts and Models

The purpose of chapter two is to establish energetic models for film analysis. The chapter begins with many preliminaries for understanding basic concepts and terms of physics. The organization of this chapter divides the concepts of motion and continuum mechanics to create models. Each model begins as an explanation of an energy or force as a purely physical phenomenon. Then, each physical concept is related to a music concept as a metaphor. This chapter compiles and summaries energetic models from various sources, as well as adds some new models. Non-film music examples demonstrate the proof of concept on a purely musical basis. Lastly, one or more film music examples demonstrate how these metaphors connect the musical gestures to onscreen actions, as well as to narrative concepts and events.

Chapters 3-5 – Analyses

Chapter 3 consists of three large-scale analyses using the models and concepts presented in chapter 2. The films analyzed in this section are *Signs* (2002), the films of *The Dark Knight Trilogy* (2005-12), and *The Last Samurai* (2003). Each analysis describes important moments in the film's score and highlight unique applications of the energetic models. This chapter demonstrates how the score functions as a narrator, foreshadows events to come, and reveals character development. For instance, the

analysis of *Signs* demonstrates motif characteristics that are reflected in global and local motivic parallelisms. *The Dark Knight Trilogy* analysis examines musical chaos as demonstrated in pitch, rhythmic, and metric space. Musical conflicts that parallel conflicts in the actions and narrative events are analyzed in *The Last Samurai.* All three large analyses demonstrate character development throughout the film or series of films. Additionally, this chapter demonstrates how the energetics models deals with a wide range of musical gestures and types of music, many of which may present difficulties for traditional systems of analysis.

Chapter 6 – Conclusion

Chapter four concludes this dissertation with a summary, implications for future research, and potential practical uses for this study.

Explanation of Track Timings

Track timings are provided for clips under discussion. Not all examples warrant listing the timing, therefore none is given. The timings are not directly based on the Society of Motion Picture and Television Engineers (SMPTE) standard. Instead, the list the hour, minute, and seconds, as read on a DVD or Blu-ray player. For example, "1:54:43 – 1:55:32" should be read as, "the scene starts at 1 hour, 54 minutes, and 43 seconds, and ends at 1 hour, 55 minutes, and 32 seconds." Unless otherwise specified, these timings correspond to the Blu-ray release of the film.

CHAPTER 2 - MUSICAL ENERGETIC CONCEPTS AND MODELS

The process of composing music for film often involves creating cues or synchronization points, which serve as a guide for matching the music to the action or narrative events in the film.[1] Inherently, this practice often produces musical gestures, which may serve as a means for connecting film music to certain filmic and narrative attributes and events. This chapter provides several models that describe musical gestures by way of metaphors borrowed from physical models. The physical energetics models do not describe the physical traits of the music or sound, nor do they imply that film composer imagine these particular models when writing the music—whether consciously or subconsciously. Instead, the models in this chapter form a basic taxonomy and lexicon for describing musical gestures, and relating them to extramusical events in the film.

This chapter compiles and reconsiders several established music energetic concepts and models. Some of the models form the core of musical energetics philosophy, such as those by Ernst Kurth. Other models, such as those of Steve Larson, are certainly energetic in nature, but are not traditionally associated with musical energetics. Additionally, this chapter proposes several original models based in continuum mechanics. Together, these models provide a foundation for analyzing and understanding how film music connects to filmic and narrative imagery.

[1] For more on the process of spotting and composing to the film, see Richard Davis, *The Complete Guide to Film Scoring: The Art and Business of Writing for Movies and TV*, ed. Jonathan Feist (Boston, MA: Berklee Press, 1999), 153–163; and Fred Karlin and Rayburn Wright, *On the Track: A Guide to Contemporary Film Scoring*, 2nd Edition, (New York: Routledge, 2004), 33–50.

Musical Metaphors, Gesture, and Energetic Models

The term "gesture" can have a myriad of meanings. This dissertation employs Robert Hatten's definition of an "energetic shaping through time."[2] Note that this musical gesture is distinct from a performance gesture. Such musical gestures represent the continuity of motion between musical entities (e.g., pitches, rhythms) and are subject to musical forces, thus portraying music as "shaped psychic motion."[3] Energies constitute these gestures. The notes of the gesture do not themselves contain energy, but energy is perceived as flowing between the notes.[4] As a conceptual metaphor, these energies and forces serve as a cross-domain mapping of our experience of physical energies and forces.[5] Many of the metaphorical concepts used in this dissertation largely trace back to Mark Johnson's work on conceptual metaphors, embodiment, and image schema.[6]

Understanding these gestures may yield insights into one's aesthetic experience of music.[7] Hatten refers to musical gesture as a communicator of information pertaining to its

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[2] Robert Hatten, *Interpreting Musical Gestures, Topics, and Tropes: Mozart, Beethoven, Schubert* (Bloomington, IN: Indiana University Press, 2004), 114.

[3] Lee Rothfarb, *Ernst Kurth as Theorist and Analyst* (Philadelphia, PA: University of Pennsylvania Press, 1988), 190.

[4] Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 301, endnote 6.

[5] Steve Larson, "Musical Forces and Melodic Patterns," *Theory and Practice: Journal of the Music Theory Society of New York State*, 22-23 (1997-1998): 58; Mark Johnson, "Embodied Musical Meaning," *Theory and Practice: Journal of the Music Theory Society of New York State*, 22-23 (1997-1998): 99.

[6] George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980); Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: University of Chicago Press, 1987).

[7] Leonard B. Meyer, *Emotion and Meaning in Music* (Chicago: University of Chicago Press, 1956), vii-ix.

context.[8] By way of metaphor, understanding a source domain allows one to more easily understand relevant features of a target domain.[9] This study uses metaphor as a common link between film music and other elements of a film (e.g., onscreen actions, narrative events). Any of these filmic elements may serve as a source domain to inform the viewer about any other filmic element as a target domain. Understanding the music gives one insights into the film, while understanding the film provides insights into the music. One does this quite naturally when watching a film.

Sergei Eisenstein, a Soviet Russian film director and film theorist, noted the connections between the movement in film and music in *The Film Sense.*[10] In this text, Eisenstein famously demonstrates such connections with a graph of the pictures frames and score from *Alexander Nevsky* (1938), shown in figure 2.1. Eisenstein relates the imagery of film composition to music. There are certain problems with this approach. This chart suggests that viewers scan each static shot frame from left to right. While music is read left to right, a film is not viewed the same way. For example, one does not necessarily view the ascending arch in shot III from left to right as they might read the musical ascent in m. 6. Essentially, the motions and shapes being described are those perceived by the audience as their eyes scan across the screen in a manner presumed by Eisenstein. Still, Eisenstein's theory sets an important precedent for examining the correlations of motion between film and music. Unlike Eisenstein's chart, this dissertation

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[8] Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 125.

[9] Lawrence M. Zbikowski, *Conceptualizing Music: Cognitive Structure, Theory, and Analysis* (Oxford, United Kingdom: Oxford University Press, 2002), 73-77.

[10] Sergei Eisenstein, *The Film Sense*, trans. and ed. Jay Leyda (London: Farber and Farber Limited, 1943).

focuses on timing correlations between musical and extramusical events, making no presumptions about how one experiences music in relation to film.

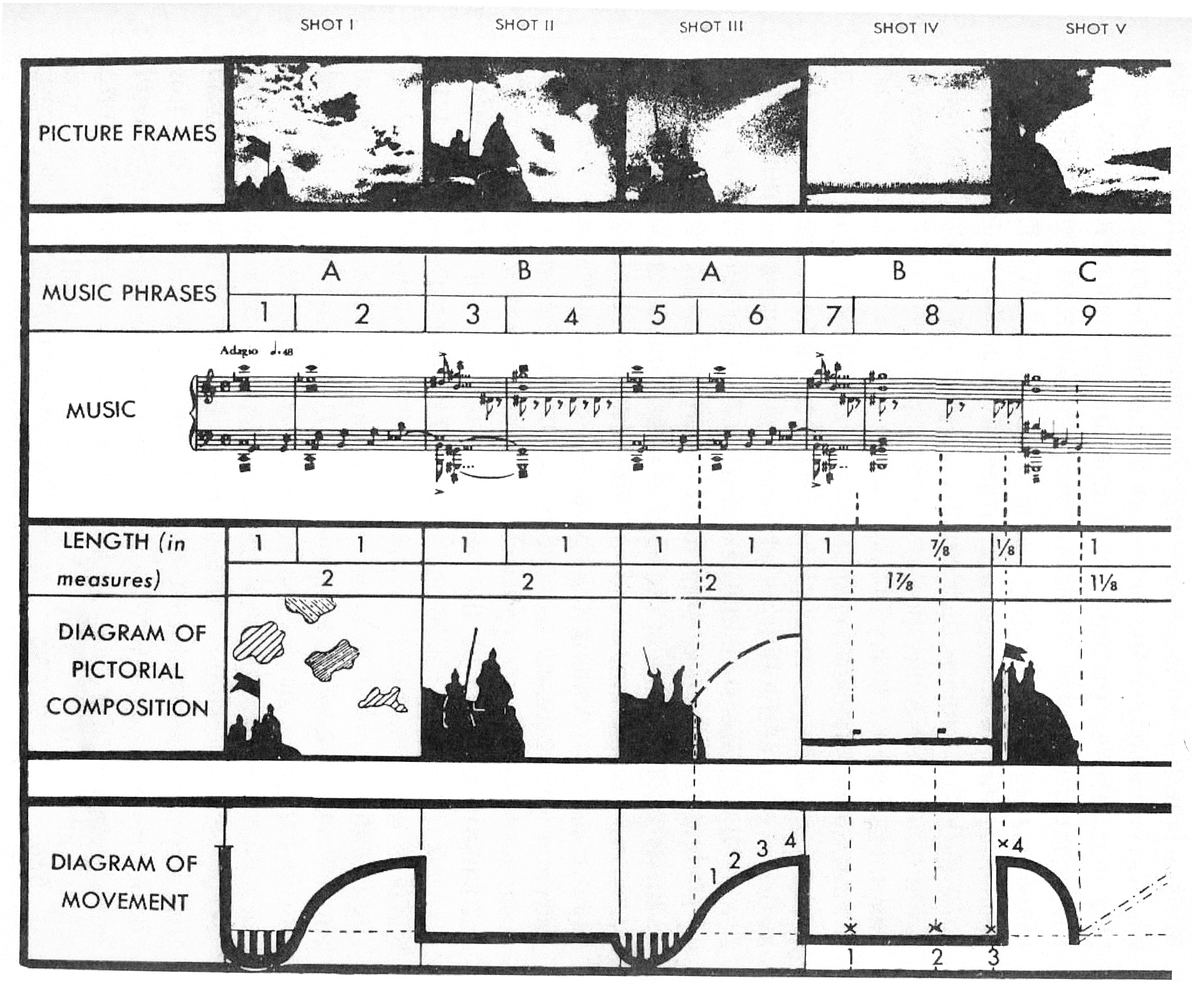

Figure 2.1. Excerpt from Eisenstein's Diagram of Audio-Visual Correspondences in a Sequence from *Alexander Nevsky*

Others have discussed the connections between music and film. Of note are the dissertations by Claudia Widgery and Juan Chattah.[11] Widgery examines how time and motion interact between

[11] Claudia Joan Widgery, "The Kinetic and Temporal Interaction of Music and Film: Three Documentaries of 1930's America" (PhD diss., University of Maryland College Park,

the film and music in three documentary films from the late 1930s. She demonstrates general instance of kinetic energy connections at the gestural level, but does not describe small-scale traits of energies and forces. This dissertation systematizes the energetic traits of the music at a deeper structural level than Widgery's work.

Also of note is Juan Chattah's dissertation. Chattah presents methods for describing the semiotic and pragmatic relationships between the film and music. His approach to analysis uses various conceptual models for relating film and music. The current dissertation presents energetic models for describing and better understanding these connections, focusing less on the cognitive processes and more on the specific metaphors that makeup these connections.

This chapter provides several energetic models and associated terms for describing musical gestures. In some cases, several energetic models may describe a particular musical gesture, creating an overlap between certain concepts. This raises concerns about hermeneutical freedom and the use of many energetic models. Many of the energetic models described in this dissertation are adapted from other authors. These authors often only describe two or three models or concepts for explaining musical gestures. For instance, Larson only uses gravity, magnetism, and inertia. He freely admits, however, that there may be others.[12] Increasing the number of energetic models also increases the number of perspectives for viewing the same gesture. For instance, Larson's models related to pitch are primarily melodic. He is focused primarily on musical motion, therefore harmonic considerations are only regarded from a melodic perspective. The continuum mechanics models of this dissertation, however, primarily

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1990); Juan Roque Chattah, "Semiotics, Pragmatics, and Metaphor in Film Music Analysis" (PhD diss., The Florida State University, 2006).

[12] Steve Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music Music* (Bloomington, IN: Indiana University Press, 2012), 3.

consider certain musical phenomena harmonically as musical objects. Having this option provides a great deal of hermeneutical freedom to the analysts; however, the interrelation and overlaps of these models creates a balance to this freedom. The overlaps between these models strengthen the music-as-energy metaphor.

Larson also describes the single-mechanism fallacy, the mistaken assumption that a single operating force or mechanism best explains an event.[13] Consider an aircraft flying through the air. It would be wrong to assume that only one or two forces affect the aircraft. Gravity pulls the aircraft toward Earth. The applied forces of the propellors or jets propel it forward, allowing the wings to provide lift. Friction and drag from the air also affect the speed and lift of the aircraft. The aircraft has inertia and momentum resulting from its motion. Rarely does only one force affect an object. One may describe each force individually, but their impacts on the aircraft affect one another. This dissertation compiles several energetic models from various authors, many of which are adapted to connect to other models and concepts presented here. Many original models, such as those related to continuum mechanics, are presented here as well. Some examples, such as "Twinkle, Twinkle, Little Star" and the Bride's leitmotif from *The Bride of Frankenstein* (1935), will be revisited several times, as this helps establish the notion that more than one model may describe one particular musical gesture and its relationships to the film, each providing a unique perspective.

Organization of Energetic Models

The remainder of this chapter presents various energetic models. Each model is explained as a physical concept and then as a musical metaphor. As proofs of concept, examples

[13] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, 7 and 332.

from the common-practice repertoire demonstrate how each metaphor works on a purely musical level—without extramusical relationships. Lastly, to demonstrate extramusical connections, each model describes one or more film music examples.

Following the kinetic and potential energy models, the force models are grouped into three basic categories: fundamental forces, fictitious forces, and nonfundamental forces. This organization separates those forces primarily associated with motion—whether physical or musical—from the forces associated within the structural makeup of an object. Consequently, the existing music energetic models of Ernst Kurth, Steve Larson, and Arnold Schoenberg are separated from one another, as well as from the original energetic concepts presented in this dissertation. Additionally, this grouping also presents the widely-used models (e.g., gravity, inertia) first, followed by the lesser-known rotational models, and lastly the original models based in continuum mechanics.

Kinetic and Potential Energy

Kinetic energy is the energy of an object due to its motion.[14] For instance, a ball rolling down a hill contains kinetic energy. *Potential energy*, on the other hand, is "the energy of an object or system that relates to its position or state, [that is] the energy that could potentially transfer from the object or system."[15] A ball being held in place on the side of a hill contains potential energy. If released, the ball would roll down the hill. Therefore, the potential energy would become kinetic energy upon release of the ball. These two energies are closely related.

[14] Eric Deeson, *Collins Internet-Linked Dictionary of Physics: Physics Defined and Explained* (London: HarperCollins Publishers, 2007), 230.

[15] Deeson, 358.

To an extent, everything contains potential energy, as "all energy is potential energy: until it causes something to happen."[16]

Ernst Kurth uses kinetic energy and potential energy to describe the interaction of melodic and harmonic forces.[17] Like Kurth, Paul Hindemith also commented on the interplay between harmonic and melodic forces; however, Hindemith does not describe these musical forces in terms of kinetic and potential energy.[18] Kurth describes melodic forces as containing kinetic energy, and harmonic energy as being composed of potential energy.[19] The potential energy of certain sonorities can disrupt or even halt the free flow of melody. Lee Rothfarb summarizes Kurth's conceptual relationship between these conflicting energies using water as a metaphor for energy: "Just as a dam builds up potential energy in restraining the flow of water, so do certain sonorities build up potential energy in restraining the active flow of linear impulses."[20] It is important to note the difference between *energy* and *force* here. The melodic or harmonic entities described by Rothfarb are forces, whereas the kinetic and potential entities are energies. The forces are vectors that can be composed of energy, but energy cannot be

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[16] Deeson, 140.

[17] Lee Rothfarb, "Energetics," from *Cambridge History of Western Music Theory,* ed. Thomas Christensen (Cambridge, United Kingdom: Cambridge University Press, 2002), 940.

[18] Paul Hindemith, *Craft of Musical Composition*, Revised 4th edition. 2 vols., trans. Arthur Mendel (New York, Associated Music Publishers, 1945), 87-94. Unlike Kurth, however, Hindemith looks for an innate melodic or harmonic quality in the intervals as produced from a progenitor tone.

[19] See Ernst Kurth's *Voraussetzungen* (pp. 65, 71: kinetic; pp. 69, 71: potential), *Grundlagen* (p. 9: kinetic; p. 68: potential), and *Romantische Harmonik* (p. 5: kinetic; pp. 9-10 potential).

[20] Rothfarb, *Ernst Kurth as Theorist and Analyst*, 133.

composed of force. Therefore, the melodic line contains kinetic energy in its forward motion, but an applied force causes the forward motion.

The conflict between kinetic and potential energies is evident in Kurth's *sensuous* harmony.[21] A sensuous harmony is generally an extended tertian harmony that is a ninth or larger that represents "material 'resistance' to the flow of melodic forces, which try to wedge apart chords at their intervallic seams."[22] Found predominantly throughout the Romantic era, these extended harmonies provide material resistance, which the melody must penetrate.[23] Dissonance is present in the added thirds that create the extended harmony, because this distracts from the strong sense of root, which results in harmonic inertia.[24] A characteristic of the sensuous harmony is that these dissonances do not resolve as expected, especially in nondominant extended harmonies.[25] A significant part of melodic function is the resolution of dissonances. Unresolved harmonic dissonances deny forward momentum to a melodic flow, thus creating harmonic material resistance that the melody must penetrate.

Edvard Grieg creates harmonic material resistance to the melody in his "Wedding Day at Troldhaugen" from *Lyric Pieces*, op. 65, no. 6, shown in m. 8 of example 2.1. The E-minor ninth chord in m. 8 obscures the melodic line. Rather than being clearly distinguishable as a melody with an accompaniment, the melody is lost in the E-minor ninth chord, where several of the upper voices could suffice as the melody note.

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[21] Kurth, *Romantische Harmonik*, 382-83.

[22] Rothfarb, *Ernst Kurth as Theorist and Analyst*, 113.

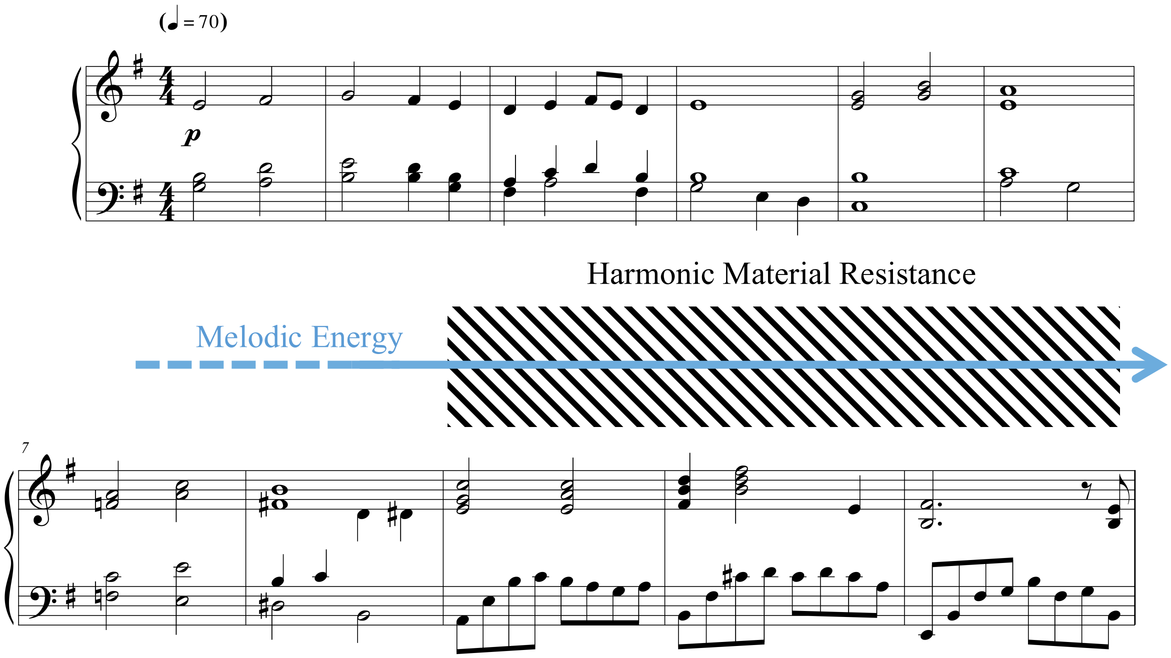
[23] Kurth, *Romantische Harmonik*, 230.

[24] Rothfarb, *Ernst Kurth as Theorist and Analyst*, 114.

[25] Rothfarb, *Ernst Kurth as Theorist and Analyst*, 154-55.

Example 2.1. Grieg, “Wedding Day at Troldhaugen” from *Lyric Pieces*, op. 65, no. 6 (mm. 3-10)

Basil Poledouris uses a similar effect in his score to *Conan the Barbarian* (1982). At the beginning of this sequence, Conan is faced with the decision to continue his quest or forsake his adventures for his new-found love. The music shown in example 2.2 contains extended tertian sonorities, which create a thick, lush texture. The highest voice serves as the melody, which contrasts with the moving, eighth-note accompaniment that begins in m. 9. In m. 9, for instance, the harmony is an A-minor ninth, which leads to a B-minor ninth. Because the roots of these chords ascend by a major second, the dissonances resulting from the extended portion of these harmonies do not resolve. These dissonances—the melodic seconds in particular—are part of what gives a melody its forward momentum. As part of the harmony, however, this sonority steals from the melody its typical forward propulsion.



Example 2.2. “The Leaving/The Search” from *Conan the Barbarian* (1982)

The melody is in flux with these sensuous harmonies. Through his use of these sensuous harmonies, Poledouris weakens the function and direction associated with tonality, causing the melody to drift aimlessly like a wanderer. The conflict between melodic and harmonic forces symbolizes Conan’s internal struggle. Later in the sequence, Conan choses to continue his quest. The sequence is a time lapse, which shows Conan searching through various lands and climates. Because of the sensuous harmonies, the melody wanders aimlessly like Conan.

Fundamental Forces

The first grouping of energetic models consists of *fundamental forces*, which are the four fundamental interactions that are currently known to be at work in the physical universe. Of these four fundamental forces, this dissertation will only discuss gravity and magnetism. Strong and weak nuclear forces, the remaining two fundamental interactions, are too small for one to

easily embody and their musical metaphors provide little benefit not already presented in the gravity and magnetism models.[26] Additionally, this chapter will discuss inertia that, while technically not a force itself, is certainly bears mention.

Gravity

Gravity is the "universal long distance (but weak) interaction through which all masses attract each other. It is the force that holds the Universe together, the stars in the galaxies, and planets in stellar systems…There have been many theories of gravitation, but none can yet explain the effect."[27] This definition describes the attraction of masses to one another, such as the attraction between celestial bodies. In a personal frame of reference, however, one perceives of gravity as a downward force. The *Collins Internet-Linked Dictionary of Physics* states that "[gravity] has negligible effect within matter, in comparison with the much stronger electromagnetic and nuclear interactions."[28] Electromagnetic (and nuclear forces) are stronger interactions than gravity for describing the attraction between objects. One can use gravity primarily to describe the downward-pulling phenomenon and use magnetism to describe the general attraction between musical objects without much loss of meaning.[29] Unless otherwise stated, the term 'gravity' will refer to the downward-pulling force that one perceives in a

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[26] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, 18-23.

[27] Deeson, 184.

[28] Deeson, 184.

[29] Steve Larson, in his work concerning musical forces, describes gravity and magnetism, where gravity describes a downward-pulling force and magnetism describes the attraction of two musical objects to one another. See Steve Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, 23 and 94-95.

personal frame of reference. The forthcoming magnetism force model describes the force associated with the attraction between two musical objects.

Steve Larson describes two manifestations of musical gravity: melodic gravity and rhythmic gravity. *Melodic gravity* is "the tendency of notes above a reference platform to descend."[30] Many other theorists have described musical gravity. Some (e.g., Rameau) conceptualize gravity as between celestial bodies, which is manifest in the dominant and subdominant having the tonic as their center of gravity.[31] Schenker, on the other hand, conceives of the downward manifestation of gravity in his *Urlinie*.[32] Other writers such as Arnold Schoenberg and Robert Erickson also speak of gravity in the latter sense.[33]

Larson demonstrates melodic gravity using the children's song "Twinkle, Twinkle, Little Star (example 2.3)."[34] The first note is C5.

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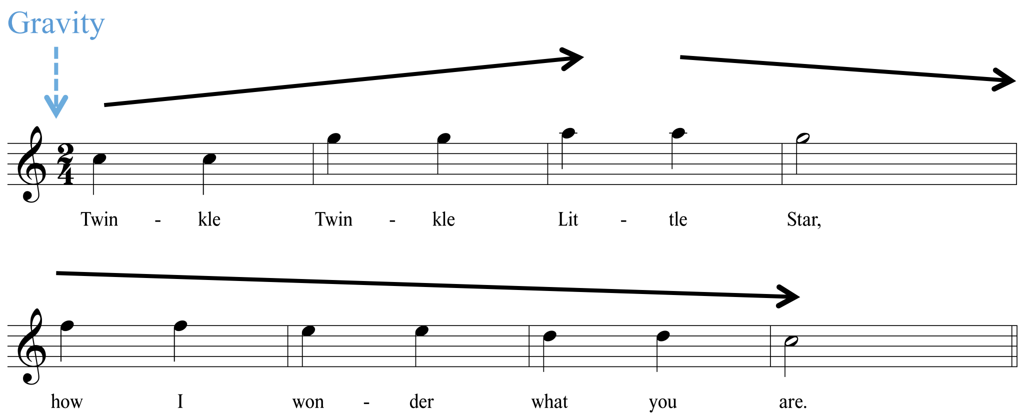
[30] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 328.

[31] Rameau speaks of gravity, but his conception is, in some ways, more closely related to the notion of magnetism in this study. See Rothfarb, "Energetics," 934; Thomas Christensen, *Rameau and Musical Through in the Enlightenment* (Cambridge, United Kingdom: Cambridge University Press, 1993), 131-32 and 189-90.

[32] Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 118-19; Janna Saslaw, "Life Forces: Conceptual Structures in Schenker's *Free Composition* and Schoenberg's *The Musical Idea*," *Theory and Practice: Journal of the Music Theory Society of New York State* 22-23 (1997-1998): 17-34.

[33] Arnold Schoenberg, "Composition with Twelve Tones," *Style and Idea: Selected Writings of Arnold Schoenberg*, ed. Leonard Stein, trans. Leo Black (Berkeley, CA: University of California Press, 1975), 245-46; Robert Erickson, *The Structure of Music: A Listener's Guide* (New York City, NY: The Noonday Press, 1955), 27-34.

[34] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 82-85. This tune derives from the French song "Ah vous dirais-je, Maman," upon which Mozart famously created a set of twelve variations. Despite the origins of this tune, this study will refer to this melody as "Twinkle, Twinkly Little Star," owing to Larson's analysis of the tune.

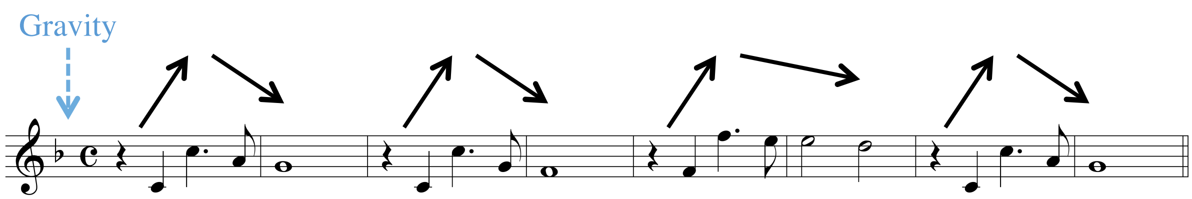


Example 2.3. “Twinkle, Twinkle, Little Star” First Phrase

As the tonic, this pitch serves as a referential platform.[35] Following an initial ascent through G5 to A5, the melody descends by step back down to C5. The initial ascent, having significantly weakened from an ascending P5 (C5 to G5) to an ascending M2 (G5 to A5), gives in to the downward force of melodic gravity and descends.

Melodic gravity in film music carries with it certain associations. Gravity represents the reality of life; however, the physical restrictions of gravity often do not apply in dreams. Tara’s Theme from *Gone With the Wind* (1939) illustrates this characterization of melodic gravity. Scarlett O’Hara, the film’s main character, undergoes several disappointments and much heartache in the film. The memories and thoughts of Tara, her family’s plantation homestead, is her source of strength through these hard times. Tara’s theme encapsulates Scarlett’s hardships and her enduring strength. The theme contains a basic motif, which contains this same basic rhythmic pattern and melodic contour. The basic motif is an ascending leap of an octave, followed by a descent of varying intervals (example. 2.4).

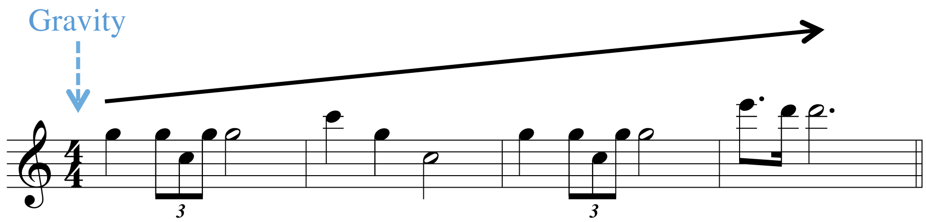
[35] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 83.



Example 2.4. Tara's Theme from *Gone with the Wind* (1939)

The ascending octave leap embodies Scarlett's hope and strength; however, the following descent represents the letdowns she experiences in life. The apparent melodic gravity affecting the motif roots Scarlett in reality. The third statement of the motif (starting on F4) starts and ends much higher than the others. The persistent repetition of the motif signifies Scarlett's undying endurance. The last statement of the motif in the theme does not end on the tonic. The theme feels unresolved, propelling itself forward. Perhaps this too signals Scarlett's endurance. Likewise, the melodic gravity is not fully resolved, as the theme does not complete the descent to the tonic. If melodic gravity is representative of reality in this instance, the absent descent to the tonic symbolizes Scarlett's continued dreamlike sense of reality. Despite her growth throughout the film, she experiences one final letdown when Rhett finally rejects her. The reappearance of Tara's theme at the end of the film tells the audience that Scarlett will again endure through this struggle.

Melodic gravity can also represent human nature or the human condition; therefore, a lack of melodic gravity can represent something of an extraterrestrial nature. The fanfare from *Superman* (1978) demonstrates the lack of gravity's affect on the melody, signifying Superman's superhuman strength and abilities. The fanfare melody contains little stepwise motion, instead consisting of many large leaps. The theme contains some melodic descents, but overall, the theme ascends, beginning on G5 and ending on D6 (example 2.5).



Example 2.5. Fanfare from *Superman* (1978)

Here, melodic ascents occur just as effortlessly as descents, indicating that gravity has not effect on the motion of the melody. This fanfare's immunity to gravity parallels Superman's exemption from the physical laws of Earth.

Rhythmic gravity, Larson's second manifestation of musical gravity, is "the quality we attribute to a rhythm, when we map its flow onto a physical *Gesture*, that reflects the impact physical gravity has on that physical *Gesture*."[36] He attributes the feeling of a musical gesture leading or "falling into a downbeat" as being rhythmic gravity.[37] This rhythmic propensity toward a strong downbeat is similar to Riemann's conception of an end-accented metric unit.[38] This notion of rhythmically falling seems to imply a gain of momentum (not inertia) preceding the arrival to the downbeat.[39] Schoenberg described this same sense of gravity in describing the

[36] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 332. The emphasis on "gesture" is Larson's.

[37] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 149.

[38] William E. Caplin, "Theories of Musical Rhythm in the Eighteenth and Ninteenth Centuries," from *Cambridge History of Western Music Theory,* ed. Thomas Christensen (Cambridge, United Kingdom: Cambridge University Press, 2002), 687-691.

[39] "The smallest notes in any segment of a piece, even in a motive or motive-form, have an influence on the continuation which can be compared to the momentum of acceleration in a falling body: the longer the movement lasts, the faster it becomes." Arnold Schoenberg, *Fundamentals of Musical Composition,* eds. Gerald Strang and Leonard Stein (London: Farber & Farber, 1967), 27, footnote 1.

over-accentuation of strong beats.[40] Rhythmic gravity often occurs in conjunction with metric magnetism. Examples demonstrating rhythmic gravity will be shown later alongside metric magnetism so that these terms may more readily be compared and contrasted.

Magnetism

Another fundamental force is magnetism, a truncation of electromagnetism.[41] *Magnetism* is the property of a magnet (whether permanent or electro-), whose force is manifest through its exertion on other magnets.[42] Magnetism is the attraction or repulsion of two magnetic bodies toward or away from each other. The *Collins Internet-Linked Dictionary of Physics* explains that "the phenomenon is part of the electromagnetic interaction, one of the four types of interaction between matter particles: moving charge generates a magnetic field, while a changing magnetic field induces charges to move."[43] This electromagnetic force, "stops solids from falling apart and acts between all particles with electric charge."[44]

Magnetism is one of the three types of forces described by Larson in his body of work. Like musical gravity, he defines two types of musical magnetism: melodic magnetism and metric

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[40] Arnold Schoenberg, "Today's Manner of Performing Classical Music" from *Style and Idea: Selected Writings of Arnold Schoenberg*, ed. Leonard Stein, trans. Leo Black (Berkeley, CA: University of California Press, 1975), 321.

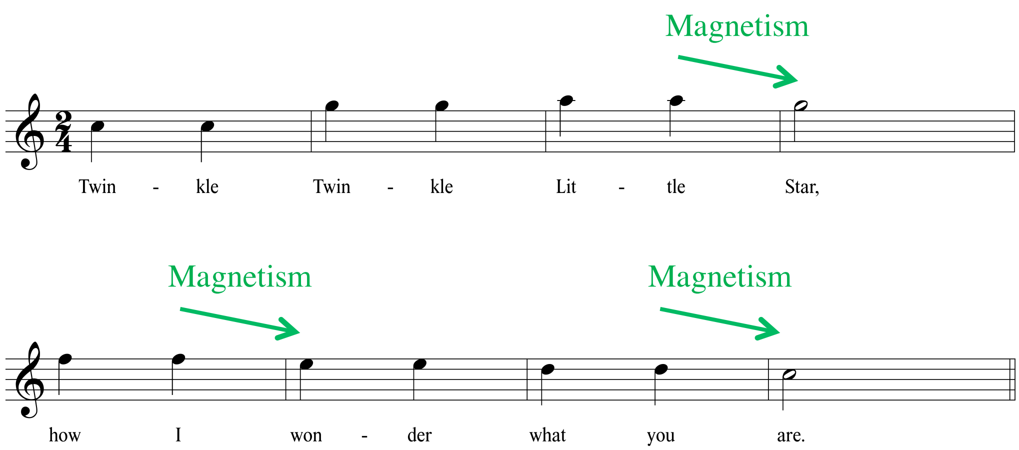
[41] Larson's work and the present study make no distinction between the terms 'magnetism' and 'electromagnetism,' as both have the same effect, regardless of their cause. This study uses electromagnetism to explain the physical model of magnetism, both for consistency's sake and because electromagnetism is perhaps the most easily embodied and comprehended of the magnetism types.

[42] Deeson, 255.

[43] Deeson, 255.

[44] John Avison, ed., *Hutchinson Pocket Dictionary of Physics* (Abingdon, Oxfordshire, United Kingdom: Helicon Publishing, 2005), 62.

magnetism.[45] *Melodic magnetism* is "the tendency of an unstable note to move to the closest stable pitch, a tendency which grows stronger as we get closer to that goal."[46] Larson again uses "Twinkle, Twinkle, Little Star" to demonstrate melodic magnetism, shown here in example 2.6.[47]



Example 2.6. "Twinkle, Twinkle, Little Star" First Phrase

The pitches of the tonic triad are more stable than the other pitches. These less stable pitches are magnetically drawn to the nearest stable pitches. The previous analysis of this tune noted that the melody descends after A5 because of melodic gravity; however, melodic magnetism is also at play here. Here, A5 is less stable than G5, because the latter pitch belongs to the tonic triad. As an unstable tone, A5 could either resolve upward to C6 or downward to G5. G5 is the closer

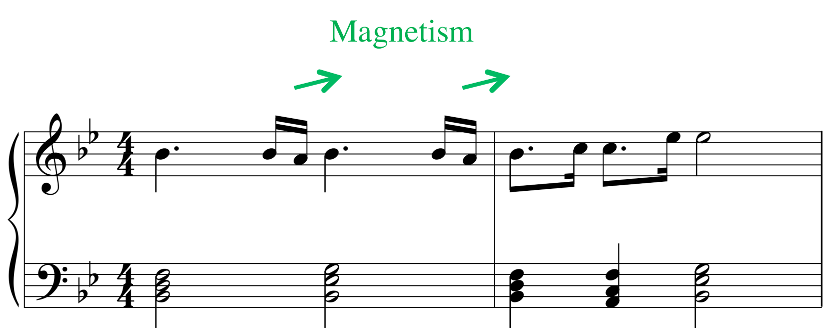
[45] Larson sometimes refers to metric magnetism as rhythmic magnetism. See, Larson, *Musical Forces: Motion, Metaphor, and Meaning in Musi*c, 147, 148, 178, and 311.

[46] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 88.

[47] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 88-89.

of the two notes of resolution; therefore, the melodic magnetism drawing A5 to descend to G5 is stronger than the magnetism drawing A5 to the comparatively distant C6. After the initial descent to G5, melodic gravity causes the melodic line to continue to F5, which is magnetically drawn to E5 a half step below. Melodic gravity continues to pull the melody down to D5, which is a M2 below E5 and a M2 above C5. C5, being the tonic, is more stable than E5; thus, D5 descends to C5. Melodic inertia, to be discussed shortly, also has a role in the continued descent of the melody after the initial ascent to A5.

Melodic magnetism is evident in the beginning of John Williams' theme to *Jurassic Park* (1993), shown in example 2.7.



Example 2.7. "Welcome to Jurassic Park" from *Jurassic Park* (1993)

The initial motif of this theme centers on the neighboring motion between the tonic (B♭) and the leading tone (A). In m. 1, the placement of the nonharmonic tone on a weak part of a weak beat creates a very mild dissonance. As the only dissonance in the entire first measure, however, the leading tone is distinctive and has a tendency to resolve to the tonic. This theme first appears in the scene title "Welcome to Jurassic Park." This subtle melody appears when the group first sees the Brachiosaurus, the first live dinosaur that the evaluators (and the audience) have experienced in full view. As the group marvel in awe at the enormous dinosaur, the humans of the film are

drawn closer together by this experience, every discussion and thought outside of the moment at hand ceasing.[48] In a bonus featurette interview on the Jurassic Park Ultimate Trilogy Blu-ray, John Williams states:

> What I tried to do with the music was to give a sense of wonder, and maybe even with a slight sense of religiosity, the way that we would be acculturated to these harmonies and so on, so that the orchestra makes a beautiful statement, almost like you would enter a cathedral maybe.[49]

With this subtle half-step motion, Williams seems to be emphasizing the human emotions of this experience and not the Brachiosaurus itself.[50]

Metric magnetism, the second type of musical magnetism, is the tendency of an unstable beat to move to a stronger beat, which is very often the following downbeat.[51] Larson also refers to this concept as rhythmic magnetism, a term that more accurately describes the relationship of beats.[52] In a more detailed description, he defines metric magnetism as "the pull of a note on an unstable attack point to a subsequent and more stable attack point, a pull that grows stronger as

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[48] Additionally, many audience members were particularly stunned at the quality of the animatronics and computer graphics in 1993.

[49] "The Score" bonus feature from *Jurassic Park*. The Ultimate Trilogy Blu-ray. Directed by Steven Spielberg. Music by John Williams. Universal City, CA: Universal Pictures, 2011.

[50] There is, however, something sinister in this m2 interval. Interestingly, this same pitch relationship serves as the infamous motif from *Jaws* (1975), another earlier collaboration between Williams and director Steven Spielberg that deals with a prehistoric topic.

[51] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 148-149.

[52] Larson appears to use metric magnetism and rhythmic magnetism interchangeably, which creates some confusion for the reader. The term 'metric magnetism' emphasizes the relative pull of strong and weak beats (i.e., metric accent). 'Rhythmic magnetism' seems to describe the force effect on the rhythms in this metric space. This dissertation refers to this force as 'metric magnetism' to more clearly distinguish this model from rhythmic gravity.

the attracting attack point grows closer."[53] Like melodic magnetism, metric magnetism is comparative. There is no absolute quality of magnetism. One experiences each musical moment as being either more or less metrically stable than other such moments.[54] This process of mentally comparing musical moments creates hierarchical levels of stability, similar in nature to those found in Schenkerian analysis.[55] Because one hears (either consciously or subconsciously) these levels and compares musical moments, one perceives certain notes or moments as being a musical goal point. Like melodic magnetism, the desire to move to this metric goal increases as we approach the goal.[56]

Previously, this chapter noted that the physical concepts of gravity and magnetism were similar in that both involved the attraction between objects. Likewise, the concepts of rhythmic gravity and metric magnetism share a relationship. Both describe goal-directed rhythmic motion. Metric magnetism concerns the local relationship of beats from one to the next. More specifically, metric magnetism refers to the metric force applied to a rhythm by the tendency away from weak beats toward strong beats. While Larson describes rhythmic gravity as falling into a downbeat, the concept is more of a rhythmic quality than a metric one. Rhythmic gravity gains momentum as it leads into the next phrase or other formal unit.[57] Rhythmic gravity

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[53] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 22.

[54] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 148.

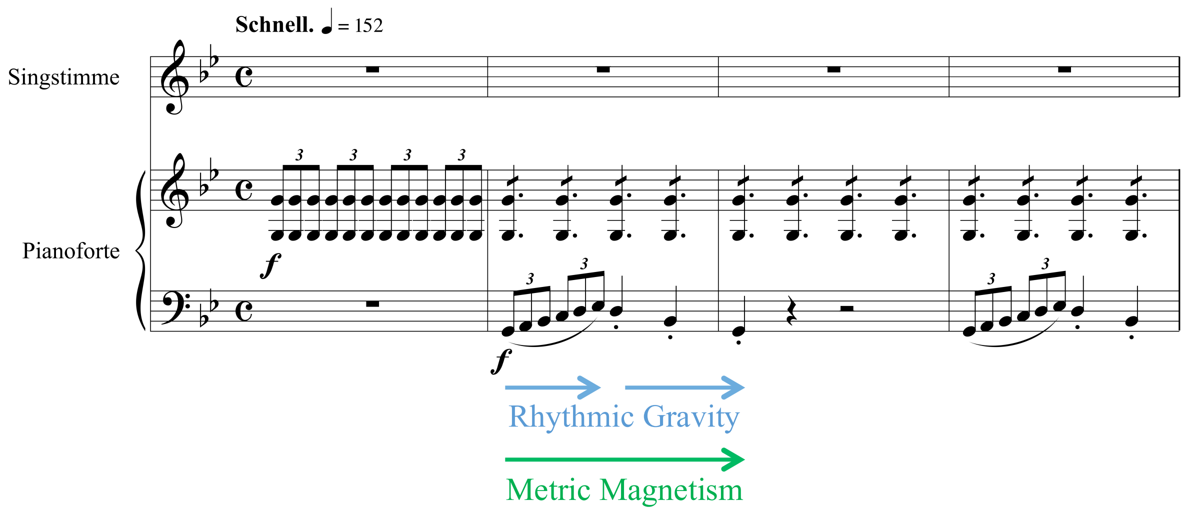
[55] Hatten, *Interpreting Musical Gestures, Topics, and Tropes,* 118-19; Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 148. Also, see Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 18-21 for an explanation of hierarchical levels of explanation in his theory.

[56] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 148.

[57] Schoenberg, *Fundamentals of Musical Composition*, 27, footnote 1; *Musical Forces: Motion, Metaphor, and Meaning in Music*, 97 (melodic), 151, and 155.

typically is strongest at the end of a rhythmic gesture, which often occurs on a strong downbeat. Therefore, one often experiences rhythmic gravity and metric magnetism simultaneously, making the task of distinguishing between the two concepts more difficult. This dissertation will use 'metric magnetism' when referring to the effect of relative metric qualities of beats on the gesture and 'rhythmic gravity' when referring to the rhythmic quality of gesture to "fall into" the next downbeat.

Schubert's "Erlkönig" exhibits both rhythmic gravity and metric magnetism in mm. 2 and 3, shown in example 2.8.

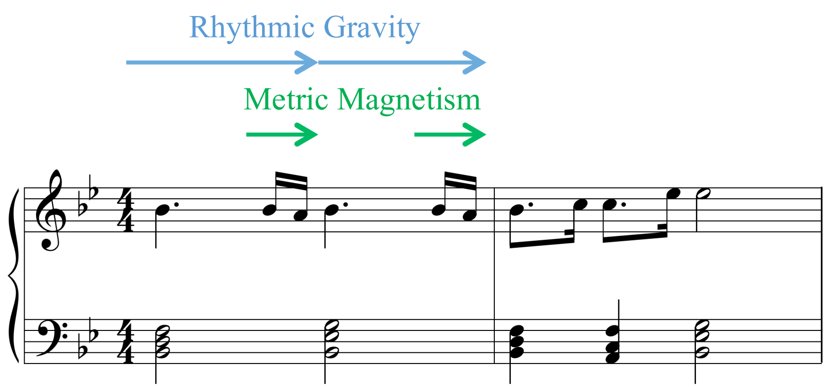


Example 2.8. Schubert, "Erlkönig" (mm. 1-4)

In m. 2, the triplet eighth notes in the left hand piano part destabilize beats 1 and 2. Rhythmically, the quarter notes of beats 3 and 4 are more stable then the preceding triplet eighth notes; metrically, however, beats 3 and 4 are weaker. The motion of the triplet eighths (beats 1 and 2) into the longer quarter note on beat 3 exhibits rhythmic gravity. At this moment, the melodic line descends from E♭3 to D3; thus, a sense of rhythmic gravity occurs in conjunction

with melodic gravity. There is a stronger sense of rhythmic gravity in the arrival on the quarter note in m. 3. This quarter note seems to occupy the space of the follow three beats of rests, making it more rhythmically stable than the preceding quarter notes. Additionally, the downbeat of m. 3 contains more metric stability than the preceding quarter notes. The motion of the unstable notes of m. 2 leading to the stable G2 in m. 3 exhibit metric magnetism.

Both rhythmic gravity and metric magnetism appear in the opening motif to "Welcome to Jurassic Park" from *Jurassic Park* (1993) (example 2.9).



Example 2.9. "Welcome to Jurassic Park" from *Jurassic Park* (1993)

In m. 1, the sixteenth notes on the upbeat of beat two lead to the following downbeat, which exhibits rhythmic gravity. Likewise, the sixteenth notes on the upbeat of beat four lead to the following downbeat. The propensity for these metrically weak notes (i.e., those occurring during beats 2 and 4) to move to metrically more stable notes demonstrates metric magnetism. The relative rhythmic quality of the notes also demonstrates rhythmic gravity. The longer note value of the first dotted-quarter note moving to the shorter sixteenth notes gives the feeling of falling forward into the next beat, which is beat three in this case. Both the metric qualities (i.e. metric magnetism) and the rhythmic qualities (i.e. rhythmic gravity) of beats one and two function as a

gesture that leads to the downbeat on beat 3. This example demonstrates how these two notions, while different in conception, often appear in conjunction. The melodic magnetism reinforces the notion of metric magnetism in this example. Leading into beat three, the melodically and metrically unstable leading tone is magnetically drawn toward the tonic, which both melodically and metrically more stable. The correlation of this metric magnetism to the melodic magnetism furthers the metaphor to the film previously demonstrated in example 2.7.

Inertia

Inertia is the third and final of Larson's musical forces. Larson refers to inertia as a musical force, noting that, in Newtonian physics, inertia is not actually a force.[58] Rather, it is a principle—Newton's first law of physics. Newton's first law states that objects continue to move in a state of constant velocity unless acted upon by an external net force. That is, *inertia* is the tendency of an object's mass to resist acceleration (i.e., change of momentum).[59] While inertia is technically not a force, Larson's point is well taken. By using the term 'inertia' as Larson does, one can envision the embodiment of Newton's first law with this tendency to resist a change in momentum, which itself acts as a resistant force that other forces must overcome to effect a change on the moving object.

In a musical sense, Larson defines *musical inertia* as "the tendency of a pattern to continue in the same fashion."[60] Like musical gravity and magnetism, he breaks down inertia into two basic types: melodic and rhythmic. A melody that continues in a direction that it is

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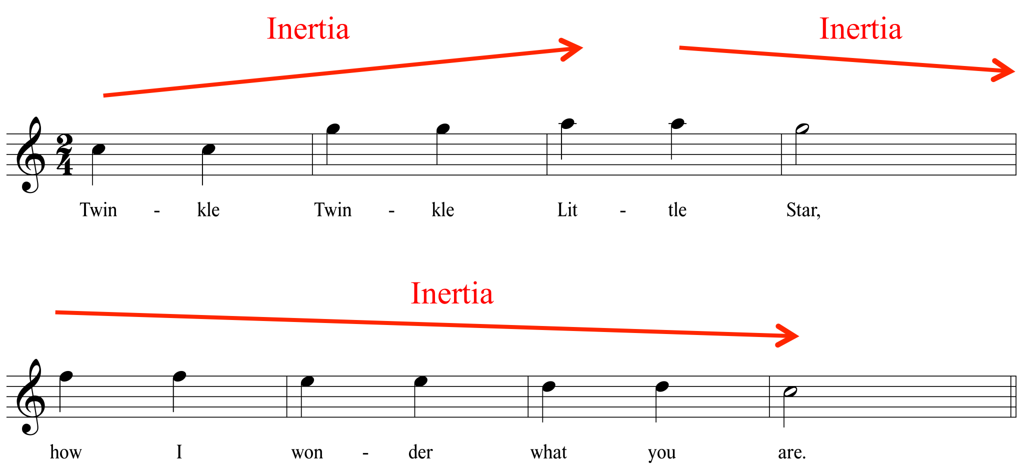
[58] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 23.

[59] Deeson, 210.

[60] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 143.

already moving—either ascending or descending—exhibits *melodic inertia*. Leonard Meyer describes a similar notion in his "law of good continuation."[61] Robert Hatten notes that, unlike Larson, Meyer's model is contingent upon a goal, likening it more to Larson's musical magnetism.[62] Inertia, as Larson describes it, causes a motion continually in a direction unless acted upon by some different force.

Consider once again his example of "Twinkle, Twinkle, Little Star" (example 2.10).



Example 2.10. "Twinkle, Twinkle, Little Star" First Phrase

The leap of a P5 from C5 to G5 continues to ascend afterward to A5. This interval from G5 to A5, a M2, is comparatively much smaller than the preceding P5, as sign of a weakened ascending melodic inertia. Both melodic gravity and melodic magnetism are weakening this ascending melodic inertia. The line reaches its peak at A5 before descending. If melodic inertia was the only force at play here, the line would ascend beyond the A5 to B5, then on to C5, and

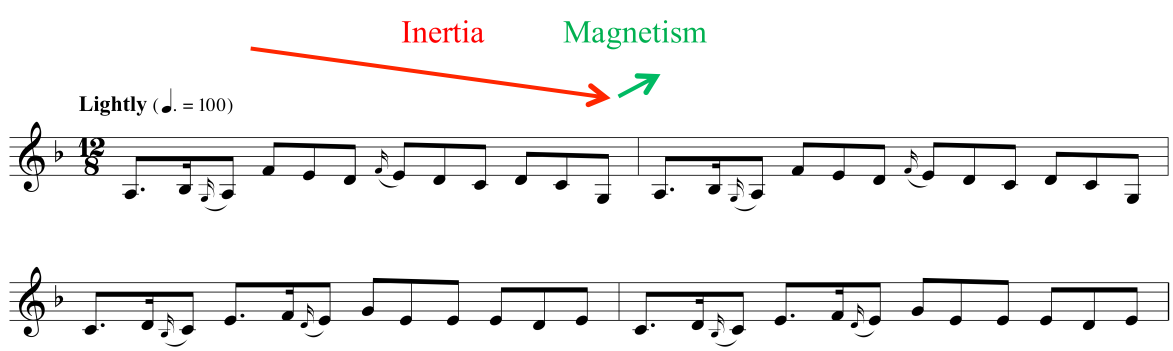
[61] Meyer, *Emotion and Meaning in* Music, 83-127.

[62] Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 116.

beyond, but the line returns to G5 as if giving into the ever-present melodic gravity and melodic magnetism.[63] As the melody descends, melodic inertia appears along a different vector.

In this scenario, the stability of C5 in m. 8 keeps the melodic line from descending any further beyond the tonic. Without the relative stability of the C5 in m. 8, the melodic inertia would cause the melody to continue descending to B4 or beyond. Hypothetically, if a weak melodic inertia were to push beyond C5, it would likely give out and the melody would ascend back to the tonic because of melodic magnetism on B4, the leading tone.

Trevor Jones's fiddle tune in *The Last of the Mohicans* (1992) demonstrates melodic inertia (example 2.11).



Example 2.11. "The Kiss" from *The Last of the Mohicans* (1992)[64]

The tune is set in D minor. In m. 1, following the m6 ascent from A3 to F4, melodic gravity is evident in the general descent of the melody. This descent creates melodic inertia. At the end of the first measure, rather than descending by step from C4 to A3 through B♭3, melodic inertia

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[63] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 88-89.

[64] This fiddle tune first appears in the film when Hawkeye kisses Cora for the first time. This music is titled "The Kiss" on the soundtrack, even though this music appears in conjunction with other narrative events. In general, this tune serves as a leitmotif for the love shared between Hawkeye and Cora.

causes the line to overshoot this goal point. The line leaps from C4 to G3 before melodic magnetism brings the melodic line back to A3 to begin the second iteration of this melodic material. The inertial overshooting of the melody helps perpetuate a forward momentum. This tune appears several times throughout the film, very notably for approximately nine minutes at the end. This last iteration of the theme appears as Duncan sacrifices himself to the Huron, freeing Hawkeye and Cora. After fleeing the Huron tribe, Hawkeye, Cora, Uncas, and Chingachgook attempt to rescue Alice from Magua and his band of warriors. Eventually, the tune ends when Chingachgook kills Magua. Even at the end of this long sequence with many repetitions of this thematic material, several block chords are required to halt the perpetual forward motion of the tune. The innate inertia and forward momentum of this tune corresponds to the efforts of the Mohicans to rescue Alice. Throughout this entire sequence, there is little talking and a great deal of running by the characters. The Mohicans, once they begin engaging Magua's warriors, hardly stop to fight. They simple push through them, much like the tune pushing through any sense of cadence or repose.

Rhythmic inertia, the second form of inertia, is the tendency of a rhythmic pattern to repeat itself.[65] Larson states, "If we hear a pattern of durations, then inertia leads us to expect that pattern to continue."[66] Larson argues that the rhythm of mm. 5-8 of "Twinkle, Twinkle, Little Star" gives into rhythmic inertia because it imitates the rhythm of the first half.[67]

Consider again Schubert's "Erlkönig," shown in examples 2.12 and 2.13. The repeated accompaniment pattern in "Erlkönig" repeats incessantly until the last three measures of the

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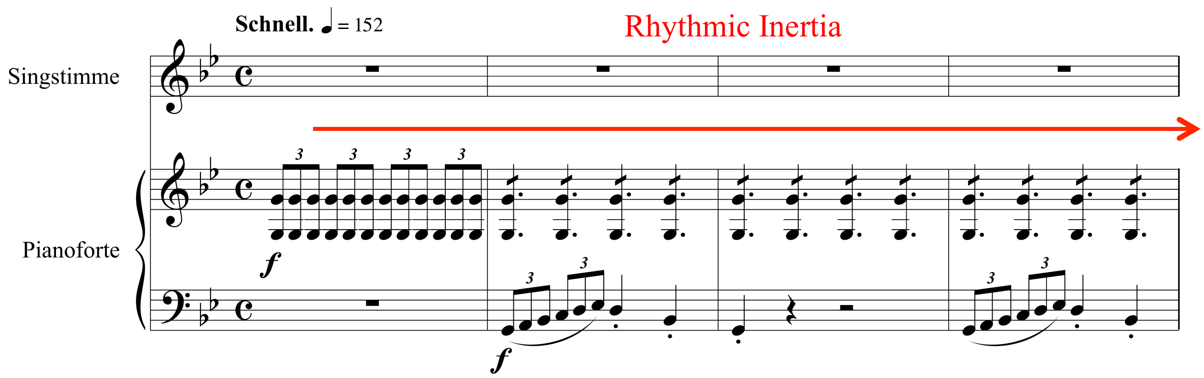
[65] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 143.

[66] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 143.

[67] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 97.

song. This rhythmic pattern famously signifies the gallop pattern of the horse's hoofs and rushing wind as it hastily carries its master and the master's ill son.[68] The incessantly repeating accompanimental pattern exhibits rhythmic inertia (and momentum). The piece begins with a measure of the triplet pattern stated alone, establishing the pattern as the stable backbone of the piece (example 2.12).



Example 2.12. Schubert, "Erlkönig" (mm. 1-4)

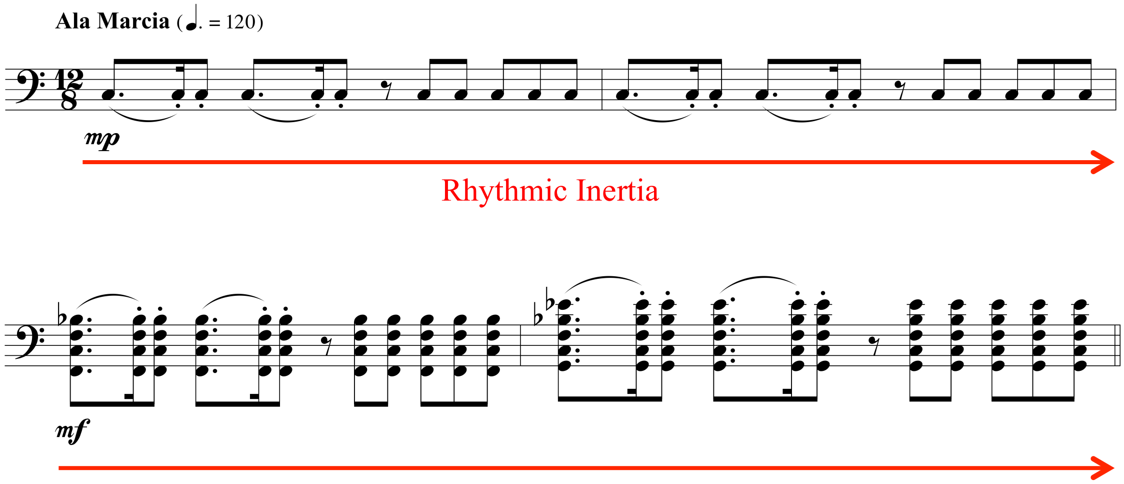
The pattern also symbolizes the angst of the father, who is rushing home to save his child. The boy is hallucinating (perhaps) and dying in his father's arms. Like the pattern, the father will not stop until the child is no longer ill and dying. The pattern ceases when the narrator states that the son is dead in his father's arms (example 2.13). This musical cessation of the pattern signifies that there is no longer a rush to save the child and perhaps even that the father has stopped the horse to mourn the loss of his child.[69]

[68] Donald Francis Tovey, "Schubert: Erlkönig," *Vocal Music*, vol. 5 of *Essays in Musical Analysis* (London: Oxford University Press, 1937), 195; William Kinderman, "Schubert's Tragic Perspective" in *Schubert: Critical and Analytical Studies*, ed. Walter Frisch (Lincoln, NB: University of Nebraska Press, 1986), 66.

[69] Kinderman, 70.

Example 2.13. Schubert, “Erlkönig” (mm. 144-148)

The theme from *Superman* (1978) demonstrates rhythmic inertia in the accompaniment rhythmic pattern that persists throughout the four-minute theme. Before the triumphant theme enters, the rhythm shown in example 2.14 repeats several times. The pattern is perpetual, continuing in the theme even when the rhythmic pattern is not explicitly stated. Once the triumphant Superman theme enters, this accompaniment pattern ceases to exist, however, echoes of the pattern ring on in the listener’s ear through the compound rhythm produced by the theme in conjunction with the accompaniment. This driving rhythm and the perpetual motion parallel Superman, who is practically unstoppable by any force.



Example 2.14. Accompaniment to the Theme in *Superman* (1978)

Nonfundamental Forces and Related Concepts

Larson uses only the metaphors of gravity, magnetism, and inertia to describe musical gestures, particularly those of musical motion. He acknowledges that there are other metaphors, which one could use. He states, "I do not claim that gravity, magnetism, and inertia are the only forces that shape melodic expectations. I do not claim that musical forces and musical motion are the only metaphors that inform music discourse and musical experience."[70] Larson statement suggests that other models may be of benefit in describing music, perhaps even models that overlap those already mentioned.

Rotational Forces: Centripetal and Centrifugal Force

Two basic forces are unique to the concept of rotation: centripetal and centrifugal forces. These two forces act in opposition to one another. *Centripetal force* is the 'center-seeking' force needed to maintain an object moving along a curved path. According to Newton's first law of

[70] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 3.

force, moving objects will travel in a straight line unless a net outside force acts upon it to change its direction.

Centrifugal means 'center-fleeing.' *Centrifugal force* is caused by inertia being continually redirected in a rotation rather than acting in a straight line. One perceives of centrifugal force as acting in opposition to centripetal force, although this is not actually the case. Centripetal force is a real force, whereas centrifugal force is a fictitious force. A fictitious force is any apparent force that acts on all masses whose motion is described using a non-inertial frame of reference.[71] To put this into simpler terms, imagine a ball attached to a pole (i.e., axis of rotation) by a string. If the ball revolves around the pole, a fictitious force is present (shown as a top view in figure 2.2).

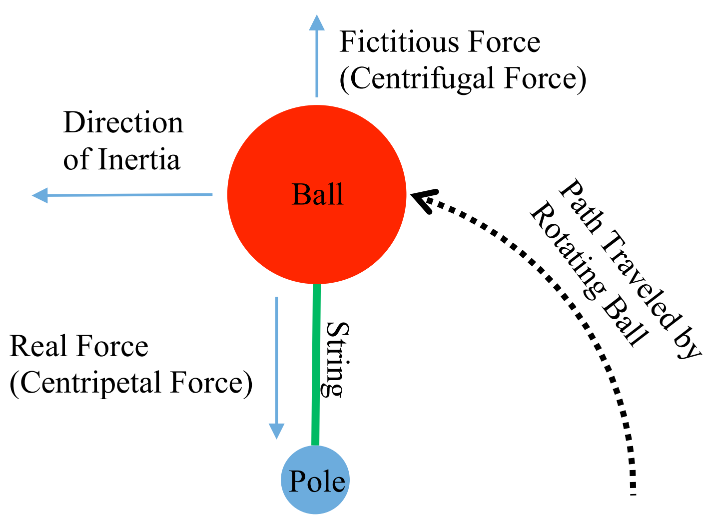


Figure 2.2. Centripetal Force Physical Model

After the rotation has begun, the only real force present is the centripetal force located in the string, which keeps the ball from flying away from the pole. However, from the perspective of

[71] Deeson, 167.

the ball, which is in a non-inertial frame of reference, an apparent force is pushing it away from the pole, namely centrifugal force. This apparent force is not a real force, but rather just the combination of the real force resulting from the string and inertia.

To demonstrate this notion, imagine if one were to cut the string while the ball was rotating around the pole (see figure 2.3).

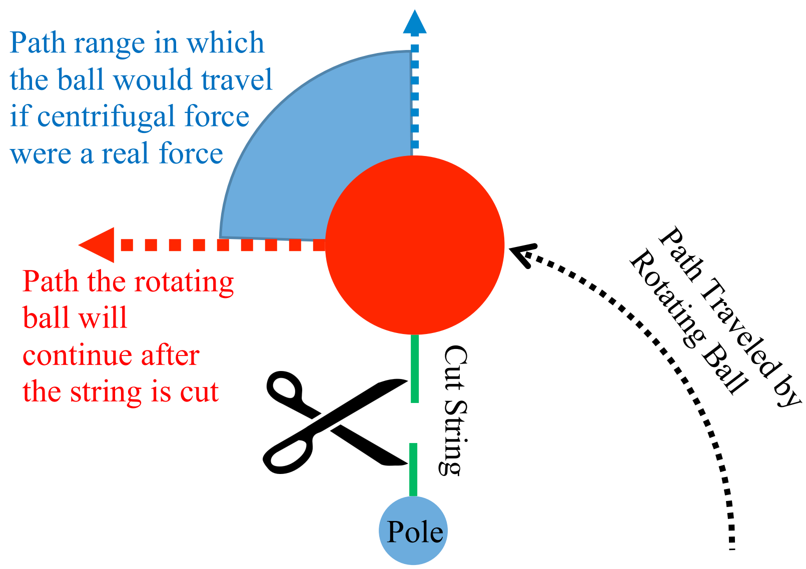


Figure 2.3. Demonstration of Centripetal Force as a Fictitious Force

The ball would fly off in a straight line in the direction of rotation. The path of the ball when one eliminates the centripetal force (i.e., cuts the string) demonstrates how centrifugal force is not a real force. If centrifugal force were a real force, the ball would simply fly off in a direction not resulting from rotation, but rather, in a direction outward from the pole. Eric Deeson states that it would be "an invalid use of Newton's third law to claim that centrifugal force is the reaction to

centripetal force as both would act on the same object."[72] While centrifugal force is not a real force, it is a perceived force. As an apparent force with a perceived effect, centrifugal force model may provide a unique perspective as a metaphor for music.

Arnold Schoenberg conceptualized centrifugal and centripetal forces as relating to tonal area relationships in music. Tonal regions, their relationships to one another, and the motion between them is an important concept in his tonal theoretical writings.[73] In their commentary to *The Musical Idea,* Patricia Carpenter and Severine Neff note that "Schoenberg viewed tonality as a necessary conflict, a battlefield upon which the struggle between centripetal and centrifugal foces is played out."[74] For Schoenberg, as a monotonalist, centrifugal force represents the tendency or motion away from the initial tonal area of a work. Centripetal force, on the other hand, represents the tendency or motion toward the initial tonal area. Schoenberg states, "The centripetal function for progressions is exerted by stopping centrifugal tendencies, i.e., by establishing a tonality through the conquest of its contradictory elements. *Modulation* promotes centrifugal tendencies by looseneing the bonds of affirmative elements."[75] Ernst Kurth and Blake Howe describe these motions to and from a tonality as centrifugal and centripetal forces.[76]

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[72] Deeson, 61.

[73] Schoenberg, *Structural Functions of Harmony*, 19-23 and 30-34.

[74] Arnold Schoenberg, *The Musical Idea and the Logic, Art, and Technique of its Presentation*. Trans. and ed. Patricia Carpenter and Severine Neff (Bloomington, IN: Indiana University Press, 2006), 62.

[75] Arnold Schoenberg, *Structural Functions of Harmony*, ed. Leonard Stein (New York: W. W. Norton, 1969), 2. The emphasis on "modulation" is Schoenberg's.

[76] Rothfarb, *Ernst Kurth as Theorist and Analyst*, 200; Blake Howe, "The Allure of Dissolution: Bodies, Forces, and Cyclicity in Schubert's Final Mayrhofer Settings,"*Journal of the American Musicological Society* 62, no. 2 (Summer 2009): 288-9; Blake Howe, "Music and the Embodiment of Disability" (PhD diss. The City University of New York, 2010).

There may be a balance or imbalance between these opposing forces.[77] Schoenberg writes in *Foundations of Musical Composition*, "when substitute 'altered' or 'chromatic' chords are used, the tendency of the harmony may become 'centrifugal' – may produce modulations, to balance which becomes a problem."[78] In *Structural Functions of Harmony*, he states, "the centripetal function for progressions is exerted by stopping centrifugal tendencies, i.e., by establishing a tonality through the conquest of its contradictory elements. *Modulation* promotes centrifugal tendencies by loosening the bonds of affirmative elements."[79] Schoenberg's conception of centripetal and centrifugal forces not only creates individual force models, but opposition between these forces provides larger conceptual model for understanding tonal relationships.

For Schoenberg, every composition consists of a question or problem that must be resolved.[80] Concerning harmonic problems, he states that "there is a problem in every harmonic phrase no matter how short that phrase: straying from and then recovering the path to the principal tone."[81] Describing a similar notion in his concpetion of melodic problems, he states, "Every succession of tones produces unrest, conflict, problems. One single tone is not problematic because the ear defines it as a tonic, a point of repose. Every added tone makes this

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[77] David W. Bernstein, "Nineteenth-century Harmonic Theory: The Austro-German Legacy," from *Cambridge History of Western Music Theory,* ed. Thomas Christensen (Cambridge, United Kingdom: Cambridge University Press, 2002), 805.

[78] Schoenberg, *Fundamentals of Musical Composition*, 59.

[79] Arnold Schoenberg, *Structural Functions of Harmony*, 2.

[80] Jean Christensen and Jesper Christensen. "My Subject: Beauty and Logic in Music" from *From Arnold Schoenberg's Literary Legacy: Catalog of Neglected Items* (Detroit, MI: Harmonie Park Press, 1988), 99.

[81] Schoenberg, *Theory of Harmony*, trans. by Roy E. Carter from *Harmonielehre*, 3rd ed. (London, England: Farber & Farber, 1978), 130-31.

determination questionable."[82] The musical idea of a tonal composition is inherent in the tonal problem, a dissonance—often a chromatic tone—in the *Grundgestalt* (basic idea) of the composition that does not resolve directly as expected.[83] The composer must neutralize the tonal problem for the composition to properly end, a process that Schoenberg referred to as the musical idea. He states:

> The primitive ear hears the tone as irreducible, but physics recognizes it to be complex. In the meantime, however, musicians discovered that it is *capable of* continuation, i.e., that *movement* is latent within it. That problems are concealed in it, problems that clash with one another, that the tone lives and seeks to propagate itself.[84]

This tonal problem demonstrates centrifugal force, pulling the listener's attention away from the initial tonal area. The process of neutralization demonstrates centripetal force in solving the problem and returning the piece to its original tonal area before the composition concludes.

Phillip Murray Dineen analysis of the opening movement of Beethoven's Piano Sonata No. 1 in F minor demonstrates this tonal problem and the inherent centripetal and centrifugal forces (example 2.15).[85] The tonal problem centers on the leading tone, E♮, which appears in m. 5 and immediately resolves up to the tonic. M. 8 is the end of the theme, which contains an E♮ that does not resolve upward to the tonic (i.e., is left unneutralized). In the following transitional measures, E♭ supplants the E♮. With the arrival of the E♭, one immediately feels that the tonal balance has been shifted away from F minor to somewhere else.

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[82] Schoenberg, *Fundamentals of Musical Composition*, 102.

[83] Arnold Schoenberg, " New Music, Outmoded Music, Style, and Idea" (1946) from *Style and Idea: Selected Writings of Arnold Schoenberg*, ed. Leonard Stein, trans. Leo Black (Berkeley, CA: University of California Press, 1975), 122-23.

[84] Schoenberg, *Theory of Harmony*, 313.

[85] Phillip Murray Dineen, "Problems of Tonality: Schoenberg and the Concept of Tonal Expression" (PhD diss., Columbia University, 1989), 231-243.

Example 2.15. Beethoven, Piano Sonata No. 1 in F minor, I. Allegro (mm. 1-24)

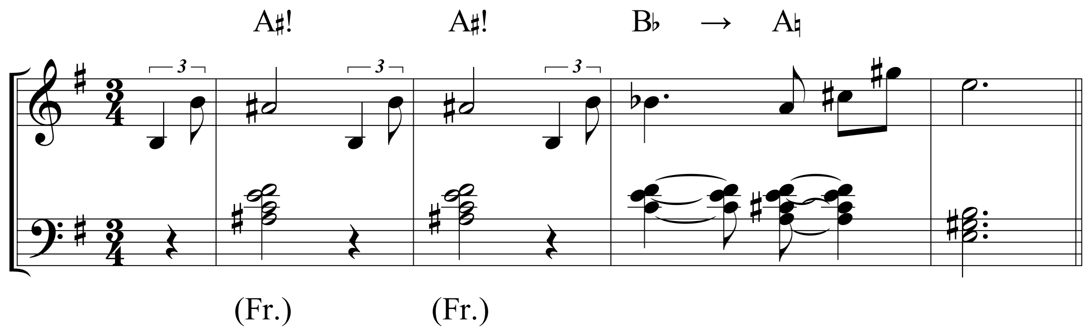
The sequential statements of the turn motif increase this feeling of moving away from the initial tonal area. This motion away from the F minor is centrifugal force.

The repetition of this opening passage in the recapitulation demonstrates centripetal force. In the exposition, the transition starts with an arpeggiated C minor triad, exemplifying centrifugal force. In m. 109 of the recapitulation, however, this C minor triad shifts up a fourth to become an F minor triad (example 2.16). The F minor triad replaces the C minor triad and

neutralizes the centrifugal force of the E♭, which pulled the piece away from the initial tonic. This adherence to the original tonic and refusal to drift out into another key demonstrates centripetal force.

Example 2.16. Beethoven, Piano Sonata No. 1 in F minor, I. Allegro (mm. 101-119)

The *Bride of Frankenstein* (1935), scored by Franz Waxman, uses this idea of strong centripetal forces for an effect (example 2.17). The musical excerpt shown above is in E minor, a key that is evident only in the music that precedes or follows the Bride's motif. The dissonant A♯—part of a French augmented-sixth chord—stands in contrast to this key, establishing an exotic, uncanny feeling.



Example 2.17. Bride of Frankenstein's Leitmotif from *The Bride of Frankenstein* (1935)

This A♯ exhibits centrifugal tendencies, as it pulls the melody away from the tonal center (E minor), perhaps evoking B as a tonal center, A♯ being the leading tone. After three repetitions of the initial three-note motif, the motif moves to A♮ in m. 3. This downward motion to A♮ establishes a back-relating neutralization of sorts, indicating that what preceded the A♮ could be understood as a B♭, not an A♯.[86] The motion of B♭ down to A♮ establishes a centripetal balance to the previous centrifugal tendencies. The discomfort caused by A♯ and its centrifugal tendencies parallels and amplifies the unease associated with the appearance of the Bride. As with many leitmotifs of early film, this music appears each time the Bride is shown. A portion of this leitmotif appears one final time after the Monster pulls the lever, causing the building to collapse, which kills the Monster, the Bride, and Dr. Pretorius. Despite earlier resolutions, the A♯ returns at the end of the film, threatening the tonality of the piece yet again. In the last seconds of the film, as Dr. Henry Frankenstein and Elizabeth looking on from a safe distance as the building collapses, B♭ replaces A♯, neutralizing the musical threat to tonality, as well as signaling the destruction of Dr. Pretorius and his demented experiments (i.e. the Bride and the Monster).

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[86] The pitch in question is transcribed as a B♭ in example 2.17 to show the voice leading down to A♯.

Torque

Another concept related to physical rotation is torque. *Torque* is "the turning effect on an object of a force that does not act through the pivot."[87] Additionally, torque is a measurement of how much force acting on an object causes that object to rotate. Like inertia, torque is not a force itself. Rather, torque is a tendency or byproduct of an applied force to rotate an object about an axis, fulcrum, or pivot.

Though closely related to the rotational ideas of centripetal and centrifugal force (both physically and musically), torque is not a concept mentioned by Schoenberg. Torque is not a force, however, the metaphor this model presents of this force's tendency is useful. As torque is not a force, it cannot cause work; however, it is present when a force causes an object to rotate. The tonal problem applies a force (whose byproduct is torque), causing the composition to follow a rotational path through other tonal areas. That is, from a monotonalist's perspective, the composition is a musical object that rotates through various tonal areas, ideally ending in the same key in which it began.

Torque can exist without rotation, such as when the applied force producing torque may not be strong enough to overcome resistance and induce rotation. In the musical analogy, this means that modulation is not necessary for the existence of musical torque, because torque is the tendency or byproduct of a force that causes rotation of that object. In relation to the tonic, all other functions are dissonant and therefore exhibit some amount of musical torque. In some cases, the initial tonal problem may cause an immediate shift to a new tonal area; in others, more torque may be required to cause a shift to a new tonal area. In either case, torque is present with the first appearance of a tonal problem.

[87] Deeson, 475.

In the case of the Beethoven Piano Sonata No. 1 (examples 2.15 and 2.16), some amount of torque is present from the very beginning of the movement, as it starts off-tonic and contains a variety of nontonic tones and harmonies. This amount of musical torque, however, is not enough to induce modulation (i.e. musical rotation). One feels a greater amount of musical torque in the unresolved E♮ of m. 8, placing the music on the verge of modulation. Musical rotation (i.e., the transition section) begins in m. 9 with the arrival of the C minor triad, which contains E♭.

Musical torque appears in the A♯ of the Bride's leitmotif from *Bride of Frankenstein*. Like the Beethoven Piano Sonata No. 1 example, the torque presented by the A♯ in the *Bride of Frankenstein* (1935) does not lead to modulation between tonal areas. One feels the effect of torque in the conflict between musical centrifugal and centripetal forces nonetheless. This torque creates the feeling of unease, and the release of the torque as a B♭ resolves to A♮ gives some sense of a return to normalcy. The musical rotation (life for the protagonists) comes to a state of rest after the Bride is dead and Dr. Pretorius' experiments at an end.

Normal Force

Normal force is the reaction force between an object and a surface that are in contact with one another. This reactionary contact force arises from a surface being acted upon by an object, opposing the force of contact. Normal force is that force which prevents (or attempts to prevent) an object from penetrating a surface.

As a contact force, normal force opposes the force of an object that pushes against a surface. Because normal force can oppose any force of motion, normal force can describe most any situation where musical conflicts exist. In considering the musical model of normal force, the idea of opposing forces or reactionary forces becomes central. In this way, the normal force

model has much in common with that of centripetal force, yet there are signification differences. The rotational models only consider one object in rotation and not the relationship of two objects with opposing forces, and thus one must view them simply as opposing vectors. Because normal force requires two objects in contact with one another, one may view this model as consisting of a *barrier* or *container* having another object forced upon it. The barrier keeps an object from passing through its surface. This distinction may allow for a different perspective in the description of the relationship between certain conflicting musical objects.

Like centripetal force, one can perceive of normal force as a reactionary force that opposes a modulation-inducing force (i.e., tonal problem or centrifugal force). In her article "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the conceptualization of Music," Janna Saslaw builds on Hugo Riemann's conception of modulation by describing keys as musical containers.[88] One can view a key as a container in which the notes belonging to that tonal area are located. As Saslaw points out, we describe passages of tonal music, for instance, as being *in* a key.[89] Riemann (via Saslaw), primarily uses this modeling of key containers to discuss modulation. The normal force modeling described here differs slightly from Riemann's modulation model and, to an extent, the philosophical notion of tonal area motion. Rather than discussing the conflict or motion between two containers (i.e., modulation), the normal force model focuses on the conflict between a tonal-area container and chromatic tone. This model labels such chromatic tones as "outside tones," because they are foreign to the prevailing key and thus does not belong in the container. As a container, the tonal area presents

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[88] Janna Saslaw, "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the Conceptualization of Music," *Journal of Music Theory* 40, No. 2 (Autumn 1996), 217-243.

[89] Saslaw, "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the Conceptualization of Music," 226.

a certain barrier that prevents tones from outside the tonal area from entering its boundaries. That is, the tonal area possesses a certain internal force, which presents outside tones from destroying the sense of tonal relationships and functions of tones within the container. To enter the container, an outside tone would have to penetrate the container's barrier, thus breaking the container.

For instance, if an F♯ were to penetrate the C-major container, the tones in the tonal container would no longer be those exclusively belonging to C major; thus, the container would no longer be the key of C major (figure 2.4). The force applied by F♯ to the surface of the C-major container has overcome the normal force of the container's surface, which resisted the F♯.

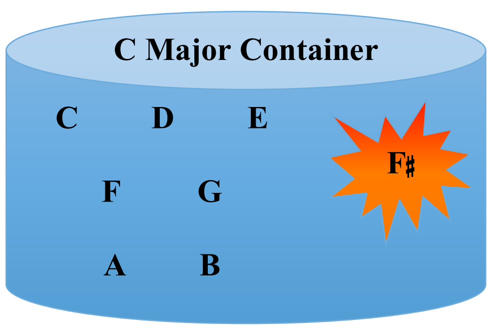

Figure 2.4. Container Broken by a Note Outside of Key

The container represents a listener's ability to maintain a tonal area, C major in this case. Note that not all chromatic tones negate one's perception of a tonality. If one maintains the tonality in the presense of one or more chromatic tones, the container is not broken. The container and the outside note(s) conflict with one another. If one loses the sense of tonality, then the container is broken.

The normal force model is not always a case of absolutes, in fact, it rarely is. This model does not simply demonstrate an outsider as being an outside tone or having destroyed any sense of a tonal center. Before any departure from a prevailing key, varying shades of grey are evident in the conflict between these two opposing musical objects (e.g., prevailing tonality versus the tonal problem). Consider the scenario where F♯ is applying force against a key container (e.g., C major). Figure 2.5 demonstrates how, in a monotonal work, the F♯ conflicts with the C major container. The normal force resistance is proportional to the applied force of the outside tone (that is, to an extent). When the applied force is greater than the container, the container breaks. This limitation is simply the listener's ability to retain the tonal area in their ear.

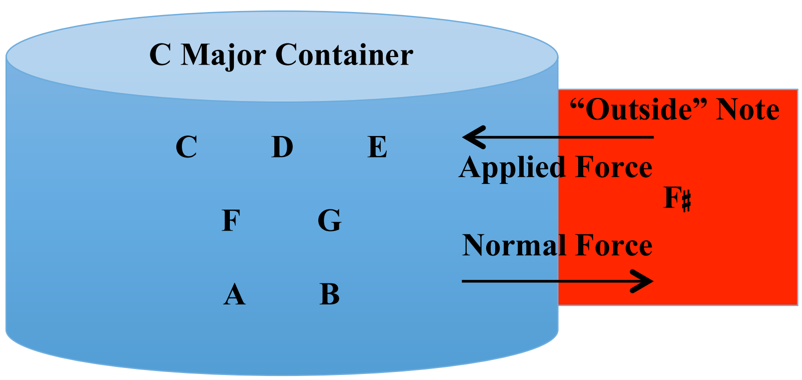

Figure 2.5. Forces Applied by Key Container and Note Outside of Key

In the *Bride of Frankenstein* (1935) example shown previously, A♯ does not belong to the key of E minor (example 2.17). If E minor is a tonal container, then one can perceive A♯ as an outside tone that is seeking to penetrate—or break—the container. A♯ applies a force to the E minor tonal container, which applies an equal amount of normal force on A♯. In this case, the force applied by A♯ is not strong enough to break the E minor container. A♯ is neutralized and the stress resulting from the exchange of opposing forces is relieved. Concomitantly, the

narrative stress is relieved as both Dr. Frankenstein and Elizabeth have safely escaped death and may presumably live happily ever after.

Continuum Mechanics and Related Concepts

Continuum mechanics involves the mechanical behavior of materials modeled as a continuous mass rather than as discrete particles. That is, continuum mechanics concerns forces contained within an object, not between multiple objects.[90] The concepts of stress, strain, compression, tension, shear, torsion, elasticity, plasticity, friction, and drag fall under the branch of continuum mechanics. This branch of study is rather vast and includes more concepts than those listed here, however, this list provides a sufficient number of models and concepts for analyzing the musical examples in this dissertation.

Concepts from continuum mechanics provide new and unique ways of describing musical gestures. In fact, many terms connected with this branch of study are commonly used to describe music. For example, descriptors such as stress or tension may describe energetic characteristics of a musical excerpt, or one's cognitive responses to a musical excerpt. In either case, the two meanings of these terms (i.e., musical and cognitive) are not entirely separate; in fact, the two are very much the same. Lee Rothfarb writes the following regarding Kurth's conception of chords as more than just sound:

> …for Kurth chords are not simply sound (*Klang*) but rather primarily urge (*Drang*). The agenda for music theory then is clear: "to observe the *transformations* of certain *tension* processes into *sounds*. Only in this way is it possible to awaken…an empathy *(Einfühlen*) and sympathetic reverberation with the animated *created forces*, and so to restore once again the connection…between theory and art."[91]

[90] This statement assumes that such objects are greater in size than the molecular level.

[91] Kurth, *Romantische Harmonik*, 2, translated by Rothfarb in "Energetics," 941-942.

Again, these energies and forces are figurative. They derive meaning from one's experience of the tones or rhythms. Using such terms as 'stress' or 'tension' to describe musical gestures is in itself a metaphorical process.

All of the previous models dealt with an object in motion or reacting to another object. The remaining models concern the mechanics within an object, particular an object undergoing change. Such changes require motion and forces; therefore, this dissertation considers this branch of musical metaphor to be nested within the larger studies of musical energetics and gesture. Alongside bodily movement, Mark Johnson lists object manipulation as a descriptor of musical experience.[92] Alongside the existing bodily movement metaphors, object manipulation metaphors provide new tools for describing musical experience and meaning.[93]

The use of the term "musical object" is intentionally ambiguous; it may consist of a pitch, interval, chord, rhythm, motif, or potentially something as large as a sonata movement. The continua described in these models are the energies associated with and produced by the musical gesture. For instance, the continumm that is expanded in the tension model is not the pitches of an interval, but rather, the energy between those two pitches. Neither does the continua consist of every possible pitch in the continuous pitch space between the two pitches of the interval. Similarly, Kurth describes the melodic element of kinetic energy residing in the motion through

[92] Johnson, "Embodied Musical Meaning," 95 and 100-1. "Object manipulation" largely refers to image schemas that deal with one's orientation in and relationship to the world. Another interpretation, however, refers to the manipulation the internal structure of the object itself. Any manipulations of the object will involve certain forces and perhaps changes within the object. Object manipulations, in the general sense, are perceptible by humans; therefore, they provide legitimate ways of describing music metaphorically.

[93] Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 99. In describing foundational principles of human gesture, Hatten cites Shuring and Williams, who describe metaphorical stresses such as compression, tension, and shear in relation to other physical laws.

the tones and not in the individual tones.[94] It is important to remember that these energies are perceived psychic energies. They are not properties of the sound itself.

The idea of examining the musical object opens the doors to different musical concepts that may be difficult to describe with the previous models. The previous models of bodily motion (e.g., Larson's) primary concern kinetic energies of music. Continuum mechanic models provide new tools for describing the potential energies of music, as well as their kinetic implications.

Deformation, Stress, and Strain

A primary focus of continuum mechanics is the study of the deformation of objects. *Deformation* is the change in shape of a solid object. There are four main types of deformation: compression (squashing), tension (stretching), shear (slanting), and torsion (twisting).[95]

When an applied force deforms an object, stress and strain are present. *Stress* is the measurement of the deforming force applied to an object, while *strain* is the measurement of the resulting change in the object's shape. "It is normal to describe [stress] in terms of the type of deformation (strain) that could result: thus tensile, compressive, shear stress."[96]

The term "deformation" is often associated with something grotesque or queer; thus, the term often carries with it a negative connotation. When using deformation as a metaphor, it is

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[94] Ernst Kurth, *Grundlagen des linearen Kontrapunkts: Bachs melodische Polyphonie*, 3rd ed. (1917), Reprint, (Hildesheim, Germany: George Olms, 1977), 18. Rothfarb also comments on the similarities and connections between Kurth's writings and those of Gestalt psychologists, particuarly Kurt Koffka. Lee Rothfarb, ed. and trans., *Ernst Kurth, Selected Writings* (Cambridge, United Kingdom: Cambridge University Press, 1991), 20-22.

[95] Bending is not a type of deformation, as it is actually a mix of compression and tension.

[96] Deeson, 447.

best not to think of deformation as a value judgment of a musical object. The term—as used in this dissertation—simply refers to the state of the object after a change. A deformation does not always imply the weakened state of a structure. Deformation does not necessarily imply that the object is lesser than it would have been otherwise.

In the metaphor of music, deformation is dissonance. A state of deformation assumes a previous, undeformed state, often a resting state. In this sense, deformation is relative. One can only understand deformation in terms of the change that the object experiences. That is, for deformation to exist there must be some previous state or standard to which one compares the now-changed object. The deformation requires an applied force. In many cases, the source of these applied forces is unclear. Hatten states, "Larson's model could be usefully complemented with the addition of a perceived or implied *source* of gestural energy—in many cases, the motivating force of an implied *musical agent*."[97] The composer's will and other external factors (e.g., filmic factors) influence these musical energies and forces. The metaphorical link between music and film helps one explain the source of compositional decisions in each.

Like deformation, dissonance is relative. To understand dissonance, there must be some understanding of consonance. If everything in a piece is dissonant, then nothing is dissonant. In music, one may refer to certain intervals as being either consonant or dissonant. This practice assumes a stylistic standard by which one compares such intervals.[98] Out of the context of the music, it is difficult to say if an isolated musical entity is consonant or dissonant. The forthcoming section on tension discusses the notion of relative consonance and dissonance further.

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[97] Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 115.

[98] This is the problem that many perceive in the absolute interval qualities described by Hindemith's series 2.

Where there is deformation, there is stress and strain; therefore, where there is stress and strain, there is dissonance. In the musical metaphor, stress is the measurement of the musical force producing the dissonance. Recall that strain is the measurement of how much something is deformed. If deformation is dissonance, then music strain is the measure of dissonance in a deformed musical object. Neither musical stress nor musical strain is easily quantifiable, as consonance/dissonance is not readily quantifiable. For instance, one not only perceives the dissonance of an interval in terms of its size and position within a scale, but also in terms of its relationship to other intervals around it. Quantifying such relationships is beyond the scope of the current study. The purpose of the study, however, is to create a context for understanding the concepts of stress and strain as musical metaphors. Ultimately, one's ears more easily compare the relative consonance/dissonance of two distinct musical objects. Such an approach will suffice for the consideration of musical stress and strain in this dissertation. Musical deformation, stress, and strain establish a terminological and metaphorical basis for the various continuum mechanics models that describe changes in a musical object.

Compression

Compression is "the reduction in volume of a sample of matter that follows from the particles being moved closer together as a result of an outside force, or pressure."[99] One can view an object that occupies less space than previously due to an applied force as being under compression. In this sense, compression is relative to a previous state. The notion of compression may or may not imply the tendency of that object to return to its previous state.

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[99] Deeson, 76.

As a musical metaphor, the listener subconsciously compares the compressed musical object to an undeformed version of that same object. For this comparison, there must either be a previously undeformed form of the object present or a hypothetical situation that presents itself as undeformed. One perceives musical compression when comparing a consonant interval to a smaller, dissonant interval. The smaller, dissonant interval often seeks to return to its previous resting state, that is, the compressed interval seeks to resolve to the larger, consonant interval. Whether the compressed interval actually resolves or not is a different matter.

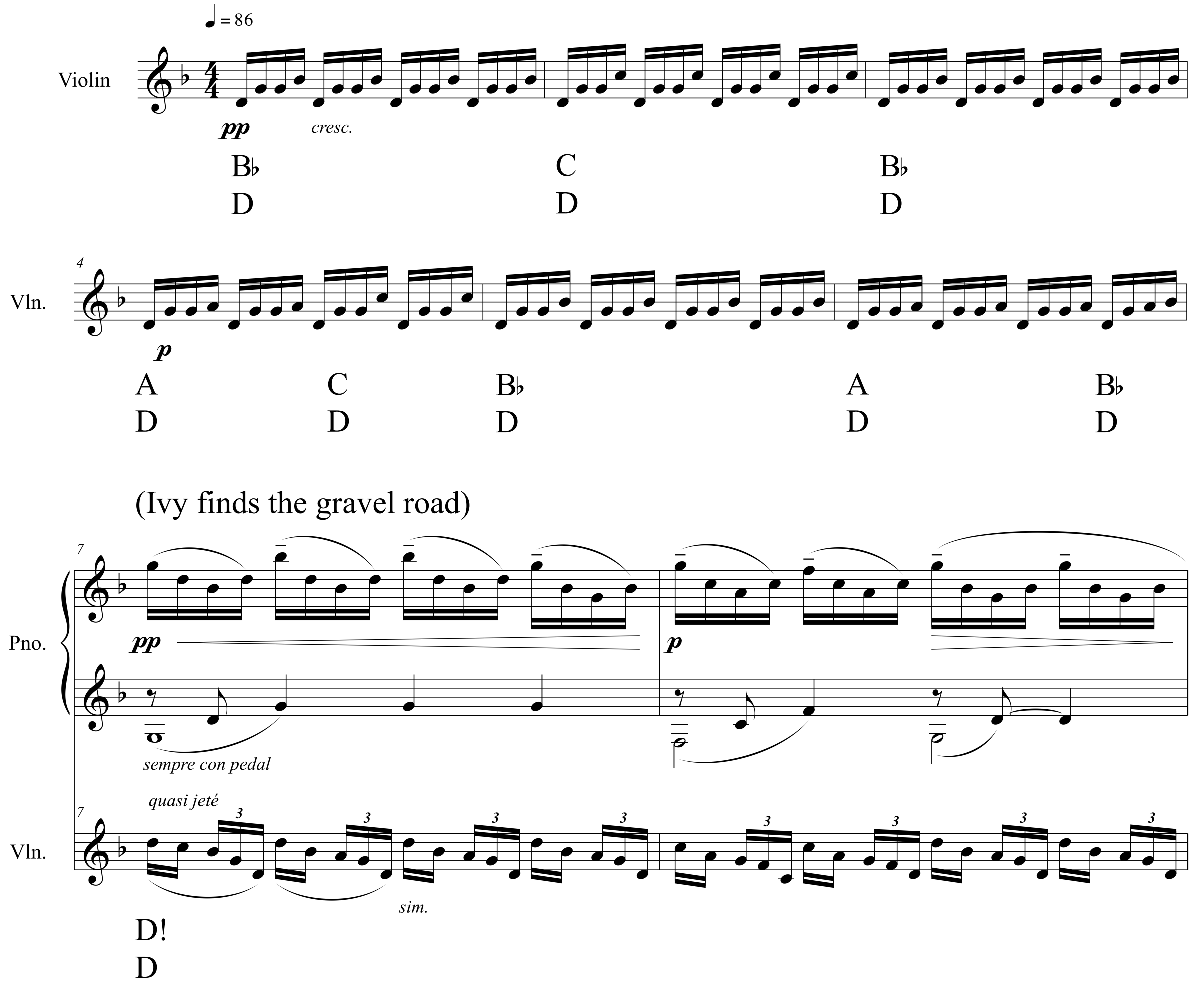
An augmented-sixth chord naturally embodies this notion of musical compression. The distance between ♯$\hat{4}$ and ♭$\hat{6}$ form an A6, which naturally seeks to resolve outward to the octave. Consider the Italian augmented-sixth chord in Beethoven's Coriolan Overture, op. 62 (example 2.18).

Example 2.18. Reduction of Beethoven, Coriolan Overture, op. 62 (mm. 15-20)

Beginning in m. 15, the orchestra plays the melody in octaves. The fact that the melody appears in octaves establishes this consonant interval in the listener's ear, something to which one may compare a later dissonance. In m. 19, the succession of octaves breaks and an Italian augmented-sixth chord appears in m. 20. Compared to the octave, the augmented sixth is compressed. The F♯ and A♭ of the augmented sixth subsequently resolve outward to the more consonant octave on G, confirming the hearing of these two intervals in comparison to one another.

The music of the "Gravel Road" scene from *The Village* demonstrates a similar use of musical compression, although it is less dissonant and more drawn out. The scene begins with Lucius lying wounded in a bed. His only hope of survival is someone obtaining the necessary medicine elsewhere outside of the village. Example 2.19 is an excerpt of the solo violin ostinato that accompanies the opening of this scene. The harmony outlined by this ostinato is a second inversion G minor chord. The top note (B♭) undulates back-and-forth between C and A, never reaching D to create the octave above the lowest note of the ostinato. Ivy, a blind girl and Lucius' girlfriend, is amongst a group sent to find medicine for the ailing Lucius. The group encounters a mythical creature and abandons Ivy out of fear. Blind and alone, Ivy wanders through the woods to the find medicine. Like Ivy, the upper voice of the ostinato pattern wanders, searching for its goal. In m. 7, the ostinato achieves octave Ds as the piano takes over the solo role and the violin ostinato becomes the accompaniment. The octave Ds occur in the solo violin part as Ivy finds the gravel road that will lead her to the towns where she will find medicine to save Lucius. The achievement of this musical goal signals hope for Ivy, that she may after all find the medicine to save Lucius. The piano melody is centric on G5, but quickly moves away from this tonal stability, wandering for some time but only resolving to an implied

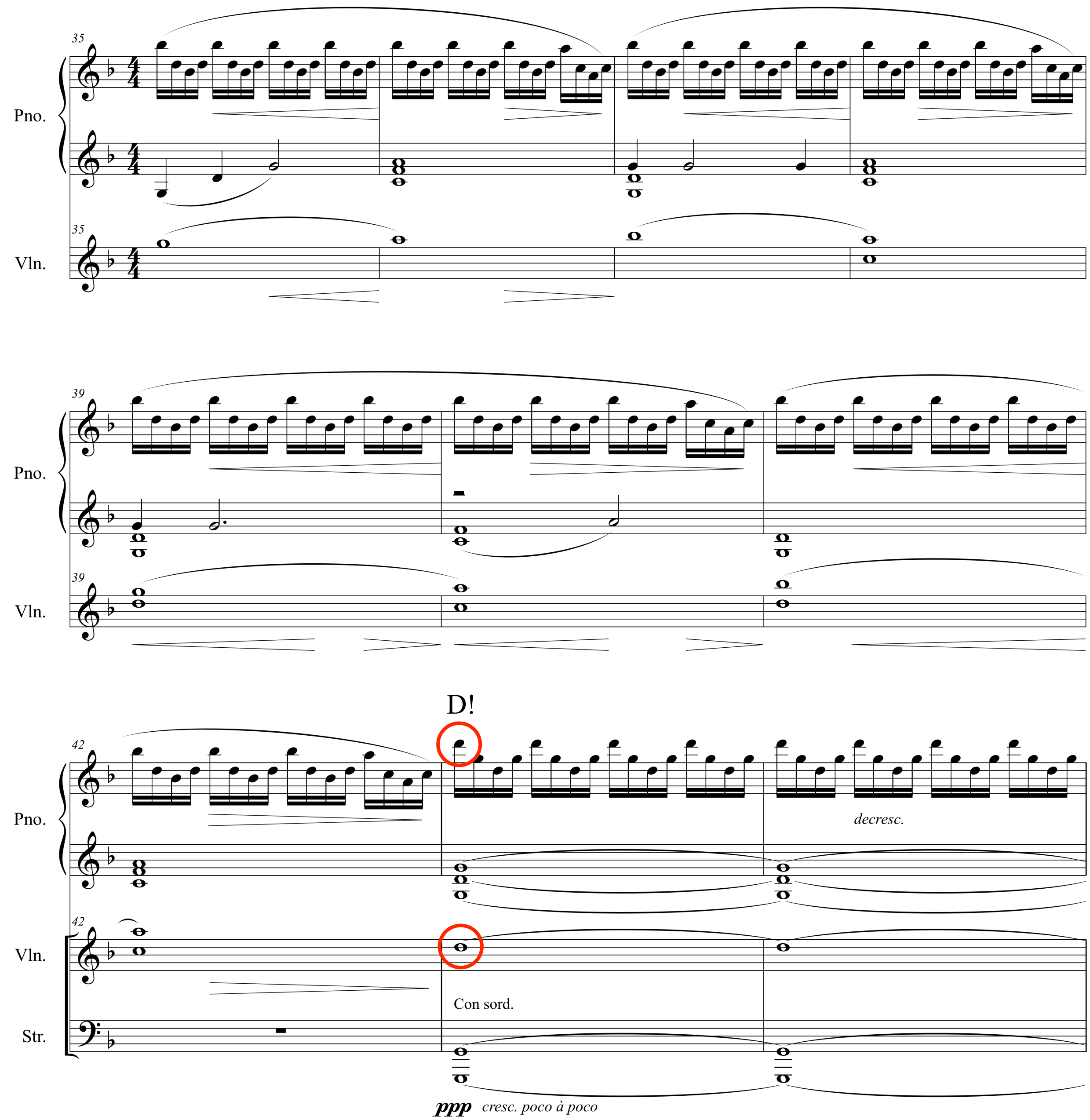
G an octave lower. This melodic and metric wandering signifies Ivy's continued search for help. After this implied resolution, the violin and piano switch roles again, the violin taking over the solo melody with the piano ostinato becoming the accompaniment.



Example 2.19. "The Gravel Road" from *The Village* (2004) (m. 1-8)

Following a wandering of its own, the violin eventually resolves to G4. The violin then repeats the final bars of this wandering passage an octave higher, ending on G5 (beginning of example 2.20).

(Ivy runs into the wall)



Example 2.20. “The Gravel Road” from *The Village* (2004) (m. 35-44)

This resolution occurs when Ivy runs into a wall at the end of the gravel road. She searches around quickly trying to find a way around the wall. Despite the earlier resolution, the melody continues to wander around, moving up to A5 and B♭5, never truly settling. When Ivy cannot

find a way around the obstruction in her path, she begins to climb over the wall. The solo violin settles on D5 just before the scene changes and the song ends. The piano accompaniment undulates between Ds in what is presumably the G minor chord (minus the third). The appearance of D again signifies hope that Ivy will save Lucius. The melodic compression that comprises this entire scene encapsulates the drama of the narrative. The release of the compression from the beginning of the song perhaps signals that Ivy has, despite the odds, found the towns. The lack of tonal resolution, however, suggests that the audience will simply have to wait to see what lies on the other side of the wall and if Ivy will find help to save Lucius.

Tension

Tension is the opposite of compression, being the attraction force or stress within an object that appears when the object is stretched.[100] Tension results from the electrostatic attraction between particles as they are pulled apart during a stretching deformation. In other words, tension is the internal pulling characteristic of a deformed object that seeks to return the object to its initial, more compressed form. One might refer to an object as containing tension, or an external force pulling, exerting, or creating tension on an object. For example, an ideal string at rest (static equilibrium) has no tension force within it. If one were to pull a string taut, tension would be the resulting internal force in the string (figure 2.6).

One possible modeling of the term "tension" is that of a vibrating string. Tension is often also used to describe cognitive tension (i.e., cognitive dissonance), as in tension and release.[101]

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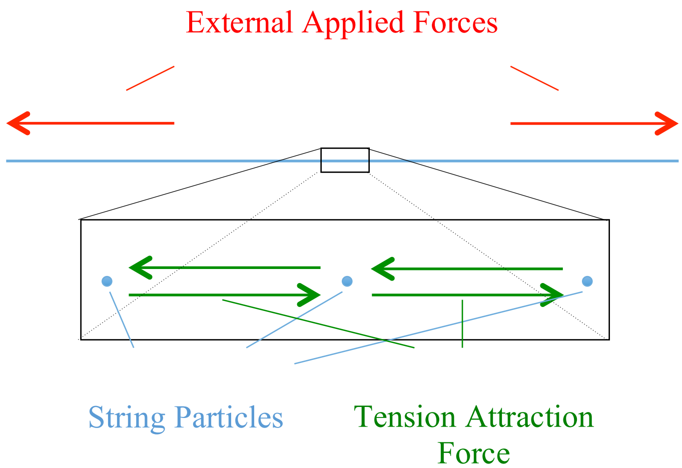
[100] Deeson, 462.

[101] For example, see Erickson, *The Structure of Music: A Listener's Guide, 34-40*; Morwaread M. Farbood, "A Parametric, Temporal Model of Musical Tension," *Music Perception: An Interdisciplinary Journal* 29, no. 4 (April 2012): 387-428; Fred Lerdahl and

Both Arnold Schering and Hans Mersmann view musical activity as contrasting forces of tension and release.[102] Kurth speaks of chordal tension as being a restrained force ("verhaltene Kraft").[103] In this typical usage, however, tension refers to any musical discomfort, regardless of the shape or gesture from which this dissonance occurs. Using the physical tension model, one can describe the musical cause and effect as a stretching of an established musical object, compression being its opposite.

(a) String at rest (static equilibrium), containing no tension



(b) String pulled taut, containing tension

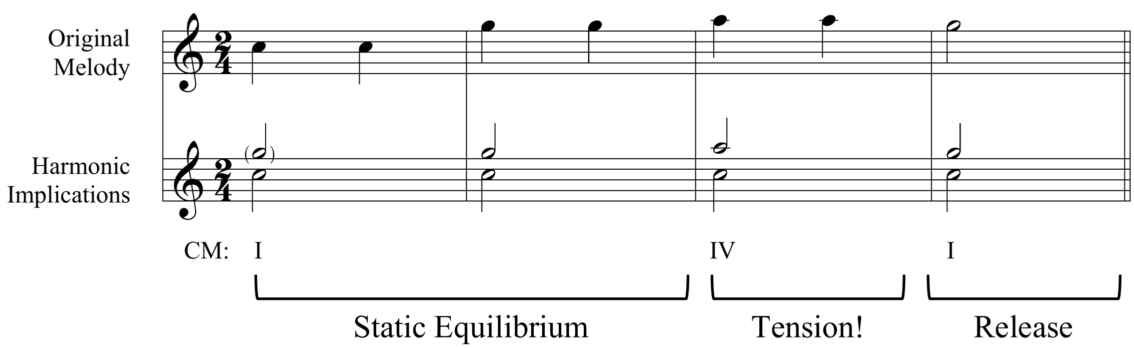
Figure 2.6. Physical Model of String Tension

Carol L. Krumhansl, "Modeling Tonal Tension," *Music Perception: An Interdisciplinary Journal* 24, no. 4 (April 2007): 329-30.

[102] Rothfarb, "Energetics," 944-47.

[103] Kurth, *Grundlagen des linearen Kontrapunkts,* 69.

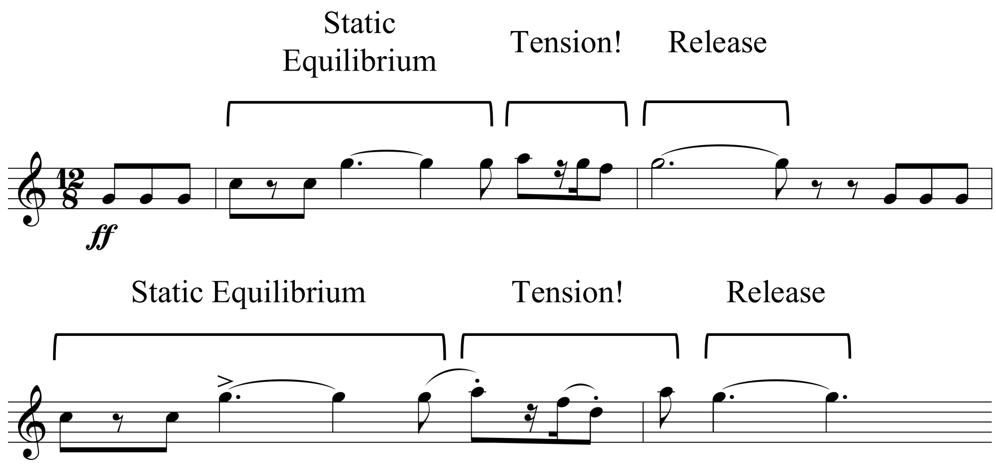
A deformed interval in a diatonic passage may exhibit musical tension. This type of intervallic tension is exhibited in the simple melody of "Twinkle, Twinkle, Little Star." The motion from C5 to G5 in the first two measures shown above outline the tonic and dominant scale degrees. After achieving the G5, however, the melody ascends to A5. It was noted earlier how A5 is unstable and returns to G5. Rather than hearing this passage as a series of notes, one can hear this passage in terms of its harmonic implications.[104] One could harmonize the first four measures as shown in example 2.21. This simple harmonization illustrates diatonic tension. When the upper voice moves from G5 to A5, the perceived P5 of m.s 1 and 2 is stretched to a M6 in m. 3. The M6 between C5 and A5 is less stable than the P5 from C5 to G5. One can illustrate this four-measure passage as a spring at rest (mm. 1-2) that is stretched (m. 3) and subsequently allowed to return to its state of rest (m. 4).



Example 2.21. "Twinkle, Twinkle, Little Star" Harmonic Implications

The general melodic motion of the Theme from *Superman* (1978) is very similar to that of "Twinkle, Twinkle, Little Star" (example 2.22).

[104] This implied harmonization is the same as the theme in Mozart's Twelve Variations on "Ah vous dirais-je, Maman."



Example 2.22. Theme from *Superman* (1978)

The pitches of the melody here are almost identical to those of the previous example, save for the turn preceding the end of each phrase.[105] One feels melodic tension in the motion up to A5, as if stretching a spring. The tension releases when the spring (i.e., the perceived harmonic interval) returns from its stretched state (i.e., M6) to its eventual resting state (i.e., P5).[106] This stretching of the P5 in this theme, much like the leap-ridden fanfare that precedes this passage of music (see example 2.5), parallels Superman's abounding strength. Like Superman, this melody contains more energy (i.e., strength or power) than the than the typical melody that is made up of predominantly stepwise motion (i.e., a normal human).

Consider the following model of tonal tension (figure 2.7). Imagine a purely consonant musical object (e.g., interval, chord, tonal area) as an ideal string at complete rest. The presence of any type of musical dissonance would place tension on that string, deforming that string. That

[105] A more in-depth analysis of these turns and their implications will be undertaken later in the demonstration of the elasticity model.

[106] Note the temporary compression resulting from a rebounding of the released tension, which will be discussed in example 2.28.

is, the appearance of a chromatic tone creates tension in a tonal-area object that was not otherwise present. For example, if C major were a string, the dissonance resulting from the appearance of F♯ would pull at the bonds of that string, creating tension. Shown in this figure, dissonance (i.e., resulting deformation in the string) is a byproduct of F♯ (i.e., external applied force) pulling the listener's attention from the perception of C major (i.e., the string). While one might colloquially refer to F♯ as a dissonance in the context of C major, it is simply a note that *creates* dissonance when appearing in this context.

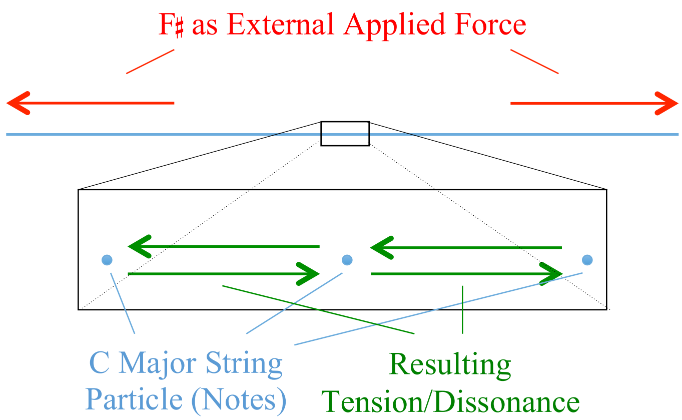


Figure 2.7. Model of Tonal Tension

One can connect the tension model to the centrifugal/centripetal force models previously demonstrated. Centrifugal force is evident in a tonal problem, which pulled the ball away from the pole. The pulling of the ball away from the pole creates tension in the string that connects them. In this way, the concept of tension in the string embodies the conflict of centrifugal and centripetal forces earlier in this chapter.

Neither pure consonance nor pure dissonance exists; thus, tension is not an absolute quantity. As Richard Hoffman states, "Tension is trivially present as the sound of the first note

engages the listener's expectation, and tension continues into the concluding silence. It is not he presence of tension, but rather changes in levels of tension that allow for meaningful analytical interpretation."[107] Hoffman is referring to cognitive tension, but this statement still holds true for the physical tension metaphor. As a physical force, one may apply varying amounts of tension to an object. The stronger the pulling force on a string, for instance, the greater the tension. This notion holds true when referring to consonance and dissonance in music as well. As Robert Erickson states in *The Structure of Music*, until the mid-nineteenth century, consonance and dissonance were traditionally held as two opposing states. Since this time, dissonance has been viewed as relative to consonance. Erickson writes, "Contemporary music does not throw the idea of consonances out the window, but instead of two absolutely opposing states, consonant and dissonant, it substitutes the notion of graduated dissonances, from very weak to very strong."[108] Physical and musical objects under tension typically seek rest or relaxation. Erickson also speaks of pitch dissonance as musical tension.

> If dissonance is a state of tension, the tones comprising the dissonance are necessarily active. They seek places of relative relaxation, and therefore have characteristics of melodic tendency somewhat analogous to the tendency tones discussed above. But whereas tendency tones get their drive from the attraction of a tonic, temporary or real, and have for that reason a tendency in a particular direction, the tones of a dissonance tend only 'ahead.' The tension state will be succeeded by relaxation, but the individual voices may move in a variety of ways: upward, downward, by skip upward, or by skip downward. The dissonance propels the individual voices ahead, and in doing so supports the drive of the individual melodic lines. The lines in turn move in such a way that vertical patterns, alternating between states of tension and relaxation, ensue.[109]

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[107] Richard Hoffman, "A Theory of Musical Tension in Renaissance Music: A Study of Early Sixteenth-Century German Polyphony" (PhD diss., University of Kentucky, 1994), 7.

[108] Erickson, 96.

[109] Erickson, 97.

Erickson is speaking here of pitch dissonance as cognitive tension specifically, but this notion of resolution-seeking dissonance that pushes the music forward holds true for various types of musical tension. One can essentially perceive any model of perceived musical dissonance as creating musical tension and can model it as a physical object (e.g., a string) under tension. Metrical dissonance may result from a syncopated rhythm or hemiola amongst a regular beat pattern or beat-division pattern using the tension model. Upon experiencing cognitive dissonance, the natural tendency is to seek resolution of the apparent conflict.[110] When a metrical dissonance occurs, the tendency of the listener is to hear a return to stability or metrical consonance. As Erickson states, it is important to note that this notion is not true for every composition, composer, style, and era.[111] Many styles and types of music depend on this relationship between the varying forms of consonance and dissonance to propel it forward through time, as well as give it shape and meaning.

Shear

Shear is an object deformation in which parallel internal planes slide across one other, thus creating shear stress on the object. Shear stress induces this deformation. If one views a rectangle as an object, then shifting one side of the rectangle while maintaining the other side will result in shear (figure 2.8). Depending on the placement of forces, the amount of the force, and the resistance created by internal structural bonds of the object, a variety of deformations may result.

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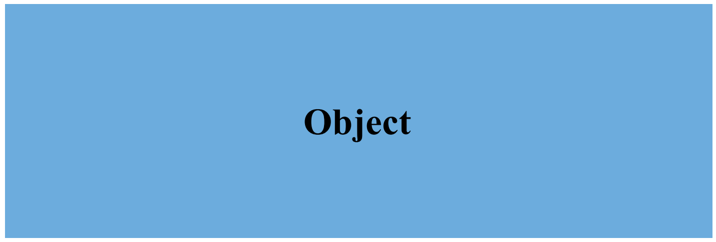
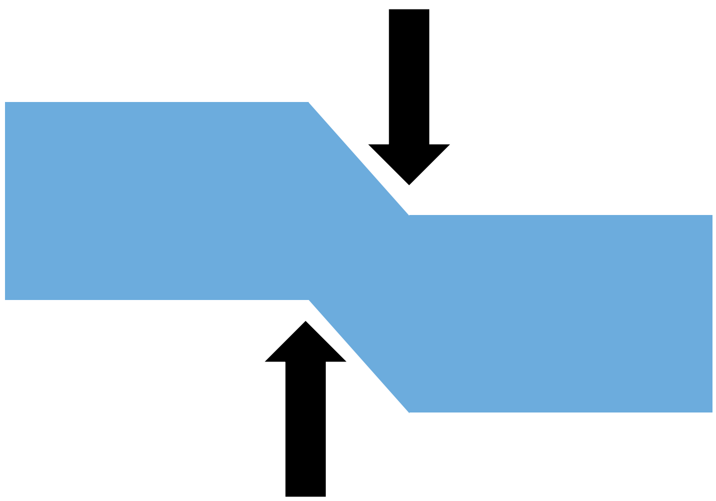
[110] Leo Festinger, *A Theory of Cognitive Dissonance* (Redwood City, CA: Stanford University Press, 1957), 3.

[111] Erickson, 98-99.



(a) Object with no Applied Forces



(b) Object Deformed by Shearing

Figure 2.8. Shear Deformation of an Object

These variables affect the size of the area deformed by shear and to what degree the affected area is deformed. The shape of the object post-deformation will vary accordingly (figure 2.9). Figure 2.9a, demonstrates a shearing force applied to an object. Figure 2.9b shows that same force amount spread over a shorter span than in Figure 2.9a. Figure 2.9c demonstrates the same positioning of shearing forces as figure 2.9a, however, here the forces applied are greater.

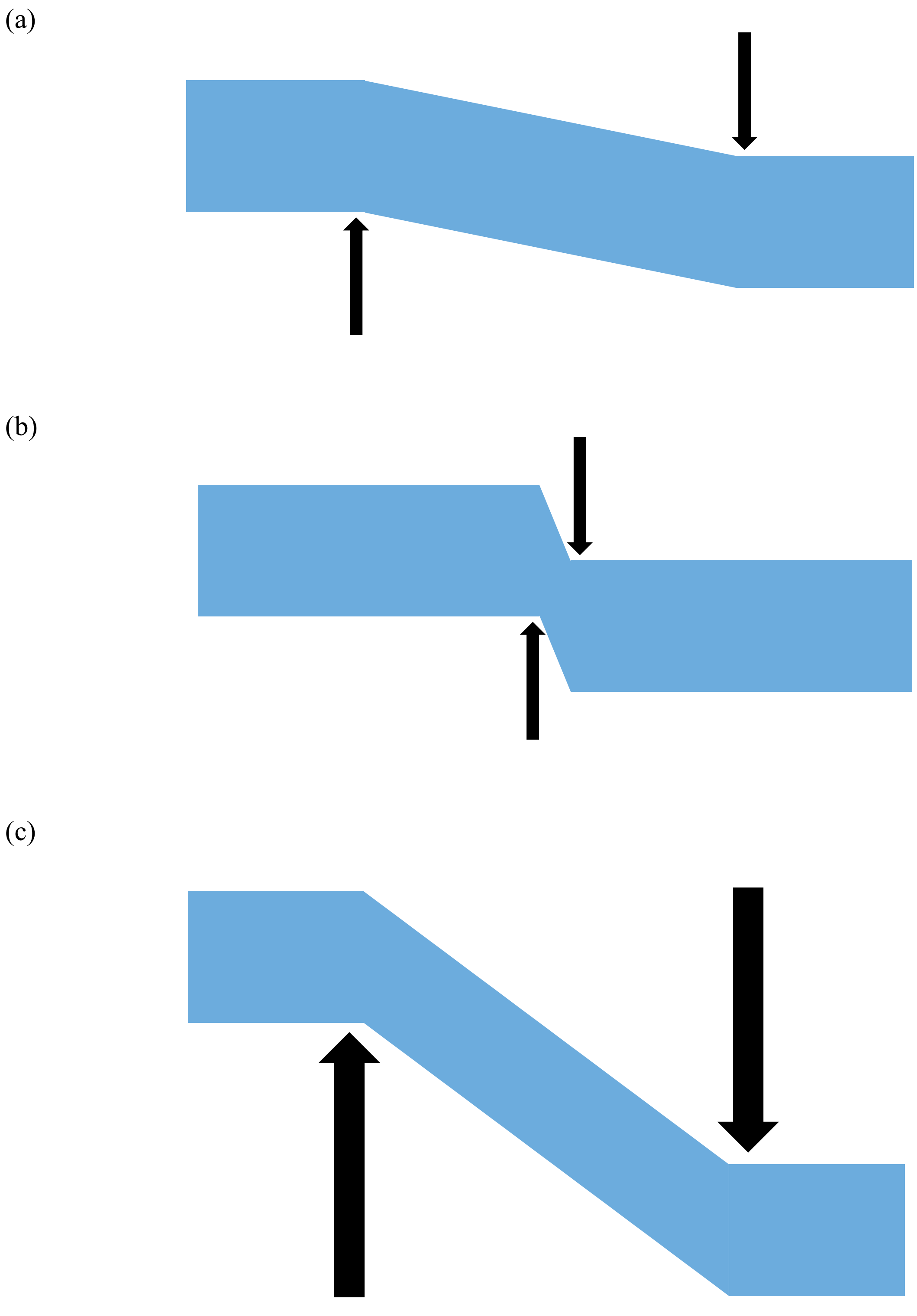


Figure 2.9. Varying Degrees of Shear

One may metaphorically use deformation resulting from shearing to represent changes in music. Imagine a musical object as a physical object on an imaginary lattice (figure 2.10).

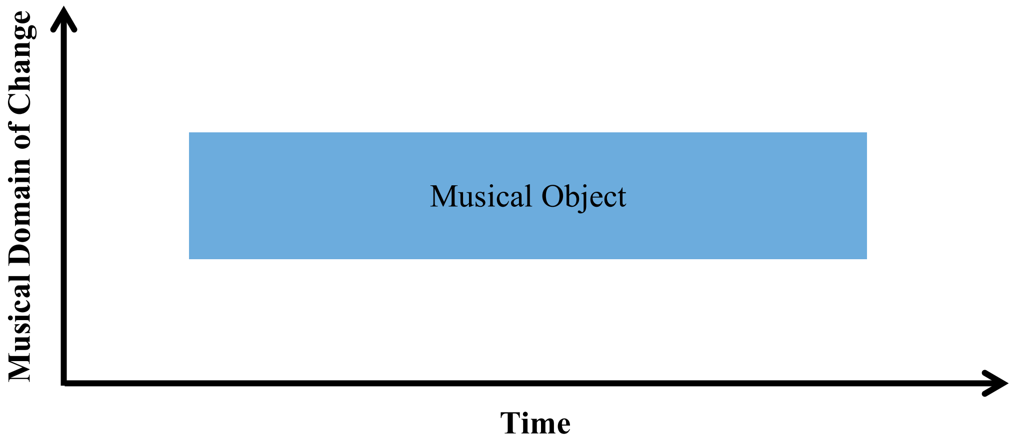


Figure 2.10. Musical Object on a Lattice

This lattice gives a frame of reference for gauging any changes or deformations that may occur. Conceptually, this model can represent any musical object that undergoes change. This model works best when the musical object is within one musical domain (e.g., tonal area, orchestration, style) within a passage of music. The lattice consists of time on the horizontal axis and the domain of musical change on the vertical axis.

Imagine a tonal area as a musical object. Any shift to a new tonal area is a deformation of that object, which may be demonstrated as shear deformation of that musical object. Consider the typical tonal motion of a sonata exposition. The principal theme tonal area is the tonic and moves through a transition to the secondary theme's tonal area. The tonic tonal area is the original musical object that is deformed through a transition period to arrive in the new tonal area. In a major key, this secondary theme tonal area is often the dominant of the original

primary theme tonal area. Figure 2.11 shows this shear deformation of tonality in a typical sonata exposition in a major key.

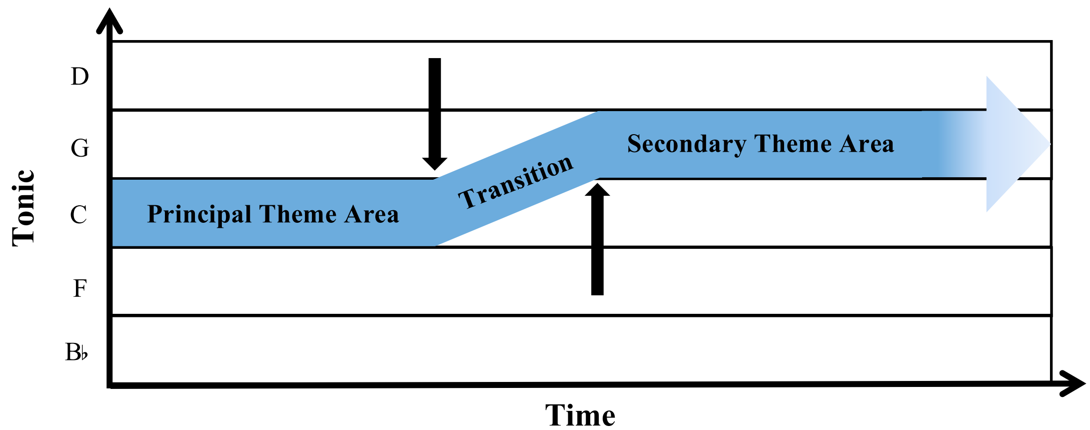


Figure 2.11. Shear Deformation of a Hypothetical Sonata Exposition Tonality

Because the transition functions to connect or modulate between the primary theme and secondary theme tonal areas, it is not completely in one tonal area or another. This transition period may vary in time or shift in tonal area depending on the amount of forces at work musically.[112] Transitions between tonal areas over a larger tonal space in the same amount of time require a stronger the motivating force (i.e., tonal problem).

The modeling as shown in figure 2.11 highlights the affected area of a deformed object, however, musical objects do not contain a musical transition. Consider the situation where there is an abrupt change in style, where one musical style simply stops and a new style beings, containing no transition between the two (figure 2.12). In such a case, one may view the musical object as broken, because the motivating force is greater than the internal bonds of the musical

[112] Furthering the analogy, one might consider the amount of force necessary to transition or modulate from one tonal area to the next.

object can withstand. It is important to note here that the musical object describes only one aspect of the music.

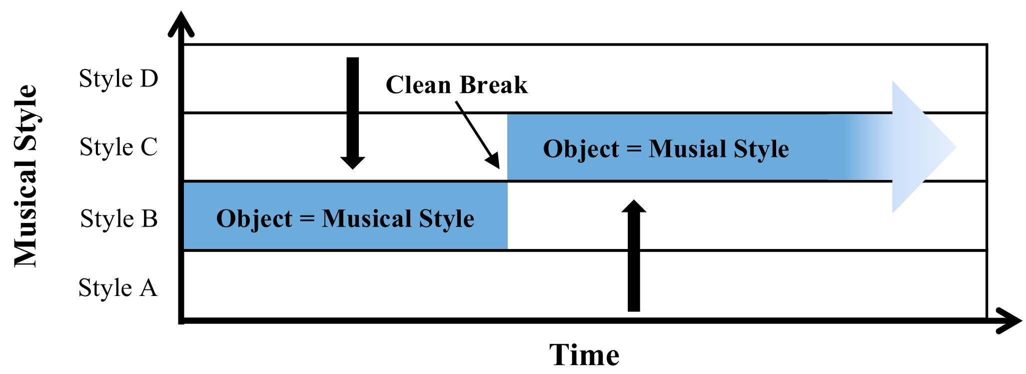


Figure 2.12. Break in Musical Object Due to Shear Force

It is possible for the area before the break to contain some of the same musical content as the area after the break. For instance, consider a hypothetical abrupt sequential modulation that spans a great distance harmonically (figure 2.13). Because the two passages are sequential, they both contain the same (or very similar) melodic and harmonic material within their respective keys. These two passages (or object parts) are very closely related musically because, abstractly, they were previously both parts of the same uniform musical object before the deformation. Thusly, the passages are labeled as *musical passage A* and *musical passage A'*. These passages are best thought of as segments stemming from a single object, not two separate objects. The domain of deformation—the tonal area in this case—is what separates them. In this instance, the shear model can only represent the change in tonal areas. The slight thematic differences must be represented on a separate graph, distinct from the tonal area differences resulting from a sequential modulation.

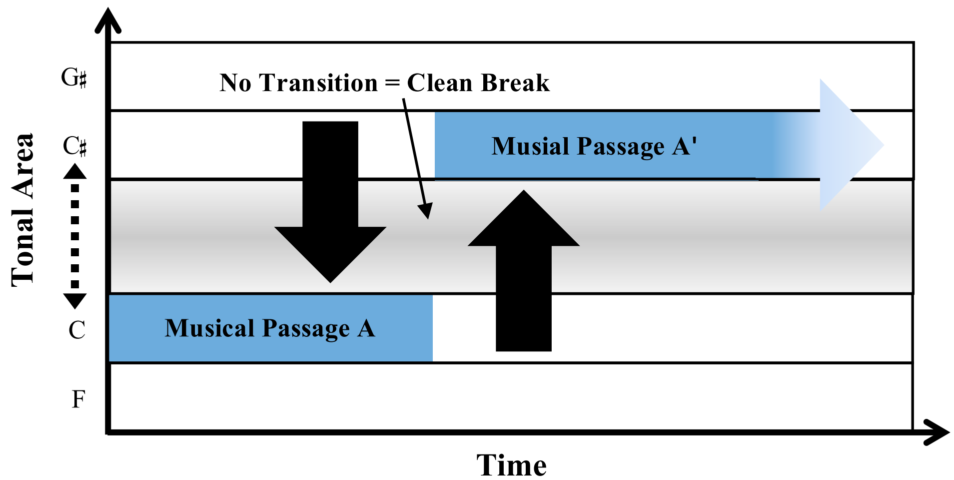


Figure 2.13. Shear Model of Key Change without Transitions

Key changes in Schumann's "Wilder Reiter" from his *Album for the Young* demonstrate this notion of key changes as a musical shear (example. 2.23). The overall key of the piece is A minor. The piece shifts without transition from A minor to F major in m. 9. In m. 17, the piece again shifts back to A minor without transition. These static tonal shifts demonstrate this shearing model.

Example 2.23. Schumann, *Album for the Young*, No. 8, "Wilder Reiter"

(Example 2.23 continued)

The piece is divided into three separate sections. Despite the fact that the thematic material is essentially the same in all three sections, the changes in key (and mode) highlight these formal divisions. in tonic and not the mode change because the model is only capable of representing one aspect of music at once.[113] Figure 2.14 shows a physical modeling of the tonal center shifts in Schumann's "Wilder Reiter." Note that key changes may consist of two aspects: shift in tonal center and a shift in mode. In addition to a shift in tonal center, this example also contains a shift of mode from minor to major and back to minor. This model only represents the change

[113] It is perhaps possible expand this model into a multidimensional model capable of demonstrating additional parameters of change simultaneously, but this is beyond the scope of the current study.

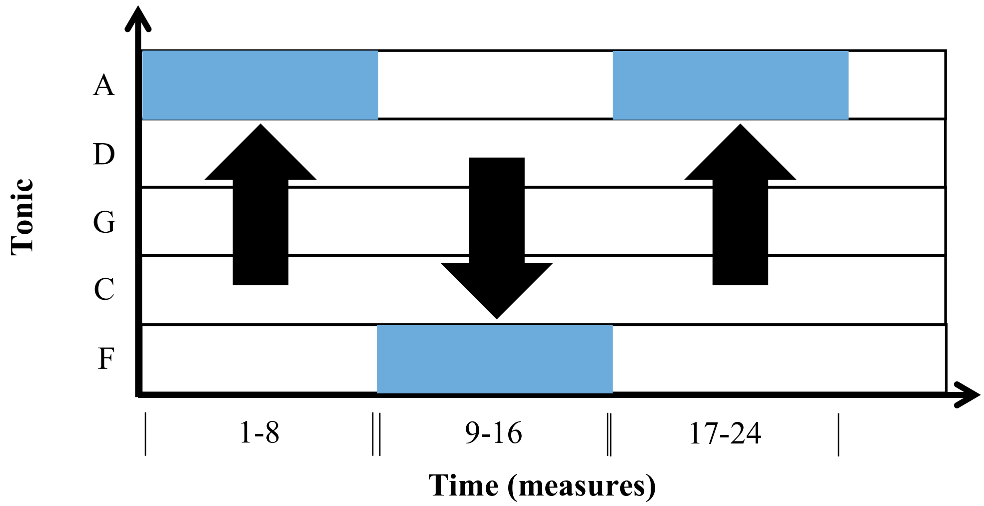
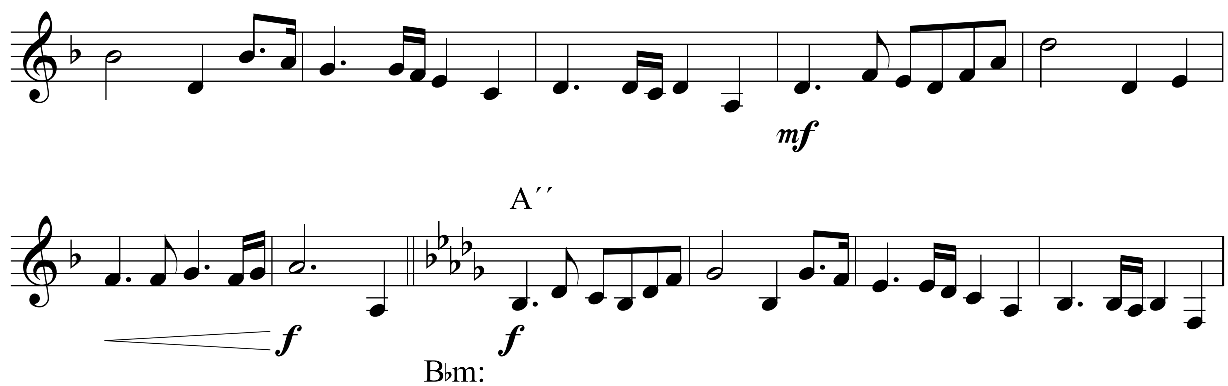


Figure 2.14. Shear Modeling of Tonal Center Shifts in Schumann's "Wilder Reiter"

In film music, such static shifts in key may parallel an extramusical event, such as a particular action or a change in emotion. A rotation of keys occurs in Hans Zimmer's score for *Crimson Tide* (1995) as Captain Frank Ramsey gives a motivational speech to his crew before they board the Alabama, their submarine. Example 2.24 shows the "Roll Tide" theme from this scene. As Captain Ramsey gives his motivational speech, the theme is in D minor.

Example 2.24. "Roll Tide" Theme from *Crimson Tide* (1995)



(Example 2.24 continued)

Captain Ramsey continues the speech, the theme repeats in B♭ minor (transposed down from D minor). With the key change, the intensity of the music increases. The theme ends with a half cadence, pushing it forward to the next statement of the same thematic material. The dynamics increase, the texture becomes thicker and more active with each statement of the thematic material. The intensity of the music parallels the rising excitement experienced by the crew of the Alabama as their commander motivates them. In this film, static key changes down a M3 are used at moments when there is growing intensity shown in the film. This static tonal shift of the same thematic material creates an incongruity for the listener, creating a need for resolution and thus, raising the intensity. The key shift down a M3 throughout this piece parallels the action of the submerging vessel, especially during high-energy combat scenes. This need for the submarine to descend deep under water during combat is the initial problem in this film that leads to larger issues concerning the need to launch nuclear missiles. There is a perceived associative intensity represented by both the musical descent of the thematic material and the action of descent by the submarine.

Torsion

The final basic type of deformation is torsion. *Torsion* is "the twisting force (stress), or the twist deformation (strain)."[114] One should not confuse the terms 'torsion' and 'torque.' Torque concerns the rotation of an object, whether it causes stress on the object or deforms the object. Torsion, however, has to do with changing the compositional makeup of an object through a twisting motion. Torque is always present where there is torsion; however, torsion does not always exist where there is torque.

Like the shear model, the torsion model can demonstrate the deformation of a musical object. Just as before, any number of musical domains may function as a musical object that is deformed. This model, however, is particularly well suited for demonstrating tonal area relationships. Imagine a work's tonality as a cylindrical musical object (figure 2.15).

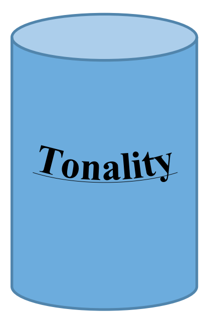


Figure 2.15. Tonality as a Cylindrical Musical Object

The shear model used a linear lattice to demonstrate tonal relationships, however the torsion model uses a rotational lattice. For this particular modeling, the common circle of fifths will suffice. Imagine the circle of fifths as a clock face on the top of an upright cylinder. This

[114] Deeson, 475.

cylindrical network serves as a fixed lattice upon which one may compare tonal relationships. It is important to note that the cylindrical lattice is fixed, whereas the cylindrical musical object is movable—in part or in whole. Tonal centers are located at the twelve points of the clock around the cylinder (figure 2.16).[115]

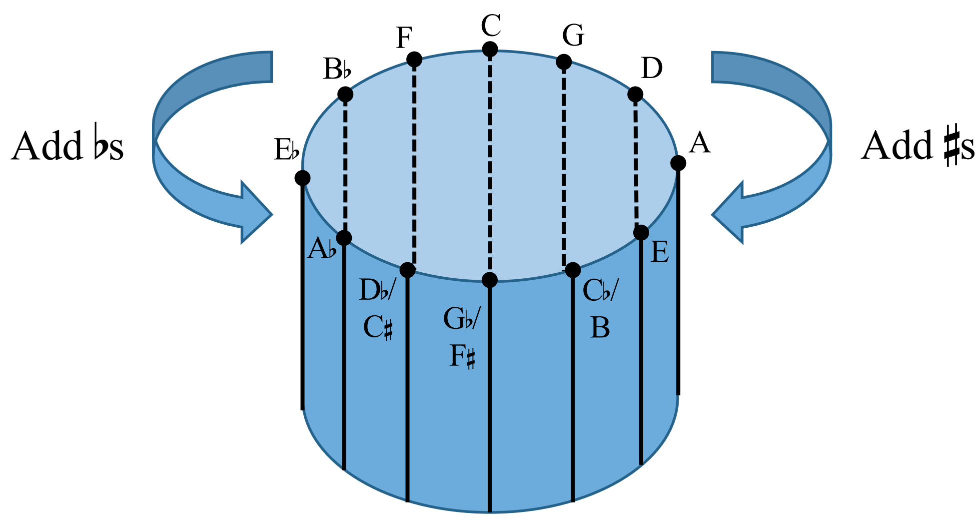


Figure 2.16. Circle of Fifths as Part of the Cylinder Lattice

Any rotation of the musical object would imply a transposition of key. The reference point (i.e., tonic) of the musical object will shift accordingly, corresponding with a different tonal center on the cylindrical lattice. Any rotation of the musical object as a whole is transposing the tonality of the entire work, not just a single portion of it. To segment the musical object, one must consider time as another referential axis in the lattice network. One may view time as a vertical axis—shown as descending in figure 2.17.

115 In this model, enharmonic equivalence of tonal centers are assumed. There is certainly a distinction between Cm major and Db major in reference to a common key; however, such a distinction would require a fourth-dimensional model, which is not easily representable. Perhaps this notion is fodder further exploration.

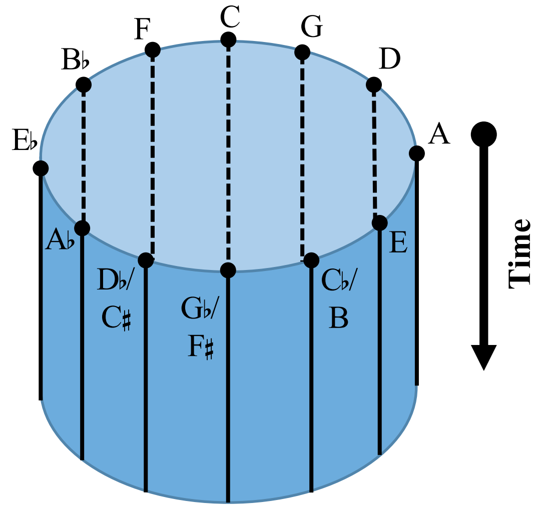


Figure 2.17. Time as Part of the Cylindrical Lattice

The vertical axis of time allows one to segment the musical object so that it may be deformed through torsion, as segments of the musical work—not the entire work—modulates to other tonal areas. A segment of the musical object that is wholly in one tonality is not deformed. Two segments of the same musical objects that have different tonal centers will be rotationally misaligned. A segment of the musical object that serves as a transition between undistorted tonal area segments is deformed as the result of torsion (figure 2.18).

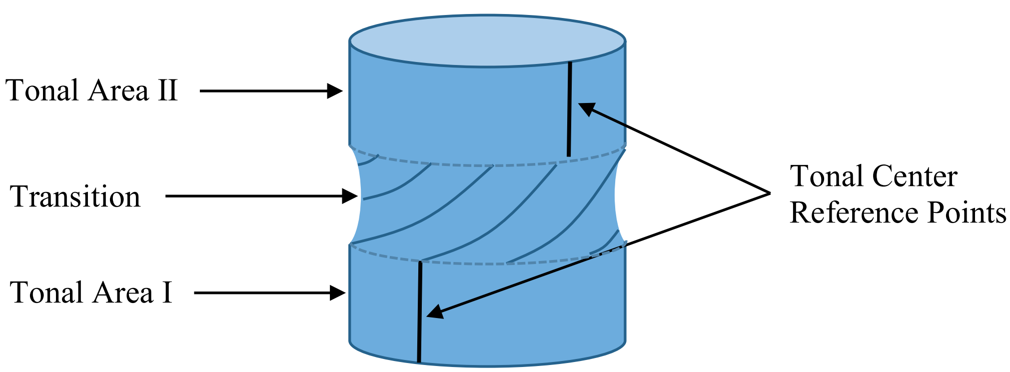


Figure 2.18. Deformed Cylindrical Musical Object as Tonal Areas with Transition

This twisted cylinder model of tonality concerns the notion of rotation, much like the previously demonstrated models of centrifugal vs. centripetal forces and torque. Both the torsion model and the centrifugal vs. centripetal force model contain torque, the impetus for rotation. These two models differ, however, in that the centrifugal vs. centripetal force model is concerned with motion of objects in relation to one another, whereas the torsion model is concerned with the deformation of a single object.

Schumann's "Wilder Reiter," demonstrated previously with the shear model (example 2.23), begins and ends in A minor, with a static modulation to F major in the middle section (figure 2.19).

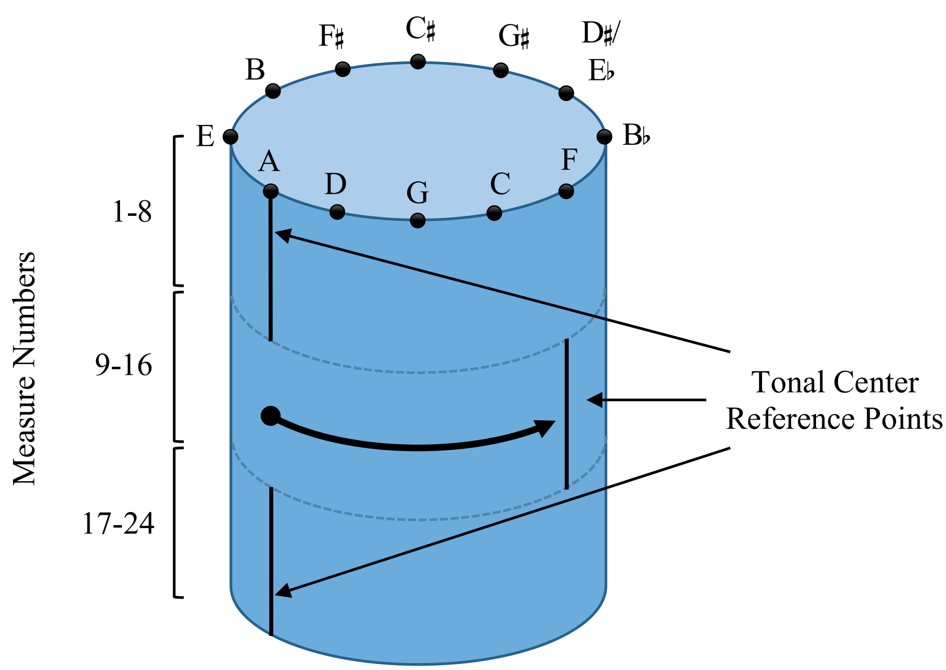


Figure 2.19. Torsion Modeling of Tonal Center Shifts in Schumann's "Wilder Reiter"

"Wilder Reiter" contains no transition; therefore, there is no stretching of the musical object. Rather, it breaks cleanly in the rotation. Unlike the shear modeling of "Wilder Reiter" (figure

2.14), there is no physical separation of these tonal areas. The shear model of this passage clearly represents the tonal break, however, the break also seems to indicate that these two passages are unalike. However, this is only true of the tonal area. The musical content is very nearly the same in the context of their respective tonal areas. The torsion model differs in that, while there is a rotation of the modulated portion of the composition, there is no visible break between these passages. This lack of a physical space in the torsion model makes clear that this composition is still a musical whole with separate parts.

In *Crimson Tide* (1995), the descending M3 modulations illustrate another benefit of the torsion model in demonstrating tonal relationships. When this theme appears the film, it typically modulations down a M3, starting in D minor and moving to B♭ minor. After the statement of the theme is B♭ minor, the theme typically returns to D minor. The final scene and end credits of the film, however, are an exception. Here, the theme modulates from D minor down a M3 to B♭ minor, then down another M3 to G♭ minor, and finally down an enharmonic M3 to D minor (figure 2.20). Following the tribunal hearing concerning the mutiny on the U.S.S. Alabama, the theme plays through twice in D minor as Lieutenant Commander Hunter and Captain Ramsey talk. As Captain Ramsey walks away, a camera shot changes to Lieutenant Commander Hunter, who smirks as the theme repeats in B♭ minor. This third statement of the theme abruptly shifts keys to G♭ minor halfway through the theme at a half cadence. Simultaneously with this modulation, the screen goes blank and then reveals the changes in nuclear weapon deployment because of this incident. The theme continues in G♭ minor where it left off in B♭ minor. After a strong half cadence, it modulates back to D minor in conjunction with the beginning of the end credits. The passage begins and ends in D minor, but one perceives that the path from beginning to end is a full rotation, descending a M3 with each

modulation. Additionally, the intensity grows with each tonal shift. The D minor at the beginning of this sequence is not the same D minor as at the end of this sequence. Perhaps this rotational sequence of modulations comments on the end of an era in nuclear submarine history or the improvement of the launch system through trial and error to a system that works again.

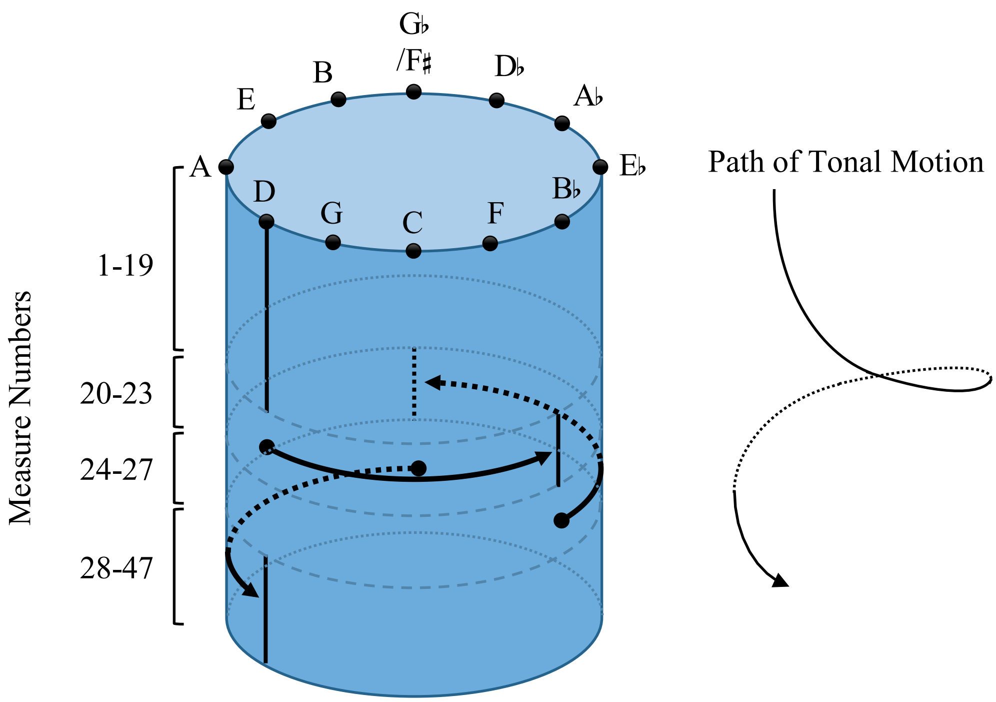


Figure 2.20. Torsion Modeling of Tonal Shifts in the "Final Scene and End Credits" Score to *Crimson Tide* (1995)

The music signals the end of Captain Ramsey's career, which has now sunk to its final depths. Of course, the lack of full modulatory rotation several times in the film could simply be a matter of not having enough time or that the moment was never right for it. The end credits are a film composer's playground, where they may experiment with the music in ways the rest of the film would not allow. Regardless of the music's function at this point in the film, the energy intensifies with each shift in tonality and extramusical event.

Elasticity and Plasticity

Elasticity is the property of a sample of matter to return to its original state after one removes the applied force that is deforming the object.[116] *Elastic energy* is the potential mechanical energy stored in the configuration of molecules in a material (or in the configuration of a physical system) as a force attempts to deform the object's volume or shape. The force that acts to return a deformed object to its original state is *elastic force*. The original resting state of an undeformed object is *static equilibrium*. For instance, an elastic force acts to return a compressed or stretched spring to its natural length.

By contrast, *plasticity* is the property of a sample of matter to remain non-reversibly in its deformed state after one removes the stress-inducing force(s). There is a limit to the extent to which an object may be deformed and return completely to its original state. Beyond this *elastic limit*, the deformation is said to include a plastic component; that is, the deformed object does not fully return to its original state. The terms *elasticity* (not *elastic force*) and *plasticity* are not forces, but rather, properties of objects. The models demonstrated here mostly concern the mechanical properties of solid objects. Elasticity and plasticity are not forces, yet these concepts certainly have a place in the musical force metaphor.

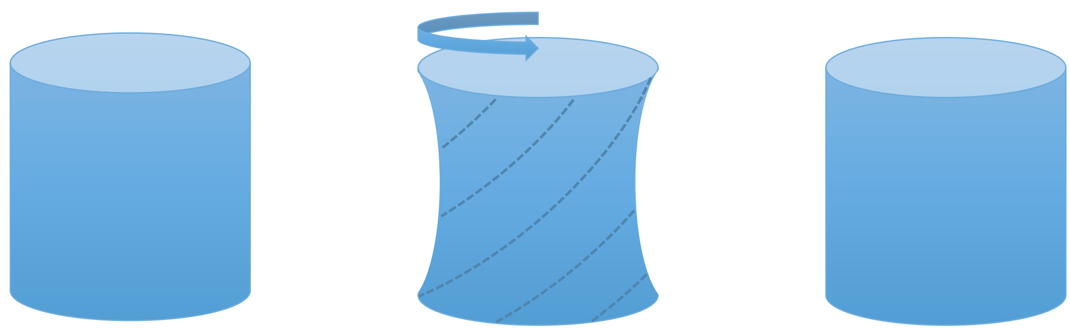
A common process in music is to present a passage, then present an altered or developmental form of the original passage, and lastly, repeat the original passage. This process may apply to any musical parameter. One may conceptualize a passage of music that undergoes such a process as musical elasticity. Here, a musical object that undergoes some change and returns to static equilibrium. For example, Erickson speaks of tension and relaxation of an

[116] Deeson, 115.

interval with a sense of "melodic elasticity being guaranteed."[117] Meyer describes chord tension as being elastic, noting the tendency toward resolution.[118] By contrast, musical plasticity is musical change without return to static equilibrium; the change is permanent.

Consider once more the tonal relationships of a monotonal work as a musical object. The return to the original tonality at the end of the work is tonal elasticity. A simple representation of the torsion model easily demonstrates this elastic reaction. Note that this model will differ from the previous torsion model concerning time, a point to be addressed shortly. Figure 2.21 shows three stages of a cylinder as a musical object representing a musical work's tonality before, during, and after modulation.

	(a)	(b)	(c)



	Before Torsion is Applied	As Torsion is Applied	After Torsion is Released
"Wilder Reiter":	A_1	A'	A_2

Figure 2.21. Elastic Representation of the Torsion Model

[117] Erickson, *The Structure of Music: A Listener's Guide*, 40.

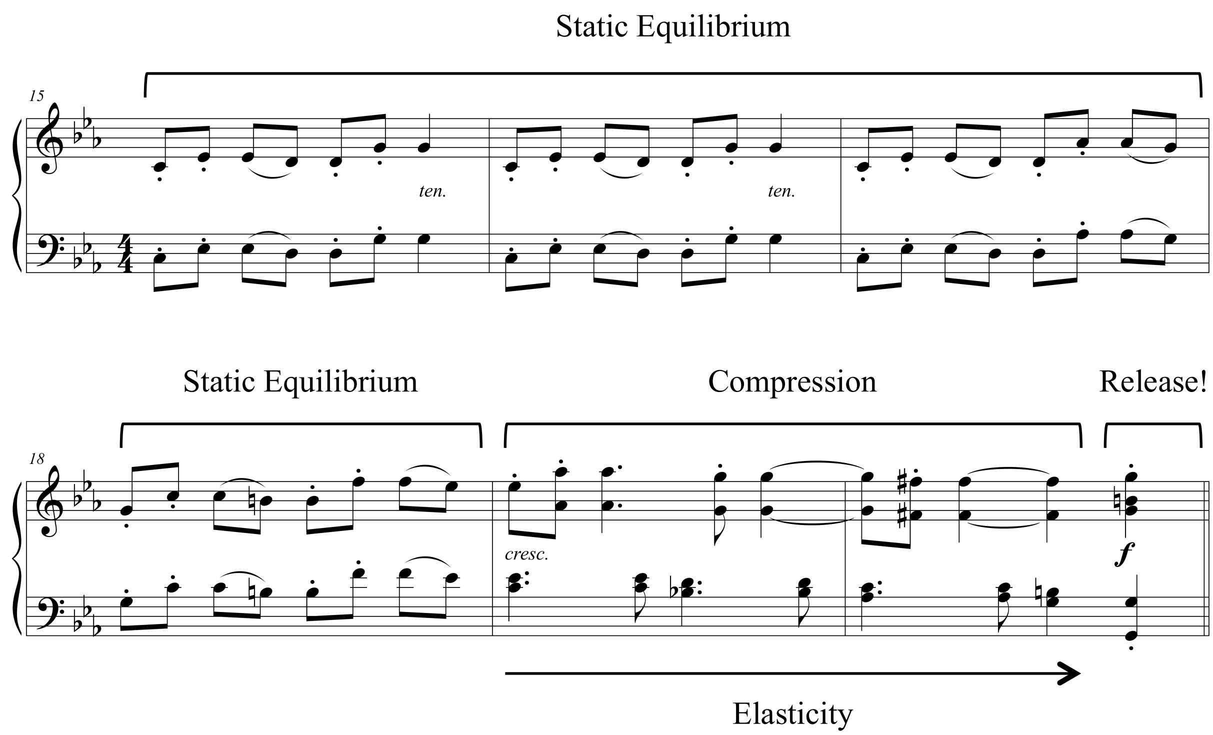
[118] Leonard B. Meyer, *Music, the Arts, and Ideas: Patterns and Predictions in Twentieth-Century Culture* (Chicago: University of Chicago Press, 1967), 310-11.

The first cylinder, which is in a state of rest, demonstrates the starting tonal area (figure 2.21a); no torsion forces are present. The second cylinder (figure 2.21b) illustrates the overall tonality of a work during a modulated passage, that is, during the deformation of the overall tonality. The third cylinder (figure 2.21c) is the cylinder after an elastic return to a state of rest, the original tonality having returned after the modulation. This example represents the tonality of Schumann's "Wilder Reiter." Figure 2.21a represents the original tonality of the piece in A minor (mm. 1-8), figure 2.21b shows the portion in F minor (mm. 9-16), and figure 2.21c represents the final portion of the piece having returned to A minor (mm. 17-24).

The point demonstrated in the previous example is that elastic changes occur in time. To demonstrate the elastic tendency of a deformed musical object, one must represent elastic changes in stages. This is the only way that an elastic model can represent the time in which a deformation and elastic reaction occurred. One cannot represent time as part of the musical object, that is, as an axis in graphical representation of the musical object. Once the force causing the deformation is removed, any elastic energy contained within the object causes the object to return to a previous state—whether the object is returned back to the original state before the deformation or not is dependent upon the amount of elasticity contained within the deformed object. With an elastic model, one must compare two or more states of the object to realize the changes in the musical parameters represented by the deformed object.

These changes from a state or position to another, which precedes a subsequent return to the original state or position, may also represent musical objects on a smaller scale than a work's overall tonality. Within a single tonal area, one may demonstrate the departure from the tonic triad and its eventual return using the elastic model. An altered interval or chord may be either elastic or plastic depending on whether or not it returns to its original state.

Consider an established interval that is stretched or compressed.[119] There is generally a tendency for this musical object to return to its original state of rest. The example of tension shown in Beethoven's Coriolan Overture exhibits musical elasticity (example 2.25).



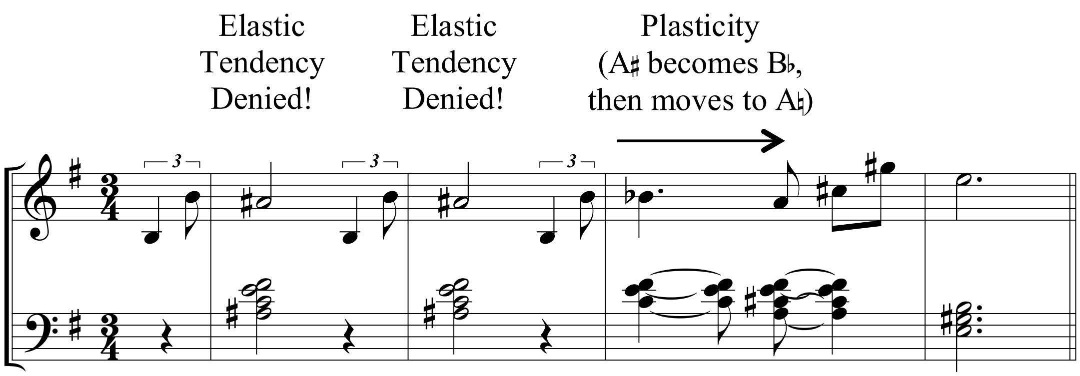
Example 2.25. Beethoven, Coriolan Overture, op. 62 (mm. 15-20)

One may perceive the establishment of the consonant and stable harmonic octaves of mm. 15-18 as musical objects at rest. In m. 19, the passage becomes destabilized as the harmonic interval is compressed. The outer voices form altering sixths and sevenths, as the two voices are no longer rhythmically synchronous. The penultimate chord of this example is an Italian augmented-sixth chord, outer voices simultaneously resolve outward to octaves on the final beat of m. 20. This

[119] It must be noted here that the musical context must provide some sort of a link between the original interval and its deformed state to hear two as such. Otherwise, one would simply here the two intervals as unrelated, distinct intervals.

example demonstrates a state of being (i.e., consonant octaves as static equilibrium), a departure from that state (i.e. interval compression), and an eventual return to that original state. The elastic tendency of the deformed interval is very strong, as it quickly snaps back once released, much like a compressed spring.

Not all musical deformations return to a state of equilibrium. Consider again the Bride's leitmotif from *The Bride of Frankenstein* (1935) (example 2.26).

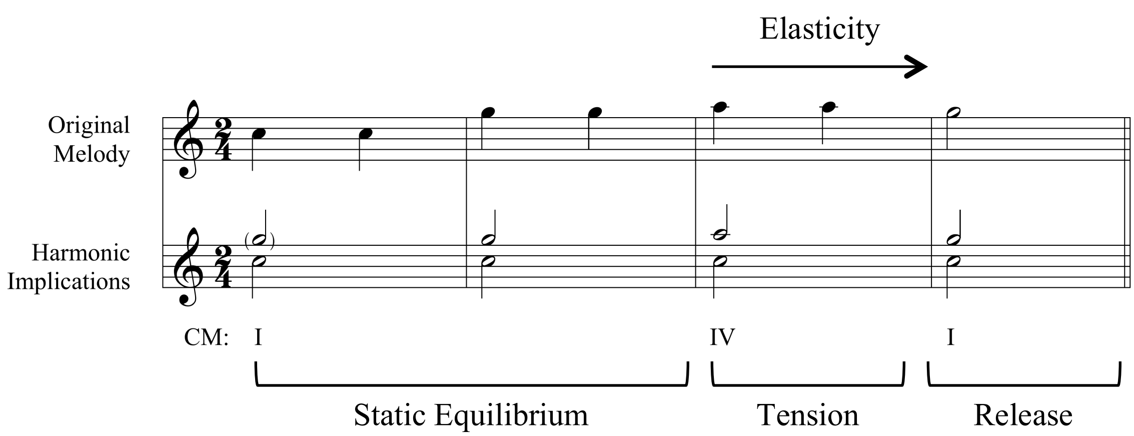


Example 2.26. Bride of Frankenstein's Leitmotif from *The Bride of Frankenstein* (1935)

The octave leap from B3 to B4 establishes this consonant interval in each statement of the three-note motif. The A♯, as it appears in mm. 1 and 2, does not resolve. A lack of resolution leaves each statement of the motif in a compressed state. The tone that follows A♯4 in the first two statements of the motif is B3 and not B4. The octave discrepancy and the same metric placement of the motif cause one to hear B3 as the beginning of a new statement of the motif and not the conclusion of the previous statement. These unresolved dissonances create an atmosphere of unease. The lack of return to a previous state in each motif statement exhibits musical plasticity (including the final statement of the motif). Rather than returning to B4, A♯3 undergoes further

compression, causing a permanent change in the musical object (i.e., plasticity). The A♯ is reinterpreted as a B♭ and resolves down to A♮. There is a sense of unexpected relief in this alternative resolution of the Bride's leitmotif. Like the ill fate of the Bride, this resolution signifies the protagonists' return to normalcy after their uncanny dealings with Dr. Pretorius, the Monster, and the Bride.

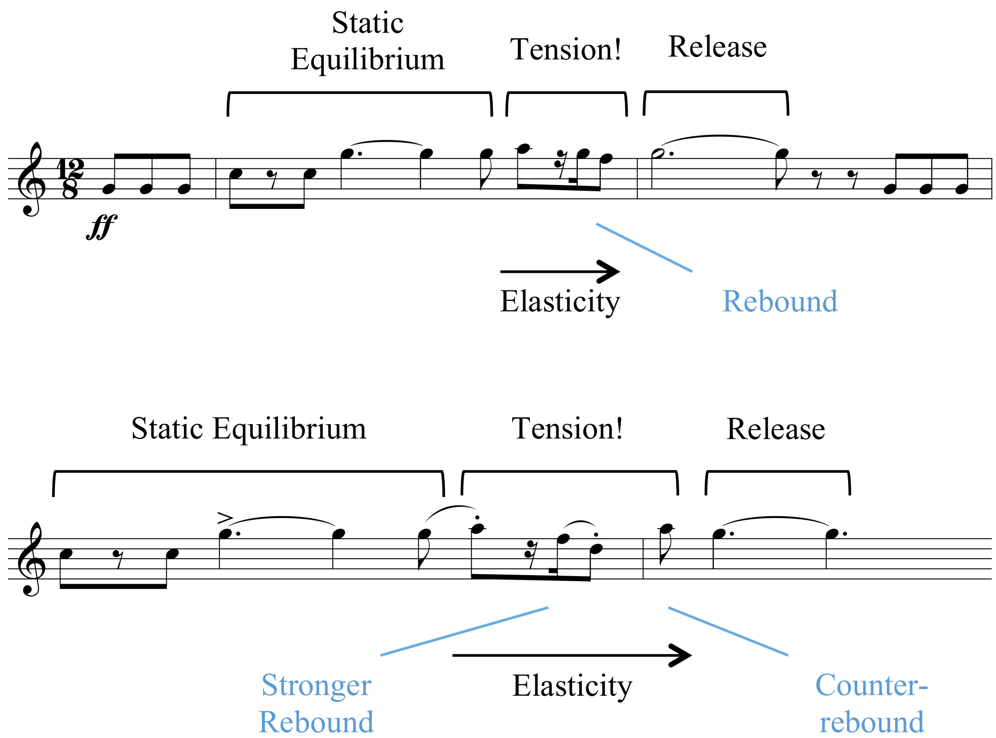
The first phrase of "Twinkle, Twinkle, Little Star" exhibits elasticity of musical tension (example 2.27).



Example 2.27. "Twinkle, Twinkle, Little Star" Harmonic Implications

The P5 in mm. 1 and 2 stretches to an implied M6 (C5 to A5) in m. 3. Elasticity is evident in the tendency of the less stable M6 to return to the more stable P5. The return to a P5 (C5 to G5) is like a stretched spring returning to static equilibrium.

A very similar demonstration of melodic tension exists in the theme to *Superman* (1978), shown in example 2.28. Much like Superman himself, the melody does not seem to know its own strength; it often overshoots its goal before settling to equilibrium.



Example 2.28. Theme from *Superman* (1978)

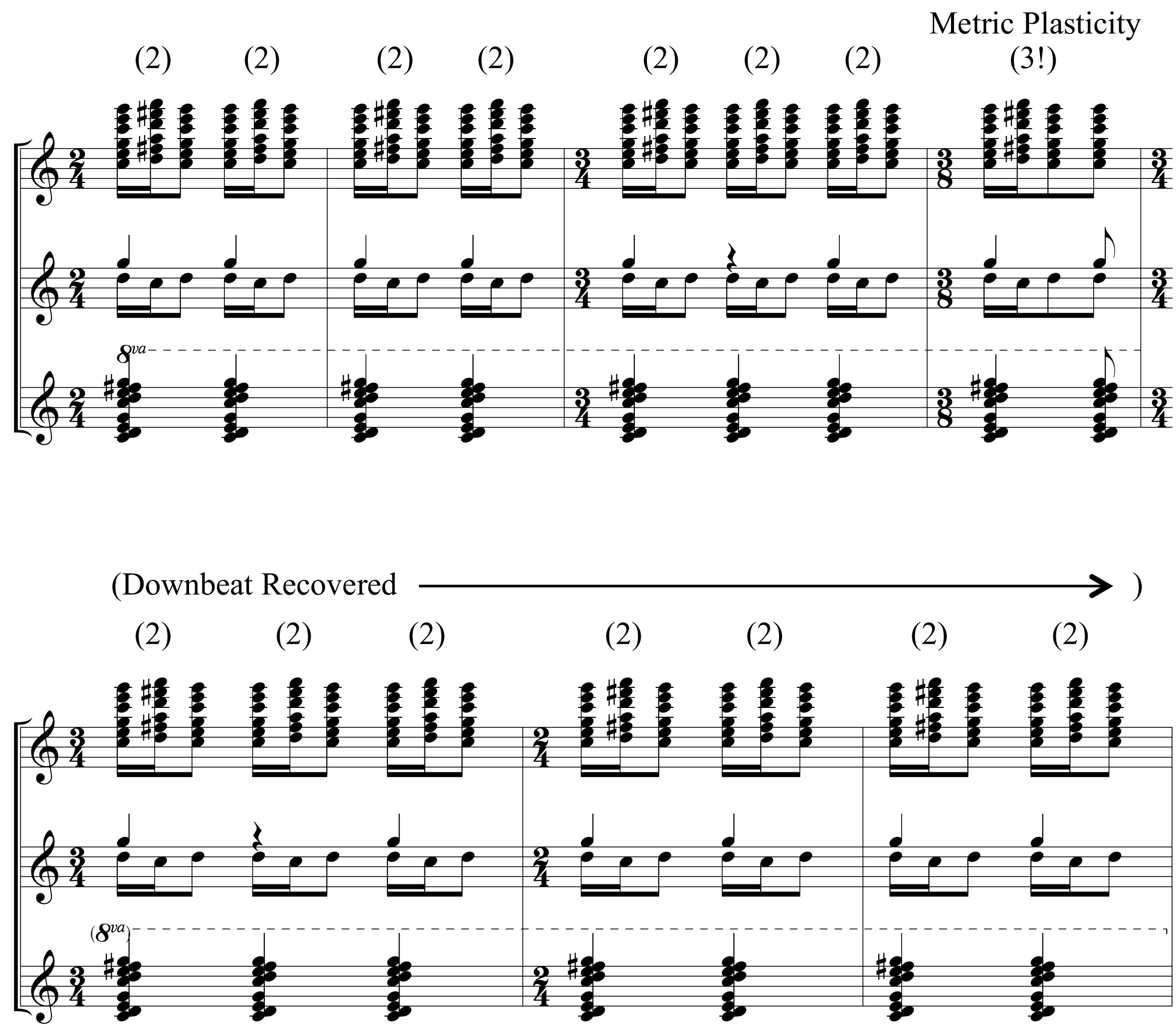
Like the opening to the "Twinkle, Twinkle, Little Star" melody, the *Superman* theme opens with a P5 leap (C5 to G5) that stretches to a M6 (C5 to A6) and eventually settles back to a P5 (C5 to G5). Unlike "Twinkle, Twinkle, Little Star," however, this melody passes through G5 down to F5 before settling on G5 at the end of the first phrase. The duration of the A5 in the *Superman* theme is much shorter than that of "Twinkle, Twinkle, Little Star" and moves down moves beyond the point of resolution before finally settling, much like a spring that is quickly stretched and released. The elasticity of the spring causes it to rebound, compressing slightly before settling back to its original, consonant state of rest. A similar motion occurs in mm. 5-7 of the same example. With the second release of this metaphorical spring in m. 6, however, the rebound carries more momentum as it skips down through F5 to D5. The rebound in m. 6 is a

m3 greater than in m. 2. The melody then leaps up to A5 in m. 7 before settling on G5. The increased downward rebound in m. 6 caused the ascending motion to pass its goal, itself rebounding up A5. This melodic action is like a spring that is stretched and released. Unlike this example, an ideal spring (one that does not fatigue with use) would produce the same amount of rebound if stretched the same distance and released identically on two separate occasions. The beginnings of the first and second melodic of the Theme from *Superman* are the same, indicating that their rebounds should be the same. The second melodic rebound is greater than the first, even producing its own counter-rebound.[120] This musical activity seems to comment again on the strength and power of the film's central character that this theme symbolizes. The physical rules of Earth do not bind this "super man." This characterization of Superman would also explain why the melody contains several large leaps—as if jumping a building with a single bound.

Rhythm and meter may also be elastic or plastic. One may perceive any alterations or disruptions of an established rhythm or metric unit (e.g., beat, measure, hypermeasure) as a musical deformation. Such deformations disrupt the rhythmic or metric equilibrium, causing syncopation or metric dissonance. In general, once a deformation occurs, there is generally a need to return to the original state.

In *E.T. The Extra Terrestrial* (1982), John Williams uses mixed meter to illustrate the drama of the "Bike Chase" scene (example 2.29). The meter through this passage is primarily set in $\frac{2}{4}$ with instances of mixed meter. Williams intermittently inserts a measure of $\frac{3}{4}$ and $\frac{3}{8}$.

[120] Similarly, one could conceive of this rebounding motion using a model of musical gravity similar to Rameau's conception. The rebounding melodic motion between the domiant above (i.e., G4) and below (i.e., G5) the tonic (i.e., C5) is similar to a revolution around a gravitational center. Similarly, the turn figure around G5 on the fourth beat of m. 1 is knocked out of its normal orbit in m. 3.



Example 2.29. “The Bike Chase” Rhythm from *E.T. The Extra Terrestrial* (1982)[121]

This $\frac{3}{4}+\frac{3}{8}+\frac{3}{4}$ combination is equivalent to four measure of the regular $\frac{2}{4}$ meter with a missing half beat. This eighth-note discrepancy throws off the balance, placing the downbeat where the upbeat had previously been. The occurrences of these missing eighth notes are not in close enough proximity to feel a sense of balance by pairing occurrences of dropped eighth notes to offset one another. There is just enough time—approximately 6 to 8 measures—for the listener

[121] The numbers in this figure represent the number of eighth notes per beat.

to recover their metric footing before Williams drops another eighth note. This music accompanies E.T., Elliot, Robert, and three other boys fleeing from the authorities. These dropped eight notes and the feelings of instability reflect the uncertain fate of the boys and the alien. These hypermetric units compress when the beats are dropped and return to their original state for a short period—just enough for one to recover. This recovery illustrates metric elasticity because there is change with an immediate return to a previous state of relative stability. However, one experiences a certain amount of plasticity because the metric instabilities disrupt the otherwise steady flow the passage.

These concepts of musical elasticity and plasticity occur on many layers. There may exist musical elasticity on one layer, while musical plasticity may exist on another structural level. Because each moment of performance passes by and one cannot alter a particular moment after it has been performed; therefore, a certain realization of musical plasticity (permanent deformation) remains in the mind of the listener. This is like an object that is repeatedly deformed and allowed to return to a previous state. Eventually, the object begins to show signs of structural fatigue. When there are few instances of weak deformation of a musical object, one may soon forget these moments of deformation. However, when there are several instances of significant deformation, this musical object fatigue becomes part of the object's identity.

It is very easy to conceptualize musical elasticity and plasticity as two absolute states. Theoretically, however, a full spectrum between these absolutes is possible. As in the hypothetical situation just mentioned, once one removes a deforming force, the object may only partially return to its original state. This is neither absolute elasticity nor absolute plasticity. It is common for a recapitulation to vary in some way from the exposition, the journey through a developmental passage having altered or affected it. In this way, the development has affected

an evolutionary change in the original musical object. The object is no longer the same, nor can it be after such a change.[122]

Friction and Drag

Friction is the resistant surface force due to contact between the surfaces of two objects in relative motion to one another.[123] Another force of resistance is *drag*, the force acting on a solid object as it moves relative to a fluid flow.[124] The term "fluid" may refer to either a liquid or a gas. Both friction and drag involve resistance or restriction of an object in motion. Because friction and drag concern objects in relation to one another, the placement of these models in the continuum mechanics may seem peculiar. However, friction between two objects in contact with one another causes internal stresses within each object. One may perceive the fluid material that creates drag on a moving object as an object itself. An object passing through a fluid changes the molecular makeup of the fluid, thus implying certain energy changes and forces at work. Detailed models of the friction and drag models are beyond the scope of the current study, because the forces and changes in the object are not as easily quantifiable and obvious as previous models. Therefore, any mentions of friction or drag here primarily concern the concepts of resistance and restriction.

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[122] Viscoelasticity, the property of a material exhibits bother viscous and elastic characteristics when undergoing a deformation, may be introduced to this musical energetic modeling to conceptualize the notion of rate of change in an object and resistance to change. The complex notions of structural integrity, rate of change, and resistance to change are beyond the scope of the current study. These concepts suggest future study.

[123] Deeson, 170.

[124] Deeson, 108.

Like physical resistance forces, musical resistance is not so easily quantifiable. For instance, one may experience the effects of musical resistance in a ritardando or a thinning texture. The object causing the resistance may not be apparent. Nonetheless, in a ritardando, the reduction of the tempo clearly demonstrates a resistance affecting the acceleration of musical motion. An unseen object causing restriction of musical motion is similar to a gas. One cannot readily see the air that creates resistance against the parachute. The effects of the air, however, are evident as the parachute expands and the object slows down. Such basic observations will suffice for the current study of musical resistance and restriction.

Schubert's *Gretchen am Spinnrade*, op. 2, D. 118 demonstrate musical resistance. Gretchen sings of her love lost as she sits at a spinning wheel (example 2.30). Rhythmic inertia (and momentum) is evident in the spinning wheel. At the climax of the music, Gretchen drifts away in her thoughts and neglects the task at hand. One presumes from the music that she gets so caught up in her thoughts that she stops working the pedals of the spinning wheel. The spinning motif slows and pauses to reflect Gretchen's absence from reality. An ideal spinning wheel, one without friction or drag, would endlessly continue to spin. This is not the case with the spinning wheel motif—and presumably with the spinning wheel. After the fermata on the climatic G5 in m. 70, Gretchen comes back to reality and begins working the pedals of the spinning wheel. The spinning wheel motif slowly regains speed, returning to full spin after a few measures. The slowing of the motif—and labored reengagement of the motif—demonstrates the physical friction and drag working on the spinning wheel and parallel Gretchen's growing absence from reality.[125]

[125] Kinderman notes the difficulty of reengaging the rotation of the spinning wheel after the climax. See, Kinderman, 65.

Example 2.30. Schubert, "Gretchen am Spinnrade" (mm. 63-75)

In a film score, for instance, a ritardando or a decrescendo may accompany a train screeching to a halt on the tracks (friction), or an arrow shot into the sky losing speed as it experiences wind resistance (drag). Just as the rhythmic changes of the spinning wheel motif paralleled the narrative of Gretchen's thoughts, musical friction or drag may represent the drama

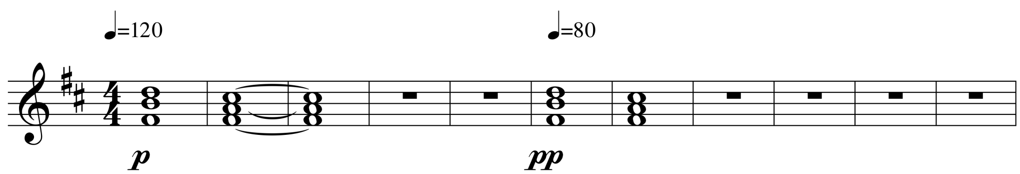
of a film. Such musical representations of narrative resistance or restriction are very common in film scores, as most all films have some sort of conflict and resolution as the foundation of the story.

The concepts of friction and drag are crucial elements to the plot of *Apollo 13* (1995). The climax of the film occurs as the command module reenters Earth's atmosphere. Here, the problem is the possibility that extreme heat due to friction will destroy the command module during reentry. James Horner not only uses musical restrictive forces to parallel the physical portrayals of friction and drag experienced by the command module during reentry into Earth's atmosphere, but also to reflect the decelerating and halt of the drama's forward momentum as everyone waits to see if the crew will survive reentry. As the ground crew waits for a response from the flight crew, the musical momentum slows to point that it nearly stops altogether. Example 2.31a-c shows excerpts from the progressively restricted music.

(a) Command Module Enters Earth's Atmosphere

Example 2.31. Reduction of Selections from "Reentry and Splashdown" Scene from *Apollo 13* (1995)

(b) Waiting for Contact from the Command Module



(c) The Four-minute Mark has Passed

(Example 2.31 continued)

The music in example 2.31a plays as the command module reenters Earth's atmosphere. In this example, the tempo is fast, the texture is thick, there is rhythmic and harmonic variety, and the

melody is very active. By contrast, the music of example 2.31b shows a slower tempo, a more sparse texture, essentially a one-to-one rhythmic counterpoint, and very little harmonic variety. This music accompanies the moment that contact is lost with the command module and everyone waits in suspense to see if the flight crew has survived reentry. The ground crew expects to regain contact with the flight crew after four minutes. After this mark passes with no contact, the music takes on a more somber feel (example 2.31c). The texture reduces to two simple chords with long musical pauses between these chords. The tempo is also reduced during the pauses between these harmonic statements. This lack of musical motion almost wills the audience to hold its breath in suspense. When ground control's monitors show the parachutes of the command module and radio contact confirms the flight crew's safe reentry, the music quickly swells, regaining forward momentum and bringing life back into the film.

Chapter Conclusion

The metaphorical models presented in this chapter are by no means comprehensive. Potentially, several other physical models have a place in the analogy to music analysis, and more specifically, film score analysis. Likewise, there is room to expand each of the current metaphorical models to describe greater metaphorical and musical detail, as well as different parameters of musical sound. The purpose of this chapter is to provide a foundation for understanding music as gestures related to a person's everyday embodiment of the physical world. This chapter has summarized several energetic models and concepts from Kurth, Larson, and Schoenberg. In addition, this chapter has compiled these different energetic ideas into one place and drawn connections between the various models. These models certainly overlap; however, this overlap provides a different perspective for analysis. Such overlaps create a web

of interconnectivity between the models, demonstrating the strength and flexibility of using such models to describe musical gestures and their relationships to extramusical events.

CHAPTER 3 – *SIGNS* (2002)

SIGNS (2002)
DIRECTED BY M. NIGHT SHYAMALAN
MUSIC BY JAMES NEWTON HOWARD

Signs (2002) tells the story of an alien invasion of Earth from the perspective of one family. This family is in the midst of working through the loss of the mother in an accident a few years. Because of this loss, the father, Graham, has lost faith in his belief in God, having previously been a minister. The aliens eventually abort their invasion and the family survives the ordeal. In doing so, Graham renews his faith and trust in God, family, and humanity.

James Newton Howard's score for *Signs* sets up contrast between consonant and dissonant intervals to create energetic gestures that parallel certain action and narrative events in the film. The music is, in large, atonal. The harmonies are often ambiguous or non-tertian structures. Ostinatos of three- and four-tone motifs dominate the score. The melodies are rarely lyrical. Rather, these melodies primarily serve to create sharp contrasts of varying dissonance against the otherwise consonant harmonies. Tone and interval tendencies often do not resolve clearly or immediately. While these musical characteristics lend themselves well to reflecting the actions and narrative of the film, they present difficulties to traditional musical analysis. Approaching this analysis from a continuum mechanics perspective, one can easily make sense of these musical gestures in context of the film's actions and narrative. The compression and tension models—along with concepts of elasticity and plasticity—allow one to flexibly analyze the energetic

qualities of these musical gestures, while also avoiding many of difficulties of labeling and nomenclature associated with more intense analytical systems. As simple as they are, the compression and tension models emphasize the intensity and contrast between perceived consonances and dissonances. Reading such events as musical gestures allows one to find timing correlations between the music and extramusical events. The process is simple, yet an important first step in film score analysis.

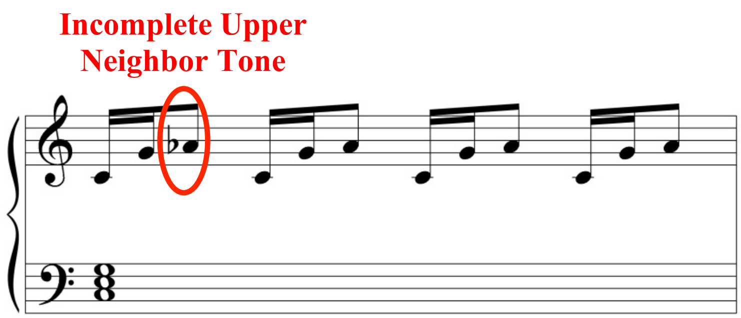
The score centers on a simple three-tone motif, shown in example 3.1.

Example 3.1. Three-tone Motif in *Signs* (2002)

Howard sets the mood and atmosphere of various scenes by manipulating and embellishing this motif and its musical surroundings. In its different manifestations, the motif represents both the aliens and the humans, although the motif's character is quite different in its representations of each group. What distinguishes these representations is the harmonic context in which the motif appears.

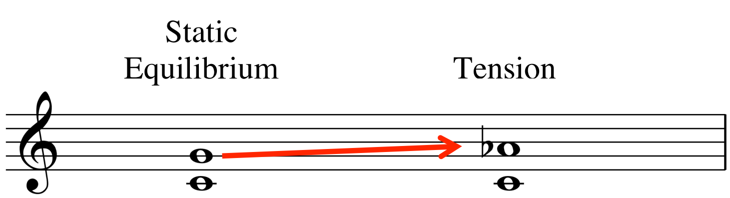
When the aliens appear on screen (or are suggested), the first and second pitch classes of the three-tone motif are harmonic tones (example 3.2). The final pitch class is a nonharmonic tone that does not resolve. This unresolved dissonance reflects the aliens, as well as the fear and danger associated with their presence on Earth. This dissonant final pitch class, displaced from its pitch class of resolution by a half step, defies melodic gravity and therefore resembles the aliens that it represents. Like the alien spacecraft,

this rising motif does not descend. The dissonant tone suspends in the air, causing the audience to anticipate and desire resolution. It is not until the end of the film that any direct and lasting resolution occurs.



Example 3.2. Alien Motif

A tension model representation of this pitch shows two states of an object (example 3.3.). The first state is the object at rest, being the consonant P5 from C to G. The underlying harmony reinforces this consonance. Moving to the second state, A♭ replaces G.



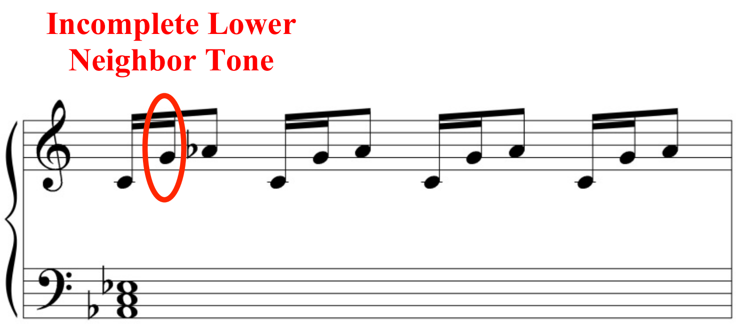
Example 3.3. Tension Model of Alien Motif

Likewise, the relatively dissonant m6 replaces the consonant P5. The underlying harmony does not change, supporting the hearing of this m6 as a dissonance and as a

deformation of the original P5. In this case, the musical object, the P5 from C to G, stretches by a half step to a m6 from C to A♭. Similar to a magnetic force reaction to this dissonant A♭, the deformed musical object has a tendency to return to its original state. This desire to return to static equilibrium is an example of musical elasticity. This tendency is denied in the alien motif; instead, a new iteration of the motif begins. It is important to understand that these motif statements are not elided. While the second iteration begins with a P5, this P5 is the beginning of a new statement of the motif and not a resolution of an old statement. The rhythm of the A♭, being equal in duration to the C and G combined, reinforces the notion that this motif ends with tension. The denial of the elastic tendency is not the same as musical plasticity, where there is little or no tendency to return to a previous state.

The tension model representation better depicts how the contrast between consonance and dissonance functions in this score. The notion of melodic gravity requires a referential platform, often a tonic or strongly perceived chord root. With the ambiguous harmonies and lack of tonality, a referential platform is not always perceivable. The tension model, on the other hand, concerns the perceived consonance and dissonance of musical objects in relation to one another. Beyond melodic intervals, the tension model is capable of relating harmonic intervals to one another, or even relating melodic intervals to harmonic intervals, something that the melodic gravity model cannot do. While the melodic gravity model provides some insight into these motifs, the tension and compression models more accurately and flexibly demonstrate these energetic musical gestures in the context of the style and texture of this score.

In cases where this basic motif represents the humans, the first and third pitch classes of the motif are harmonic tones (example 3.4).



Example 3.4. Human Motif

The rhythm and melody of the motivic ostinato is identical to the alien motif; however, G is now the dissonance, owing to its harmonic context. Whereas the alien motif ended with dissonance, the human motif contains the dissonance in the middle of the motif. The human motif's dissonance is resolved within a single motif statement, ending with the chord root. The effect of the human motif is different from the uncanny alien motif, which leaves the audience anticipating a resolution of the dissonance that may not come. The tension model does not work with this version of the motif, as the musical object (i.e., the motif) is not stretched beyond its static equilibrium (i.e., the m6 from C to A♭). Instead, the dissonant G seeks resolution by expanding the P5 from C to G outward to a m6 from C to A♭. This outward expansion to static equilibrium from deformation (i.e., dissonance) is characteristic of the compression model. The compressed musical object has the tendency to expand when one removes the applied force.

The apparent plot of the film concerns the survival of the family during an ensuing alien invasion of earth. Interwoven into the apparent plot of the alien invasion is the story of how the family copes with the loss of the mother (figure 3.1). The following scene serves as a microcosm of this latent plot (0:41:09 – 0:43:45).

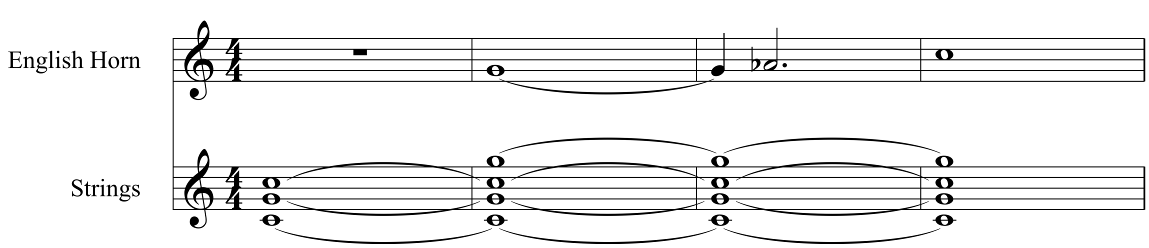
Figure 3.1. Merrill (left) and Graham (right) Watching News Coverage of the Lights

Graham and Merrill (Graham's younger brother) sit on the couch before the invasion, watching the latest developments in the imminent alien invasion on the television. The younger Merrill asks Graham, a former minister, to give him words of comfort. Graham obliges. This scene contains dialogue, which necessitates that the score be very subtle, so as not to interfere with the spoken words. Nonetheless, the music functions in this restrained scene to tell a narrative of the characters' inner thoughts. Resulting from its minimalistic qualities, the score contains several chromatic conflicts. Several harmonic and tonal ambiguities make analysis using traditional systems difficult or altogether impossible. The energetic gestural approach emphasizes these chromatic conflicts. The

compression and tension models in particular illustrate these dissonances throughout this scene. These musical gestures, together with the dialogue, reveal Graham's inner conflict between his belief in God and his emotions after the loss of his wife. Most of these moments of compression and tension are left unresolved. Graham does not come to terms with his inner conflict in this scene, therefore these musical conflicts cannot yet resolve.

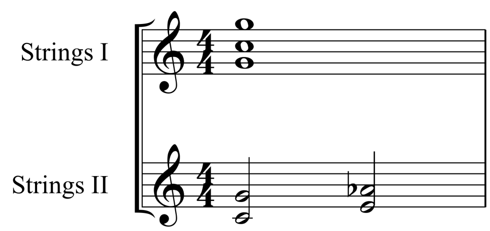
Graham and Merrill watch the news coverage of fourteen mysterious lights that have appeared over many cities, presumably from alien spacecraft. As Merrill seeks comfort from his older brother, the alien motif appears throughout the beginning of the conversation. The various statements of the motif do not directly represent the aliens, as the aliens do not appear in this scene. Instead, the motif statements represent the fear and assumed danger associated with the aliens.

As they sit, Merrill comments, "some people are probably thinking this is the end of the world" (example 3.5). The accompanying music consists of strings playing an open fifth (C and G), while an English horn solo provides a dissonant accompaniment. The first three pitches of the solo are G4, A♭4, then C5.



Example 3.5. Reduction of "the end of the world"

Note that these pitch classes form the three-tone motif shown previously. In this context, the A♭ is dissonant, suggesting the alien motif and its narrative implications. The dissonance of this passage causes the audience to empathetically experience some sense of unease. Following Merrill's comment, Graham agrees that this is likely the end of the world. Graham, responding to Merrill's objection, asks, "That wasn't the answer you wanted?" Merrill asks Graham, "Couldn't you pretend to be like it used to be?" E and A♭ appear against the pedal Cs and Gs (example 3.6).



Example 3.6. Reduction of "couldn't you pretend"

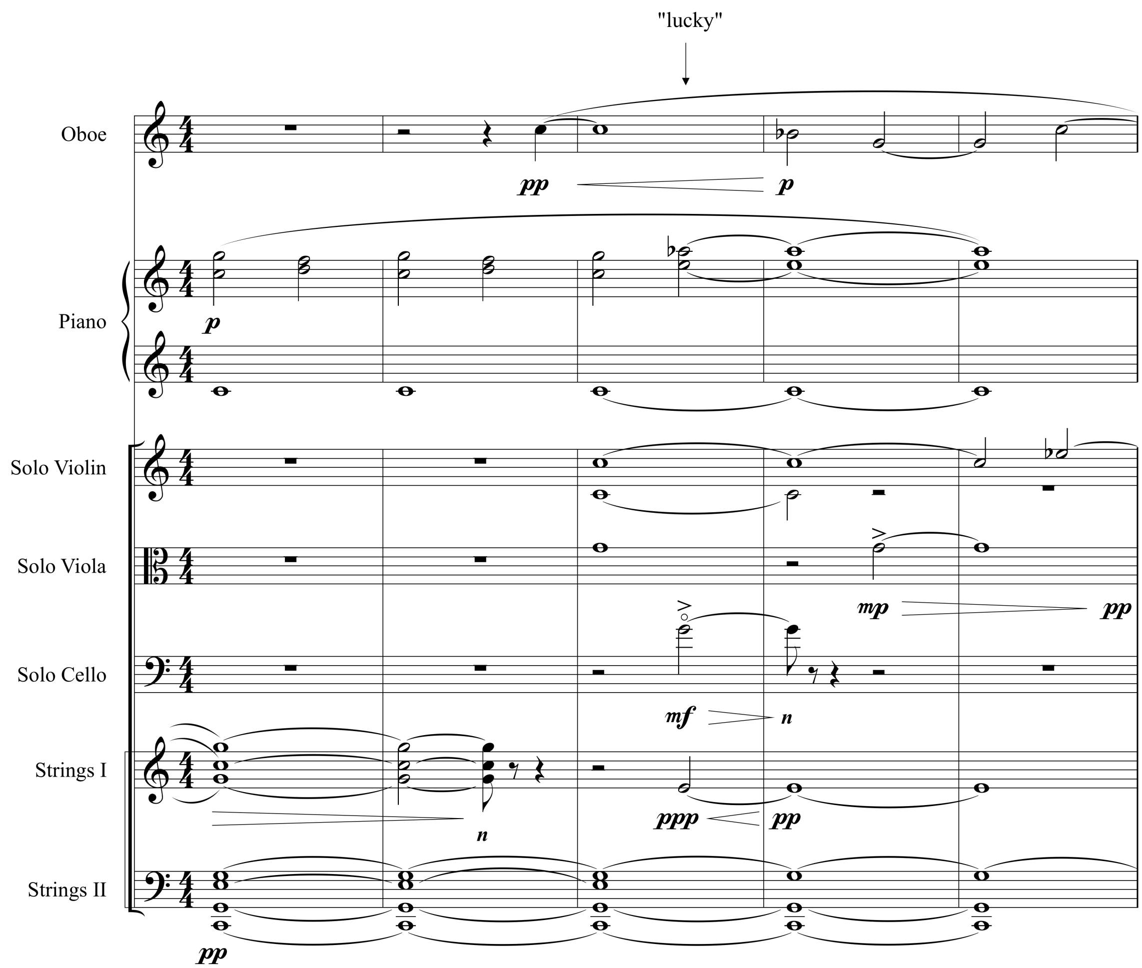
Like the alien motif, the A♭ stretches the P5 between C and G to a m6. The tension of the m6 occurs in conjunction with the words "like it used to be." Here, the A♭ is considerably more dissonant than before. Previously, the A♭ only created dissonance against the G. In this statement, however, the A♭ also forms a d4 with the E. This added dissonant interval creates yet another musical object under stress. In this case, the d4 seeks to return to a relatively stable and consonant m3 between E and G. The object does not return to static equilibrium, denying the tendency of musical elasticity.

The dissonance created by ascending to A♭ parallels the question Merrill asks. Questions are very often marked with an ascending vocal inflection at the end of the sentence that does not descend. Likewise, these ascending musical gestures contain an

unresolved dissonance, a musical question of sorts. The d4 of E and A♭ compounds the dissonance previously experienced, just as the loneliness Merrill is experiencing compounds his fear of the aliens. In the previous phrase, the English horn played A♭ against the open fifth in the strings. Here, the A♭ appears within the strings, providing no timbral separation between these contending tones. The E and A♭ fade away as Merrill asks Graham to give him some comfort.

Graham agrees to speak some comforting words to Merrill. He references two groups of people. Group one consists of believers in a higher power and miracles. Group two, by contrast, do not believe in a higher power, and believe instead that any coincidence is pure luck. As Graham tries to comfort Merrill, it quickly becomes apparent that something more is going on this scene. Graham is trying to reconcile his beliefs in God (reflected in group one) with his emotions following the death of his wife (reflected in group two). Graham states throughout the film that there is no God and that he will not waste another second on prayer. It becomes apparent that Graham is not fully convinced of this belief. His words indicate that he is angry with God. Later in the film, he even talks aloud to God, expressing his anger at God. Graham does not realize the apparent contradiction that, to be angry with God, one has to believe that God exists. The entire film is Graham's attempts to reconcile this inner conflict. As he describes the two groups, the accompanying score reflects Graham's inner conflict. When he begins describing the groups, the piano alternates between harmonic P5s (C and G) and m3s (D and F) (example 3.7). This piano alternation between C-G and D-F is like a spring undergoing compression and release. The harmonically supported P5 is the musical object at rest. The m3 is the deformed object under compression. If one quickly releases

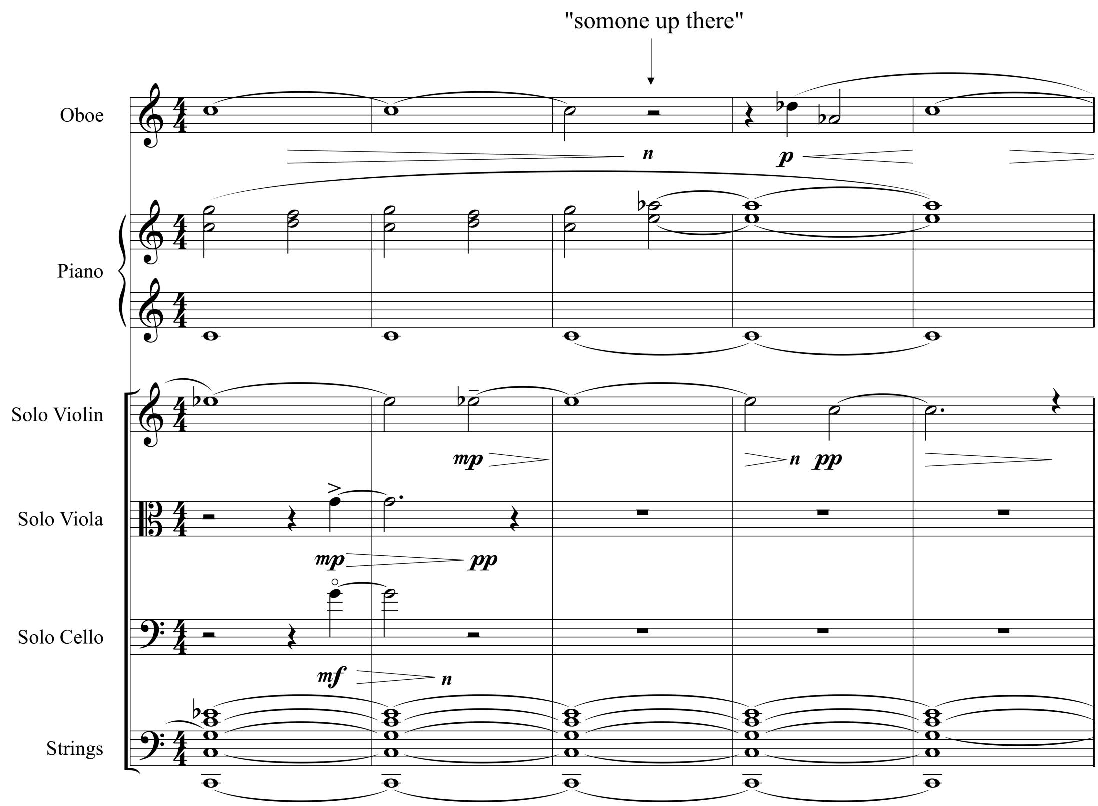
a compressed spring (with a strong elastic tendency), that spring does not immediately snap back to static equilibrium. There is often some amount of rebound.



Example 3.7. Reduction of "couldn't you pretend"

Like a spring with strong elastic tendency, this initial deformation undulates back and forth before moving forward. These two harmonic intervals (i.e., the P5 and m3) represent the two groups of people. Additionally, the undulation between these two piano intervals represents (and foreshadows) Graham's attempt to reconcile his beliefs with his emotions. The underlying harmony during this passage is CM. Graham states,

“When they experience something lucky, group one sees it as more than luck.” As Graham says the word “lucky,” the piano moves to E-A♭ instead of D-F, as if raising a question. Note that E-A♭ are same tones that appeared when Merrill ask Graham to “pretend like it used to be.” The piano undulation restarts as Graham explains that group one sees the event “as a sign, evidence that there is someone up there watching out for them.” When he says “someone up there,” the piano moves again to E-A♭ (example 3.8).



Example 3.8. “someone up there”

Here again, the P5 between C and G is stretched and now contains tension. This unresolved tension suggests that Graham is posing the question of the existence of God.

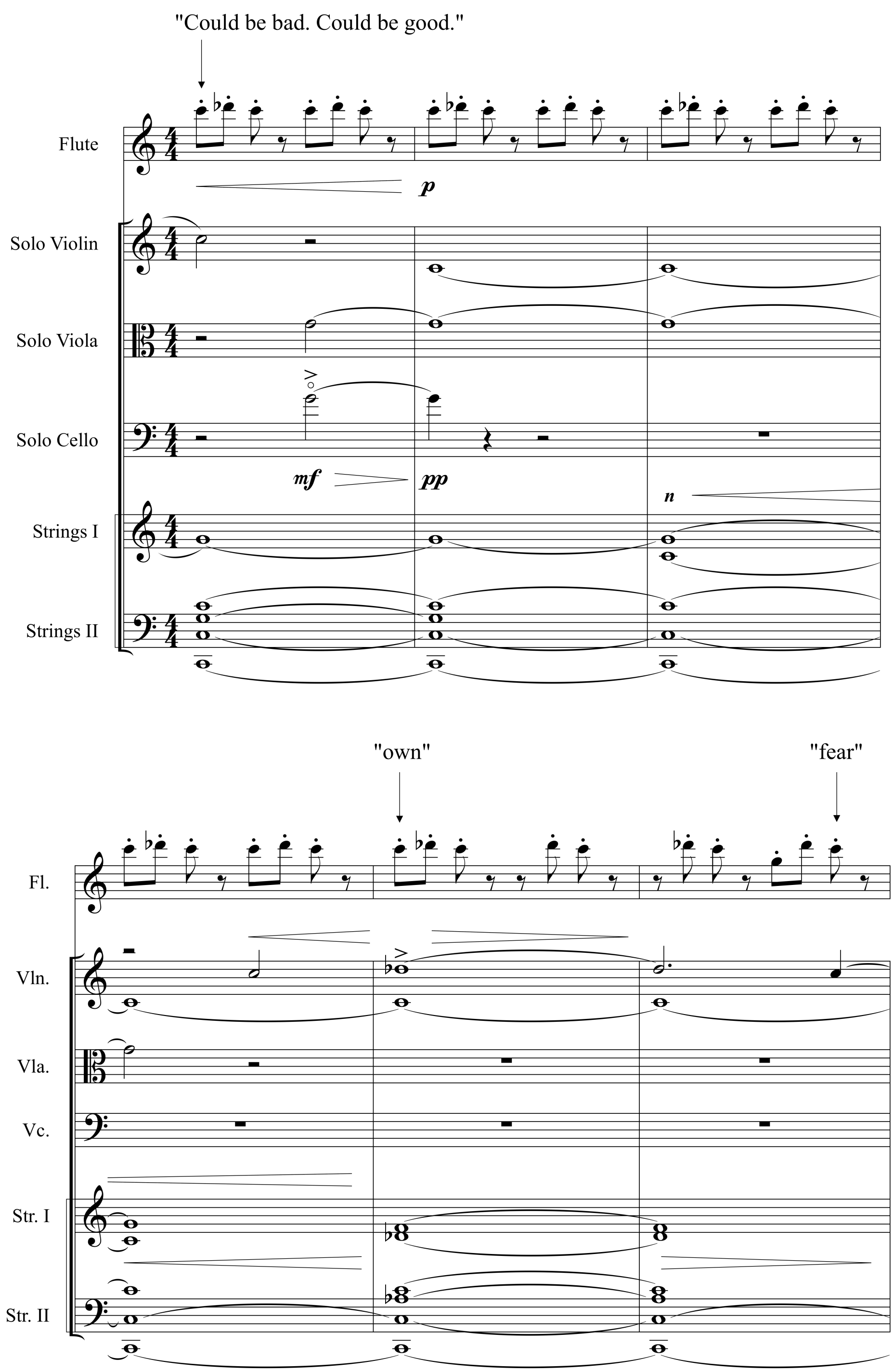
Graham now begins describing group two, stating that group two "sees it as just pure luck, a happy turn of chance" (example 3.9). When he says "luck," a third statement of the piano undulation begins.

Example 3.9. "Group two sees it as just pure luck"

The musical context surrounding this undulation changes with this final statement. The underlying pedal harmony that had been a CM chord shifts now to a Cm chord with A♭ in the bass, alternatively read as an A♭MM7 chord. This bass motion is the first change in

the pedal bass over the last several minutes of the film. The A♭ in the bass expands what had been a compound P5 to a compound M7. This intervallic expansion exemplifies tension. Following the piano alternation between C-G and D-F, the piano moves to E-A♭. This d4 sounds in conjunction with the moment he states that group two views the fourteen lights in the sky in a suspicious way. With this statement, Graham contrasts group two with group one. Group one sees the fourteen lights as confirmation, proof. The d4 and the use of the word "suspicious" with group two suggests doubt in a couple of ways: (1) the doubt and questions asked by group two concerning their knowledge of the world as they know it, and (2) Graham's doubts groups two's logic and beliefs (or lack thereof).

As Graham goes on to describe group two in detail, the music changes. He states that for group two, "this situation is a 50-50. Could be bad. Could be good. But, deep down, they feel that whatever happens, they're on their own and that fills them with fear." At the exact moment he says the word "bad," the flutes begin playing an undulation between C6 and D♭6 (example 3.10). The perpetual alternation of these conflicting pitches creates a constant tension, which counters any consonances and compounds any dissonances occurring simultaneously. Graham's comments and the flute part symbolize the doubt and hopelessness experienced by group two. It is interesting that he puts forth the notion that the coincidence could be bad before he acknowledges that it could be good. He then immediately counters the notion of the coincidence being good with "but deep down...that fills them with fear." This counterargument to the "good" perspective further acknowledging that nothing good can really come out of the situation for group two.



Example 3.10. "Could be bad. Could be good."

On the word "own," the octave between C4 and C5 expands to a m9 between C4 and D♭5, again resembling the tension model. This tension lasts until the word "fear." A D♭M

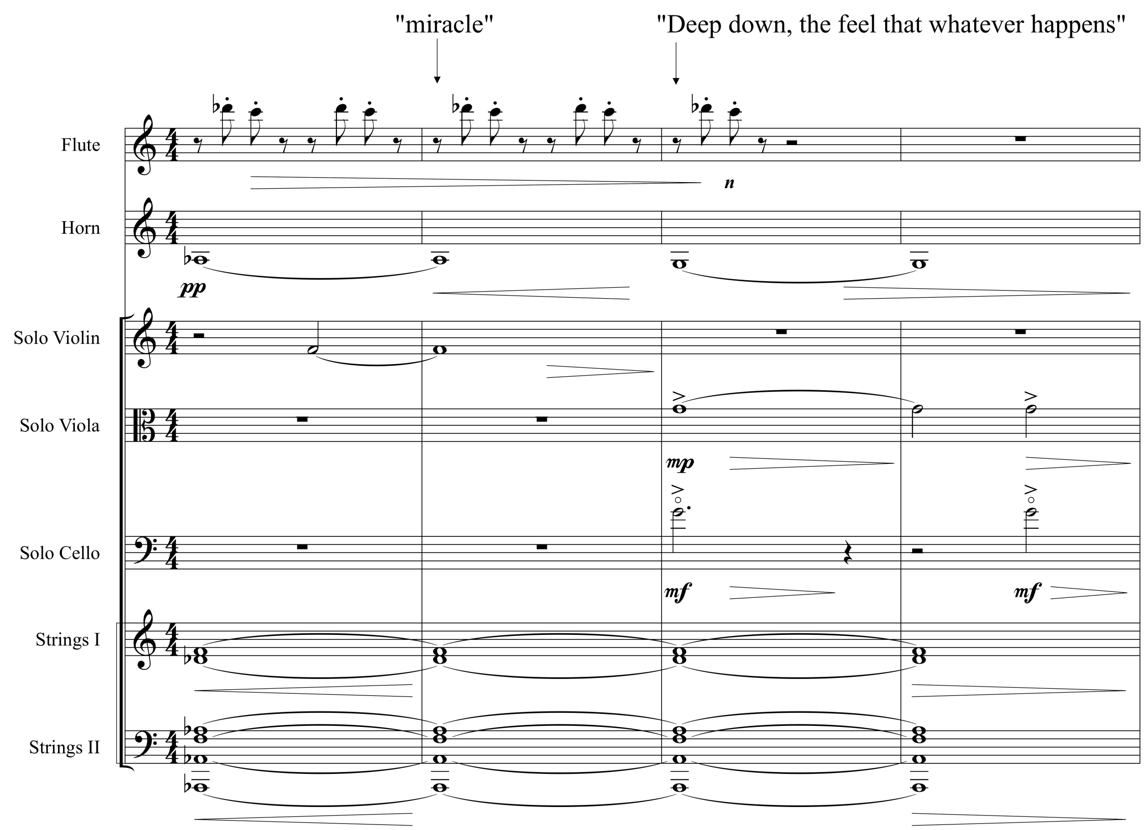
chord in the violins and violas harmonically supports the D♭, however, pedal C persists in the cellos and basses. Where C had previously been consonant and D♭ dissonant, D♭ is now consonant as the chord root and C is a dissonant, nonharmonic pedal tone.[1] The harmonic shift leaves C stranded "on its own," emphasizing the desperation and loneliness of group two in this situation. The tension of C and D♭ reappears when Graham begins to contrast how each group feels deep down (example 3.11).

Example 3.11. "but there's a whole lot of people in group one"

[1] C may be also be read as the seventh in bass of a D♭MM7. In either interpretation, one perceives it as a dissonance.

A B♭m chord harmonizes the second instance of the C-D♭ conflict, furthering the tension as the m6 (C-A♭) expands further to a m7 (C-B♭). C and D♭ appear before Graham begins discussing how group one feels deep down. This misalignment of tension with this statement signals that the C and D♭ have more to do with Graham's inner conflict than a direct symbolism of group one.

D♭ appears a third time, this time in conjunction with Graham's stating that group one sees the lights as a "miracle" (example 3.12). The underlying harmony is again a D♭M triad. This time, however, there is no conflict between C and D♭. The pedal C in the bass has moved to an A♭.



Example 3.12. "miracle"

The only C to appear in this passage is in the fading C and D♭ conflict in the flutes. Without the strong C and D♭ conflict in the strings, however, this D♭M chord is more consonant than its predecessors are. The relative lack of tension with the appearance of D♭ corresponds to the optimism and hopefulness of group one. The A♭1 in the bass moves down to a nonharmonic tone: G1, the lowest note heard thus far in this passage. This dissonance in the bass creates an energetic push forward as Graham states, "And deep down, they feel that whatever's going to happen, there'll be someone there to help them. And that fills them with hope." Here, Graham's repetitive use of the words "deep down" is perhaps a Freudian slip, suggesting that he is in fact searching for his true feelings deep down. These words, paired with the strong bass dissonance symbolize Graham's doubt that a higher power can save him from any pending peril, having once already let him down when his wife passed away.

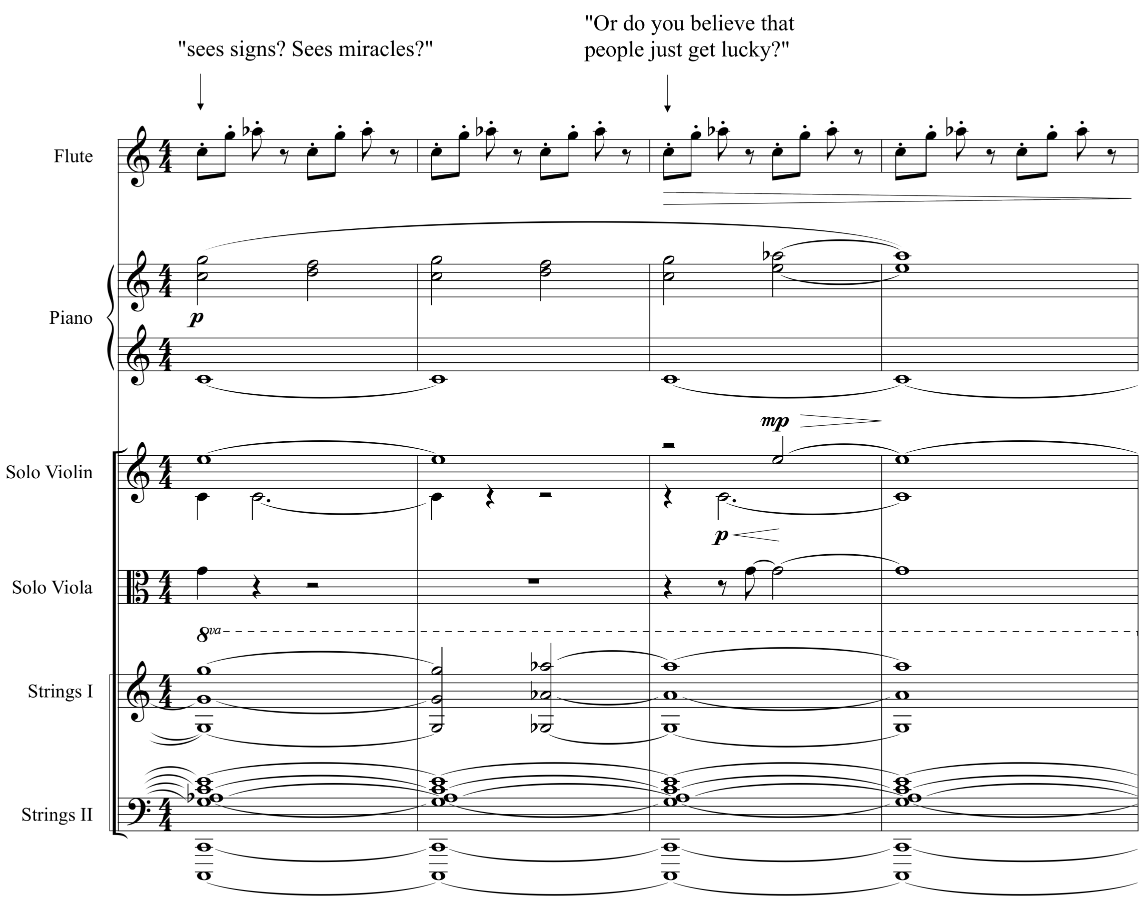
The previous dissonance partially resolves as Graham says that, "there'll be someone there to help them" (example 3.13). C major returns, the alien motif appears in the flute part as an ostinato, and the piano undulation of C-G and D-F returns. One feels a sense of resolution in the shift from the DbM harmony with G in the bass to CM. One perceives the return to CM as a type of conflict resolution, because of its earlier associations with consonance before a departure to D♭ as consonant. The CM chord contains a new lowest note, C1. This new low note reinforces this notion of resoluteness in the CM chord. C is again consonant. The harmonic resolution here is the answer to the musical problem (or question) presented by the previous chord. Similarly, people in group one are worry-free because they can cast their cares and troubles on "someone," i.e., a higher power.

Example 3.13. “there’ll be someone there to help them”

Additionally, the root motion in this scene from C to D♭ to C is a global motivic parallelism of the harmonic conflict between these pitches and the previous flute accompaniment. An A♭ appears in violins and flutes, and signals Graham’s doubt—or reluctance to believe—in God. While one feels a sense of resolution here, the alien motif appears as an ostinato in the flutes. The constant tension of the alien motif alludes to Graham’s inner conflict, but in a strange way also confirms that “someone” else (i.e., the aliens) is obviously out there unbeknownst to the humans. The compression and release associated with the piano undulation hints that Graham is still debating (or questioning) whether God exists. After Graham says the word “hope,” there is a short pause in the

dialogue. During this pause, the piano undulation moves to E and A♭, as if to ask if there is "hope" in a higher power. While Graham may secretly still believe in God, he still questions the notion of hope deriving from that higher power. Previously, despite his devotion to God, he experienced loss. Feeling let down by God, he doubts the existence of divine intervention.

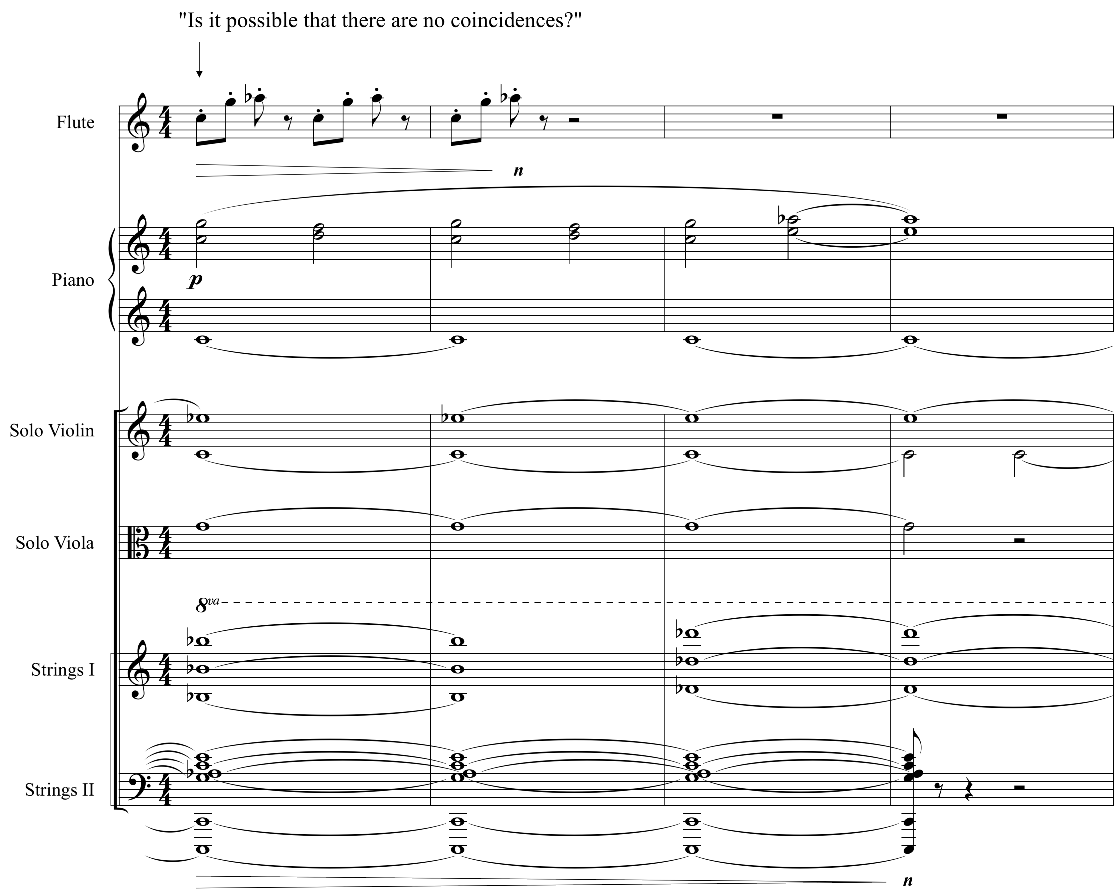
During this E-A♭ musical question, the camera shot changes to show Merrill's face as Graham says, "See. What you have to ask yourself is: 'what kind of person are you?' Are you the kind of person that sees signs? Sees miracles? Or do you believe that people just get lucky?" This music is shown in example 3.14.



Example 3.14. "What you have to ask yourself is…"

The focus has now shifted from Graham and his inner conflict back to Merrill, who initiated the conversation. The reappearance of Merrill on screen reminds the audience that this scene is actually a dialogue and not just a spoken monologue of Graham's thoughts and fears. As Graham asks this question, the violin I part ascends in octaves from G to A♭ to B♭ and eventually to D♭. A♭ appears in the violins as Graham counters his previous question with, "Or, do you believe that people just get lucky?" Following this latest question, the piano undulation moves up to E and A♭. While the dissonance of this musical question persists, he says, "Or look at the question this way—is it possible that there are no coincidences?" The alien motif ostinato fades away and another statement of the piano undulation beings during this final question (example 3.15). Graham asks this last question in manner that suggests that he is trying to convince Merrill (and himself) that there is no God and no such thing as miracles. When he completes the question, the underlying CM harmony shifts to Cm. The C and D♭ conflict appears one last time. The rising violin octaves ascend to D♭6 and D♭7, contrasting the C1 and C2 in the bass. This registral expansion of the C and D♭ dissonance heightens the tension already associated with these pitches. This final chord, including the E and A♭, remains until the music fades away, leaving an unanswered question. This lack of resolution parallels the moment that Merrill contemplates with which group he most closely associates himself. Additionally, this unanswered musical question indicates that Graham has not yet reconciled his emotions with his beliefs, and that he does not yet know how to feel. After Graham finishes, Merrill tells an unintentionally funny anecdote that explains his belief in miracles. No music accompanies Merrill's dialogue. This silence confirms that the

previous music was not reflecting the differences between the two groups as told for Merrill's emotional comfort, but rather, the score reflected Graham's inner conflict.



Example 3.15. "Is it possible that there are no coincidences?"

The shot composition adds an extra layer of complexity to this scene. As Graham compares and contrasts these viewpoints, the camera shows Graham's face as he talks to Merrill. The television is casting the only light in the room. Graham is facing toward Merrill, so that there is a shadow cast across his face (figure 3.2). Half of his face is in the light, while the other half is shadowed in darkness. The contrast between light and darkness maps onto Graham's face the inner struggle he feels between his suppressed

beliefs and his conflicting emotions.[2] By contrast, when Graham asks Merrill which group he belongs to, light shines across both sides of Merrill's face, particularly when he begins to tell why he is a "miracle man."

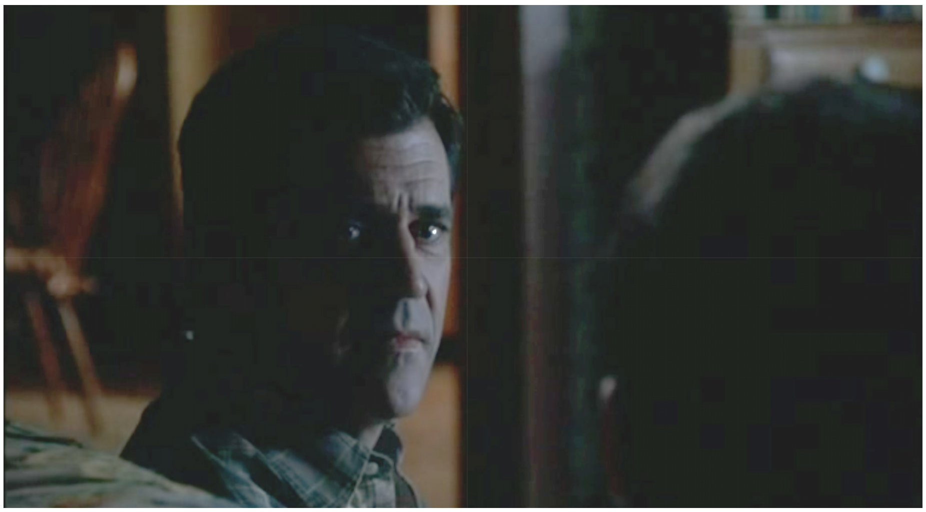


Figure 3.2. Shadow on Graham's Face

Later in the film, the aliens invade, but leave earth suddenly for some yet unknown reason. Graham and his family survive the attack in their basement. Feeling that is finally safe, they leave the basement. As Graham pulls out the television, he sees in the reflection an alien holding Morgan's limp body (1:32:59 – 1:38:23) (figure 3.3). The alien motif returns, sounding now as an open fifth from E5 to B5. C6 stretches this otherwise stable interval, creating tension (example 3.16). The unresolved tension at the

[2] This shadowed face complex appears in other films. For example, in *Star Wars VI: Return of the Jedi*, half of Luke's face is cast in shadow during the fight with Darth Vader, his father. At this very moment, Darth Vader is trying to convince Luke to join the dark side. The light and darkness on Luke's face reveal the inner struggle he feels between good and evil.

end of statement of the motif creates suspense. Additionally, the upward inflection seems to ask the question of what to do.

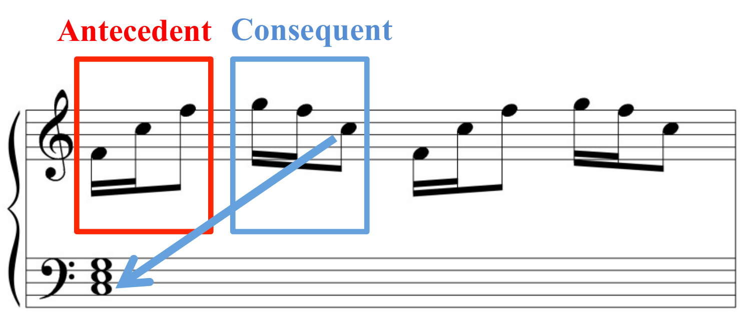
Figure 3.3. The Alien Holds Morgan

Example 3.16. Reduction of "The Alien has Morgan"

As Graham stands there, he has a flashback to the night his wife died. In this final flashback, he realizes that the words that he previously believed to be incoherent ramblings as she died were actually prophetic. He now sees the miracle in her death. Graham tells Merrill to "swing away," instructing him to attack the alien with the bat that is hanging on the wall. Merrill begins fighting the alien as Graham takes the children outside. During the fight, Merrill discovers that water is the alien's weakness. With one final blow of the bat, Merrill knocks the alien down into a cabinet that had three full glasses of water on it. The water spills on the alien, killing it. The alien motif transforms into something new at this moment. Example 3.17 shows the score reduction of this passage.

Example 3.17. Reduction of "Water Kills the Alien"

The analysis of this passage in example 3.18 shows how the less dissonant major second supplants the minor second. The unresolved dissonance of the alien motif battles musically against the consonance of the human motif. In the end, the humans defeat the alien invaders with water, an element necessary for human survival but deadly to the aliens. This transformed motif is relatively consonant and most closely relates it to the human motif. As with its predecessors, this transformed motif's upward motion ends with a nonharmonic tone. However, what distinguishes this motif is the downward return of the upward motion. The motif ends on the chord root. The upward consequent answers the antecedent's question with a downward return to resolution. As the water pours onto the last-standing alien, the music contains cascades of this transformed motif. The tension between C and D♭ and their associative qualities previously demonstrated in the scene where Graham comforted Merrill reappears here globally. As Merrill fights the alien, D♭ (spelled here as C♯) is centric. When the water falls on the alien and kills it, the music returns to the open fifth from C to G, presumably a CM centricity.



Example 3.18. Analysis of "Water Kills the Alien"

The alien is dead, but Morgan has not fully escaped danger (1:38:23 – 1:39:58) (figure 3.4). In the attack, the alien possibly poisoned Morgan, who was already

suffering from an extreme asthma attack. Representing this pending danger created by the alien, the alien motif continues as Graham holds Morgan in his arms (example 3.19).

Figure 3.4. Graham hold Morgan

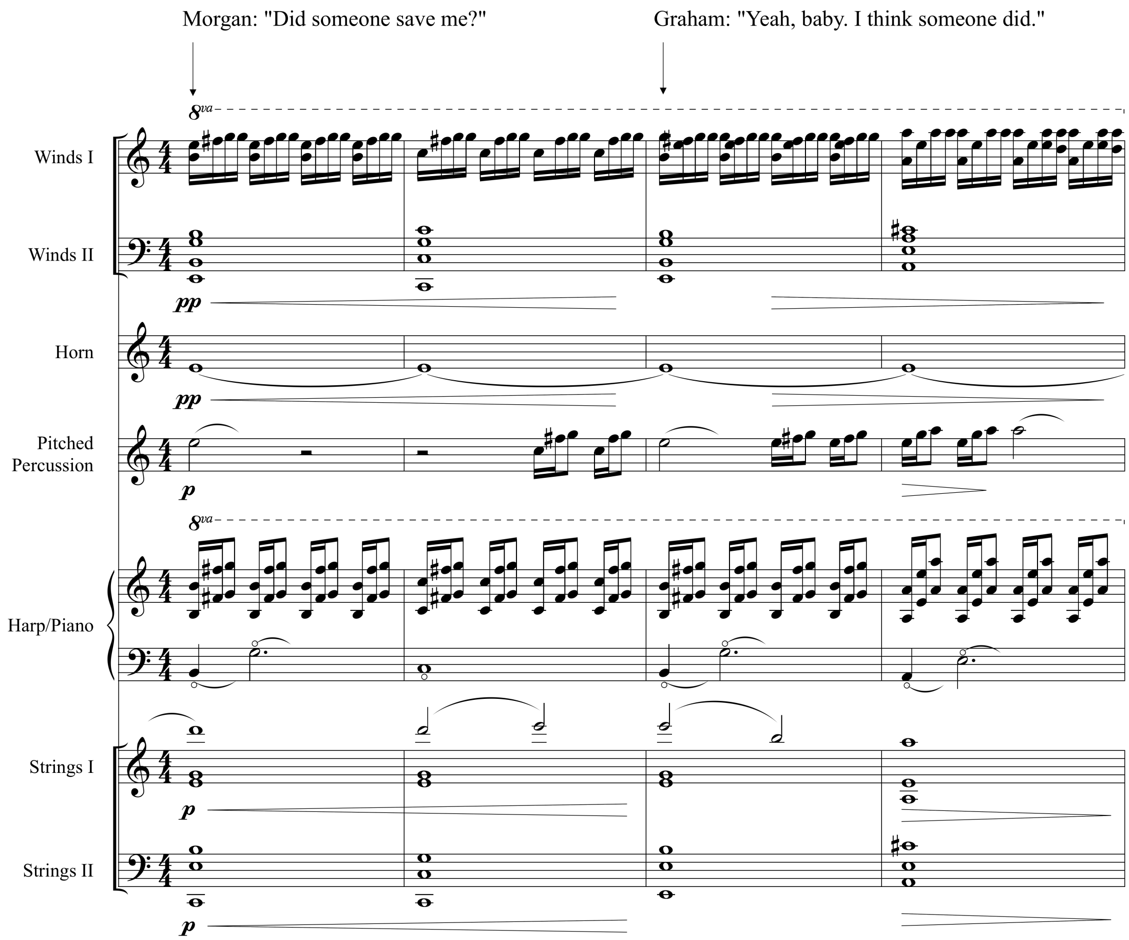
Example 3.19. Graham Holds Morgan

As Graham desperately pleads with God not to take his son, the underlying harmony alternates between CM and cm. The piano and harp play the P5 (C and G) as a melodic interval, hinting that all will end well.

Presuming that they have lost Morgan, the family weeps (figure 3.5).

Figure 3.5. “Did someone save me?”

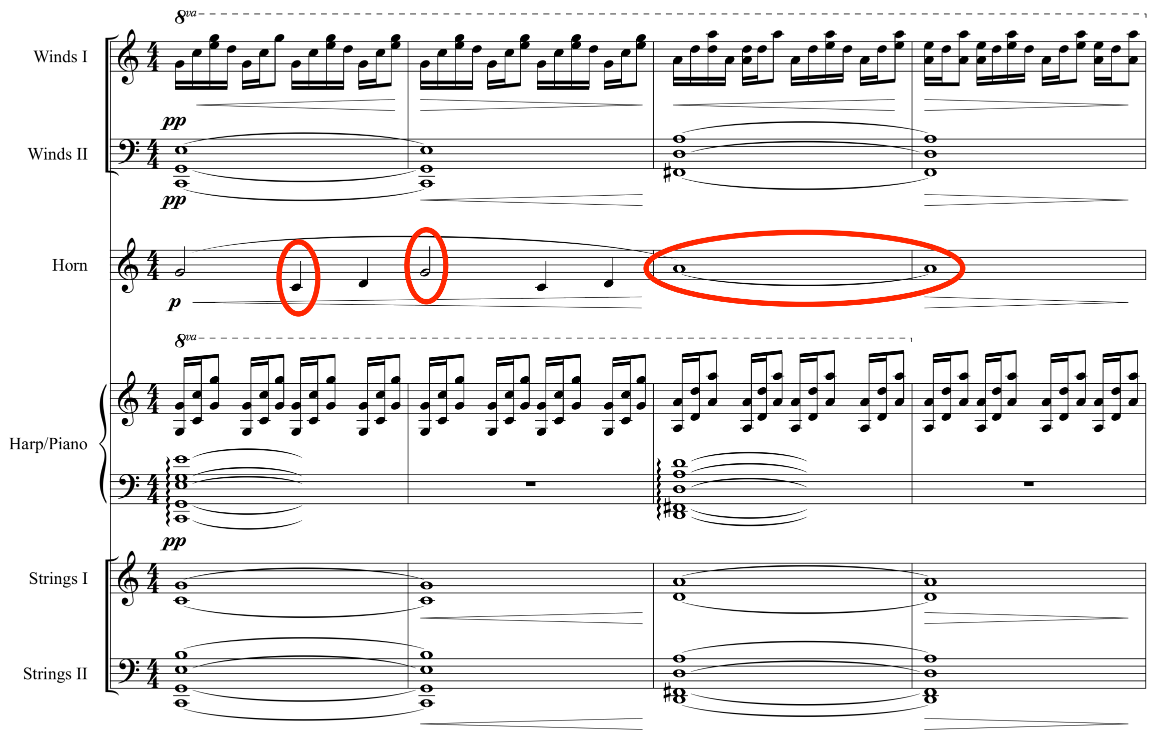
During this time, the underlying harmonies alternate between BM and F♯m. Suddenly, Morgan awakens. Shown in example 3.20, the music leads back to CM with Morgan asking, “Did someone save me?” While CM has returned, there is still a dissonant B and D present in the strings, and the ostinato contains an F♯, which resolves to G in each motivic statement. Graham replies, “Yeah, baby. I think someone did.” Graham has fully acknowledged the existence of God and the saving of his son. While CM has returned, it is not yet fully consonant.



Example 3.20. Reduction of “Did someone save me?”

After a short transition forward in time, Graham steps out of the bathroom, as the children play downstairs with Merrill (1:39:58 – 1:41:10) (figure 3.6). When it becomes clear that he is dressed in his minister attire, a transformed version of the three-tone motif sounds in the horns (example 3.21). Here, the motif contains other tones between the three-tone motif. Despite these other tones, this transformed motif is salient. The metric and agogic accents make clear that this motif derives from the previous three-tone motif. The A♭ of this version of the motif has been replaced by A♮, accompanied by a DM chord.

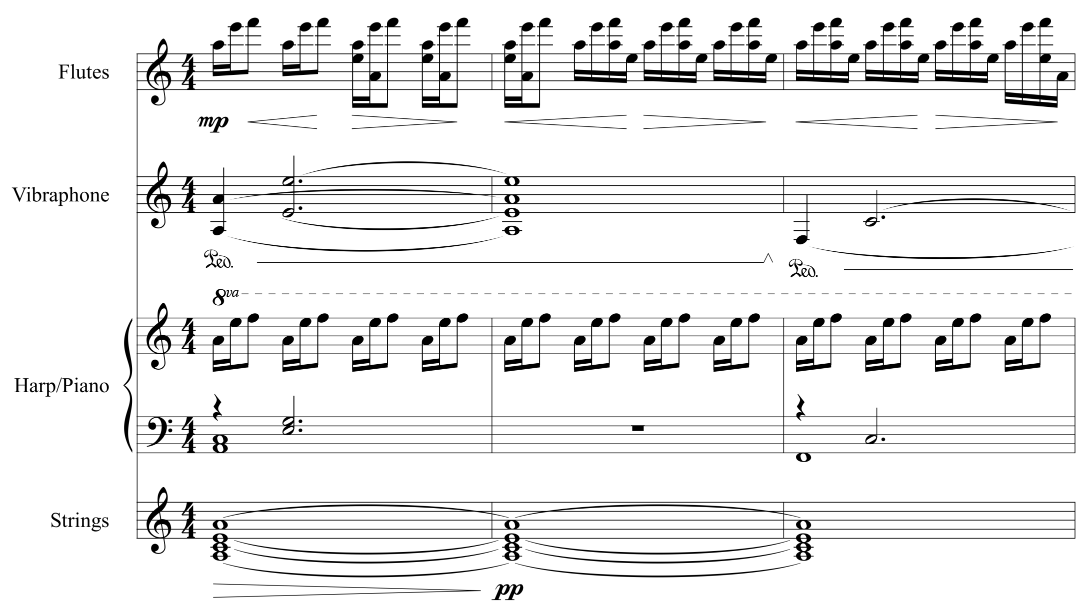
Figure 3.6. Graham Dressed as a Minister



Example 3.21. Transformed Three-tone Motif

Note that, unlike before, this rhythmically augmented motif does not appear above a single chord, but contains a harmonic shift from CM to DM. A♮ creates less tension in the context of the underlying DM chord than did the A♭ above the underlying CM chord. Additionally, the abrupt harmonic shift from CM to DM contains less tension than CM to D♭M/C♯M. The root motion up a M2 is very uplifting compared to the previous root motion up a m2, as if a sense of gravity, weight, or stress has been removed (both musically and narratively).

This slow undulation between CM and DM eventually ends when Graham leaves the room and the end credits begin to roll (example 3.22). As the director and cast credits roll, the open fifth (C to G) sounds, this time in octaves. This P5 reinforces the earlier readings of this interval as being associated with good (at rest with no tension). Additionally, this interval at this moment signals that all will be fine for the Hess family.



Example 3.22. Beginning of End Credits

As the final cast credits finish scrolling, the ostinato in the flutes and piccolos stops and the sustained open fifth (C to G) sounds in the strings (1:41:10 – 1:46:25) (example 3.23).

Example 3.23. End of Cast Credits

The uppermost voice of this open fifth is G4. C is the perceived root of the underlying CM harmony. The upper note ending on something other than the root leaves an open-ended question to the body of the score. If the chord root (i.e. C) were present as the highest sounding member of the chord, there would be a greater sense of musical closure, much like at a perfect authentic cadence. Instead, the film ends on something more closely akin to an imperfect authentic cadence. Perhaps this unresolved question suggests that the Hess family's story is not over, as they live out the rest of their lives. Marking the end to the film, this chord continues until the crew credits begin scrolling. Reprisals of source material from earlier in the score play as the crew credits scroll.

This analysis of *Signs* demonstrates how the music functions as a narrator. While the apparent plot of the film concerns an alien invasion of earth, the music brings forward a better understanding of the underlying plot, that being Graham's inner conflict between his beliefs and emotions. The compression and tension models, as simple as they are, are effective in highlighting such leitmotivic connections between the score, actions, dialogue, and narrative. Because of these models, one may easily and flexibly interpret music that is otherwise difficult to analyze with traditional approaches.

CHAPTER 4 – *THE DARK KNIGHT TRILOGY* (2005 – 2012)

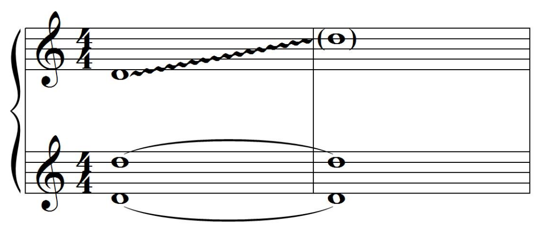
THE DARK KNIGHT TRILOGY (2005 – 2012)
DIRECTED BY CHRISTOPHER NOLAN
MUSIC BY HANS ZIMMER AND JAMES NEWTON HOWARD

The Dark Knight Trilogy, directed by Christopher Nolan, is the latest telling of the Batman saga. This trilogy includes the films: *Batman Begins* (2005), *The Dark Knight* (2008), and *The Dark Knight Rises* (2012). As the trilogy's title suggests, these films are a darker spin on the typical battle of good versus evil—chaos and anarchy are central themes of the trilogy. Hans Zimmer and James Newton Howard, the trilogy's composers, represent chaos through various musical gestures.

The music of this trilogy presents difficulties for more traditional systems of analysis. The trilogy's music is mostly pitch centric, however, much of it lacks tonal function, cadence, resolution of dissonance, and, in some cases, even harmonic motion. For instance, chaos is apparent in pitch as a rising glissando found in the *The Dark Knight*, the second film of the trilogy. This pitch gesture functions in a continuous pitch space and therefore contains no tonal motion, harmonic function, or cadence. Much of the score consists of repeated rhythms; however, rhythmic and metric irregularities interrupt the steady pulse and flow of the music. Like the rising glissando, the rhythmic interruptions correspond to extramusical representations of chaos. These musical incongruities may be difficult to fully analyze through traditional means, yet the message that these gestures convey is clear to the audience.

The primary antagonist of *The Dark Knight* is the Joker. The Joker is a proponent of anarchy and attempts to create chaos throughout the film. The most notable representation of the

Joker and his desire for chaos are apparent in a continuous ascending glissando that often accompanies his appearance on screen (example 4.1).



Example 4.1. The Joker's Leitmotif

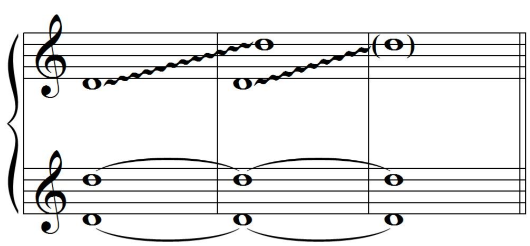
Most of the musical material in the film is in D minor. This passage has no clear tonal confirmation in the form of harmonic function or cadence, however it is centric around the D minor triad. Nonetheless, pitch class D is clearly a goal point of this glissando and serves as a resting place of little tension.

In the film, the Joker interrupts a party hosted by Bruce Wayne (*The Dark Knight*, 0:48:56 – 0:52:42).[1] The Joker grabs Rachel, Bruce's love interest in the film, and holds a knife to her throat (figure 4.1). He tells Rachel one of at least two versions in the film of how he got the scars on his face. As the Joker tells this story, the grinding glissando begins softly in the underscore. This initial glissando resolves as the glissando reaches the height of its tension. Just before resolution, however, a second iteration of the glissando begins. The second glissando overlaps the previous glissando, creating a new tension before the previous tension resolves (example 4.2). These overlapping glissandi in essence form a Shepard tone, an illusionary

[1] Bruce Wayne is the protagonist's daytime persona, while Batman is his nighttime, heroic persona. There is an overlap between these personas, as they belong to the same person. This analysis will refer to the persona that is depicted in the scene, or the persona that most accurately reflects the character trait or topic at hand.

endlessly rising tone. In this way, the second glissando steals away any semblance of resolution that the first glissando may have offered. In fact, these two glissandi contain more tension that any previously experienced. The resolution to D5 in the first glissando occurs just after the second glissando has begun, the lower pitch of this incidental harmony being just a few cents higher than D4. The flat-P8 (or a sharp-M7) obscures the resolution.

Figure 4.1. The Joker Holds a Knife to Rachel's Face



Example 4.2. The Joker Tells Rachel How He Got the Scars

Even without the extramusical factors of the film, the dissonance of this glissando gesture creates a sinister atmosphere. Contrary to melodic gravity notion, the glissando gesture always ascends and never descends back down toward D4, its starting point and reference platform.

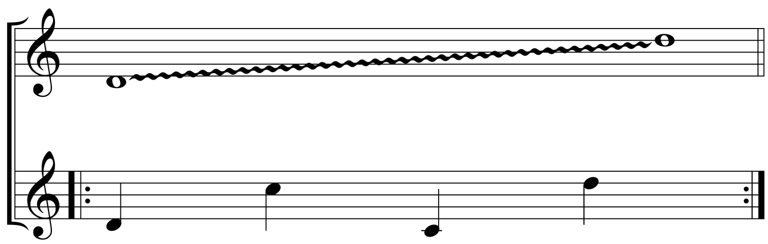
This continuous negation of melodic gravity represents musical anarchy. Adding to the chaos is the lack of a satisfactory resolution of the glissando. The resolution is always interrupted or obscured in some way. The glissando, which is very dissonant as it approaches D5, is magnetically drawn upward to its resolution; however, this musical tendency is denied. In fact, the effect of the glissando is much more extreme, because the interval of dissonance is smaller than our twelve-tone system allows. As Larson states, magnetism grows stronger as we get closer to a goal (or the resolution).[2] In this instance, the composers simply deny the sliding note these tendencies, creating a feeling that the natural laws of music have been broken or that the audience has been denied the right to hear the resolution.

The imagery of energetics and its ability to connect the music and chaos is not unprecedented in the film. The glissando shows up one last time in the film when Batman finally captures the Joker (*The Dark Knight*, 2:09:08 – 2:15:21) (figure 4.2).

Figure 4.2. Batman Captures the Joker

[2] Steve Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, (Bloomington, IN: Indiana University Press, 2012), 88.

During this glissando, the Joker states, “You just couldn’t let me go, could you? This is what happens when an unstoppable force meets an immovable object” (*The Dark Knight*, 2:13:24). He goes on to say, “I think you and I are destined to do this forever” (*The Dark Knight*, 2:14:00), as if to reference inertia. At this moment, the dissonant glissando begins. As the Joker talks about Harvey Dent and begins telling how he corrupted him, a conflict between C and D appears as musical compression and tension, both pitches deriving from the dissonant glissando (2:45:32) (example 4.3).

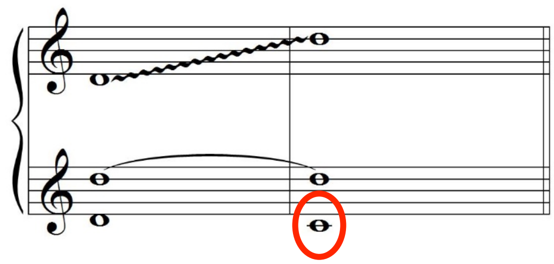


Example 4.3. The Joker Describes Harvey Dent as “The White Knight”

Along with the dissonant glissando, a dissonant melodic m7 stretches to dissonant M9. The compressed m7 expands beyond the octave to continue tension as the M9. The pattern repeats several times. The alternation of pitch class D with pitch class C also highlights several dichotomies. The Joker describes Harvey Dent as the “White Knight,” while Batman is otherwise known as the “Dark Knight.” Also, the dichotomies between good versus evil, Batman versus the Joker, Harvey Dent versus Two Face (Dent’s now corrupt persona) are all manifest in these two alternating pitch classes.[3] The Joker then reveals that he has corrupted

[3] By relation, eventually Two Face’s coin, which has the same face on both sides, figures into this series of dichotomies.

Harvey Dent by "bringing him down to our level" (example 4.4). He then states, "madness, as you know, is a lot like gravity; all it takes is a little push" (*The Dark Knight*, 2:15:01).



Example 4.4. The Joker Tells Batman of Two Face

At this exact moment, the glissando resolves to D, however, the bass moves down to C, creating its own dissonance against the higher resolution. The musical narrative indicates that, while Batman may have finally captured the Joker, chaos ensues through Harvey Dent, now reborn as Two-Face. Interestingly, at the end of the closing credits, the rising glissando resurfaces. Like the previous iteration, the bass moves to C, creating another unsatisfactory resolution. This perhaps indicates that chaos will ensue into the next film.

All three films center on the struggle between Batman and one or more chaos-inducing agents. In each film of the trilogy, rhythmic incongruities represent moments of chaos; however, these musical manifestations of chaos differ in each instance. Consequently, the appearance of rhythmic chaos also parallels Batman's character development as he learns to cope with fear. In *Batman Begins*, Bruce must demonstrate to The League of Shadows his commitment to justice by executing an accused murderer (*Batman Begins*, 0:35:53 – 0:39:50). Ra's Al Ghul's decoy

tells Bruce of the plan to destroy Gotham City, presumably by creating a chaotic scenario.[4] Bruce refuses to execute the man and becomes an enemy of the League of Shadows. He fights and kills Ra's Al Ghul's decoy (figure 4.3). Example 4.5 shows the metric instability that creates musical chaos in the scene. The meter consists of a mix of simple and compound beats, obscuring any sense of a repeating hypermetric unit. For instance, the beat division grouping of mm. 1 and 2 (2+2+2+3+2) repeats in mm. 3 and 4; however, m. 5 consists of two compound beats (3+3), which interrupts any further repetitions of the opening measures. The short succession of simple beats begins toestablish rhythmic inertia, but the compound beat destroys the forward motion. The $\frac{5}{8}$ measure contains one less eighth note than the preceding $\frac{3}{4}$ measure, which propels it forward. The 3+2 beat division composition of the $\frac{5}{8}$ measure places the shorter beat at the end of the measure, further increasing the rhythmic gravity, rhythmic inertia, and rhythmic magnetism.

Figure 4.3. Bruce Fights Ra's Al Ghul's Decoy in the Temple

[4] Here, Ra's Al Ghul refers to the decoy played by Ken Watanabe. Liam Neeson plays Henri Ducard, who is revealed later in the film to be the real Ra's Al Ghul.

Example 4.5. Beginning of the Temple Fight in *Batman Begins*

The asymmetric meters and frequent meter changes pull the audience's sense of rhythm and meter back and forth, preventing any chance that they can gain a steady metric footing. These rhythmic features parallel the physical fight between Bruce and Ra's Al Ghul's decoy; the explosions; the collapsing building; and the narrative struggle between vigilantism and the due process of law.

Bruce survives the fight and escapes the building before it collapses, killing Ra's Al Ghul's decoy. When the threat of the chaos is over, the music stabilizes with the appearance of regular simple beats in $\frac{4}{4}$ (example 4.6). The half notes in the cello and double bass parts reinforce the metric accents on beats one and three. Additionally, the longer sustained tones of the horn and trumpet parts contrast the moving eighth notes of the preceding unstable passage. Throughout the trilogy, symmetric meters and a stable repetition of beats evoke Batman and his fight against evil. By contrast, asymmetry and frequent metric changes correspond to the agents of chaos.

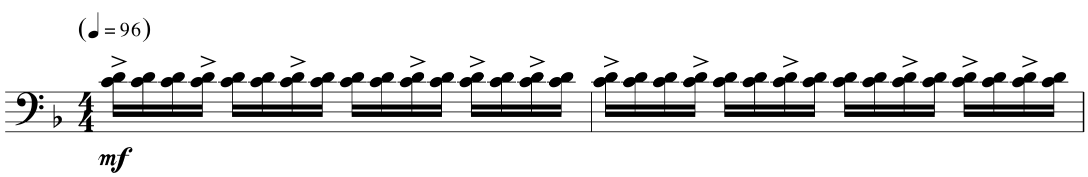
Example 4.6. End of the Temple Fight in *Batman Begins*

In the opening scenes of *The Dark Knight*, several men rob a bank that the local mob owns and operates (*The Dark Knight*, 0:00:45 – 0:06:23) (figure 4.4). The customers and employs of the bank experience the chaos of the takeover. The robbers unexpectedly experience chaos as well. The Joker hired these robbers and gave them each specific instructions. The Joker has each robber kill another robber once the latter's role is complete in the heist in order to

reduce the number of shares that he must pay out of the plunder. The robbers each wear clown masks. The last standing robber takes his mask off, revealing that he is in fact the Joker.

Figure 4.4. The Joker and Robbers During the Mob Bank Heist

The music that accompanies this opening scene is predominantly sixteenth notes in $\frac{4}{4}$. Syncopated dynamic accents in the rhythm are irregularly grouped, creating metric and rhythmic chaos (example 4.7).



Example 4.7. Syncopated Rhythm of the Bank Heist in *The Dark Knight*

The first of these accents gives the illusion of compound beats, followed by three simple beats at the end of each measure. In some appearances of this rhythmic motif, audio engineering even plays a role in the chaos of this rhythm. When one listens to this rhythm in stereo, each successive perceived beat passes between the ears (i.e., a stereo panning effect). For instance, the first perceived beat sounds primarily through the left channel, the second through the right channel, and so forth.[5] On a subconscious level, this sonic effect confuses the listener's perception as to the source location of the rhythm, increasing the chaos of the music and scene. The metric confusion creates a sinister atmosphere that is reinforced by the pitches of these notes, which are a M2 apart (C4 and D4) and sometimes played *col legno battuto* by the strings. Note that these pitch classes are the same ones that appeared as musical tension as the Joker told of his plot concerning Harvey Dent (see example 4.3). One perceives musical tension in the M2, which serves as a hypothetical stretching of the P1.

The accent pattern shown in example 4.7 also contains energy that propels the music forward. The pattern repeats for most of this six-minute opening scene. After several repetitions of the pattern, one may no longer feel the need to consider the actual beat unit, but begin to focus on the accents as unequal beats. The actual beat unit (quarter notes) is four equal beats with a consistent rhythm at the subdivision level. The syncopated accents obscure the regular beat pattern and create an apparent metric conflict. Further obscuring the actual beat unit, separate accents appear intermittently along with this pattern in the form of percussion cues. Dynamic swells in the music, dialogue, and sound effects also amplify this metric confusion. If one were to consider the accent pattern as unequal beats whose division level is equal, the grouping of beat

[5] Hans Zimmer has since experimented with an extension of this technique in his soundtrack to *Man of Steel* (2013). Using DTS Headphone: X, Zimmer replicates the 11.1 surround sound system through a regular pair of headphones, adding an extra layer to the complexity of the sound.

divisions would be 3+3+4+2+2+2. The first three perceived beats are longer than the latter three, creating the feeling of rhythmic compression. The last three perceived beats are deformed and therefore need to move toward resolution. Similarly, these last perceived beats are forward seeking due to rhythmic gravity and rhythmic inertia. The incongruities between the natural meter and the perceived energies of the accent pattern relay to the listener a sense of chaos similar to that experienced by both the bank employees and the dwindling number of robbers. Track #11 on the soundtrack begins with this music and is appropriately labeled, "Agent of Chaos."[6]

Example 4.8 shows the music that accompanies the scene that follows the bank robbery. This scene's music temporarily restores order to the previous scene's chaotic rhythm and meter. The sixteenth notes remain, but the previous accent pattern is missing. The symmetry of this music corresponds to Batman and the social order that he creates. The strings continue the sixteenth notes, the pitch changes of the rhythmic pattern emphasizing four equal beats that match that meter. The rhythm of the changes in pitch from A3 to B♭3—$\hat{5}$ to $\hat{6}$ in the underlying D minor harmony played by the violin II and viola I parts—in the final three sixteenth notes of each measure is irregular to the meter, symbolizing that some chaos still exists. This $\hat{5}$ to $\hat{6}$ motion in minor—a motivic connection that will be discussed shortly—creates a pitch dissonance that must resolve. The stable rhythm is very static, containing little forward momentum. The rhythm of the phrase anacruses in the cello and double bass melody establish the necessary rhythmic gravity and rhythmic magnetism to push the music forward. The strong melodic magnetism and rhythmic gravity propel each measure into the next.

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[6] James Newton Howard and Hans Zimmer, "Agent of Chaos" from The Dark Knight, Warner Bros. B0017I1FP8, 2008, CD.

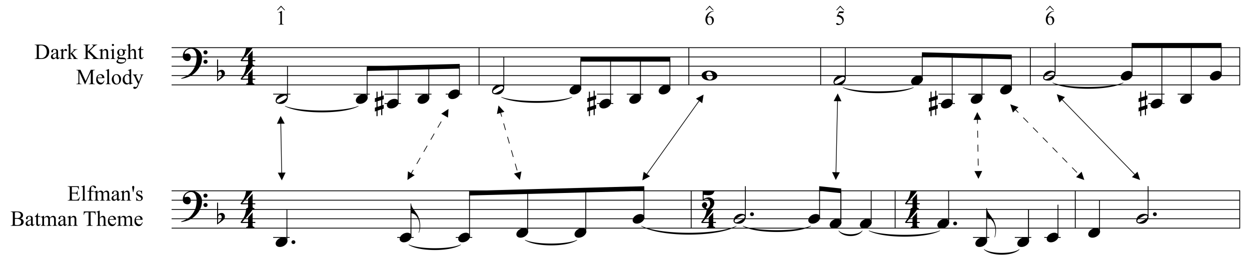
Example 4.8. Restoration of Rhythmic Stability in *The Dark Knight*

The extramusical associations that parallel this music and the bass melody clearly associate Batman with this rhythmic and metric stability. This scene begins with an aerial shot of Gotham City, while an interview plays in the background (*The Dark Knight*, 0:06:23 – 0:07:50). In the interview, the mayor is answering questions concerning whether or not Batman

is a force of good or evil. The scene then shows criminals stopping their nefarious activities with the appearance of the Bat-signal in the sky (figure 4.5). The visual cues and sounding interview confirm that, at this point in the film, Batman appears to be a force for good that is restoring order to the chaos in Gotham.

Figure 4.5. The Bat-signal

The cello and double bass melody likewise connect Batman to this musical regularity (*The Dark Knight*, 0:06:23 – 0:06:43). The melody strongly emphasizes the previously noted $\hat{5}$ to $\hat{6}$ motion. The melody and the $\hat{5}$ to $\hat{6}$ motion suggest the Batman theme that first appeared in Danny Elfman's score to the film *Batman* (1989), directed by Tim Burton. Example 4.9 shows a comparison between these the Dark Knight melody and Elfman's theme. Solid lines match the most salient similarities, while dashed lines illustrate other similarities. Repetitions of the melody in this scene reinforce the leitmotivic connection to Batman. The clever cross-series leitmotivic connection musically reinforces Batman's connection to this rhythmic regularity and thus, a restoration of social stability.



Example 4.9. Dark Knight Melody and Elfman's Batman Theme Compared[7]

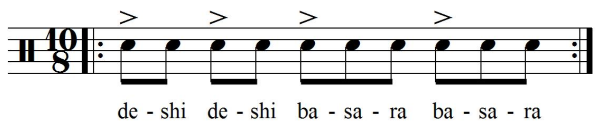
In *The Dark Knight Rises*, Batman battles against Bane and the resurgence of the League of Shadows, which seek to destroy Gotham City (figure 4.6).

Figure 4.6. Bane Hijacks a Plane

The rhythm and chant in example 4.10 appear notably in the opening scene and are associated with Bane throughout the film (*The Dark Knight Rises*, 0:00:59 – 0:06:36). The rhythm does not always appear as a chant. In many instances, the orchestra plays the rhythm. The words "deshi basara" most often appear nondiegetically, until the latter half of the film, where the words

[7] Danny Elfman's Batman theme is transposed here from B minor to D minor for illustrative purposes.

eventually gain their meaning. Unlike the *Dark Knight* rhythm (example 4.7), the shorter beats of this asymmetric meter appear at the beginning of the measure (2+2+3+3).



Example 4.10. Deshi Basara Chant Rhythm

The previous rhythms had a strong sense of forward motion because of their rhythmic gravity, rhythmic inertia, and rhythmic magnetism that propel them into the following measure or rhythmic pattern statement. Here, however, the long beats at the end of the measure prevent it from moving forward smoothly into the next measure. As chapter 2 pointed out, rhythmic gravity and magnetism very often work in conjunction, the shorter note values falling into the strong downbeat of the next measure or rhythm statement. In the case, however, the two rhythmic forces are at odds with one another. The short beats at the beginning of each measure propel the momentum forward at the middle of the measure (i.e., rhythmic magnetism), but long beats at the end of each measure counter this effect by slowing it down (i.e., rhythmic gravity). Because these two forces do not work synchronously and the rhythm always appears as a repeated pattern, the task of distinguishing where each repetition starts becomes difficult. One can easily lose their metric footing, instead hearing 3+3+2+2, a conflict that causes the listener to experience a metric chaos.

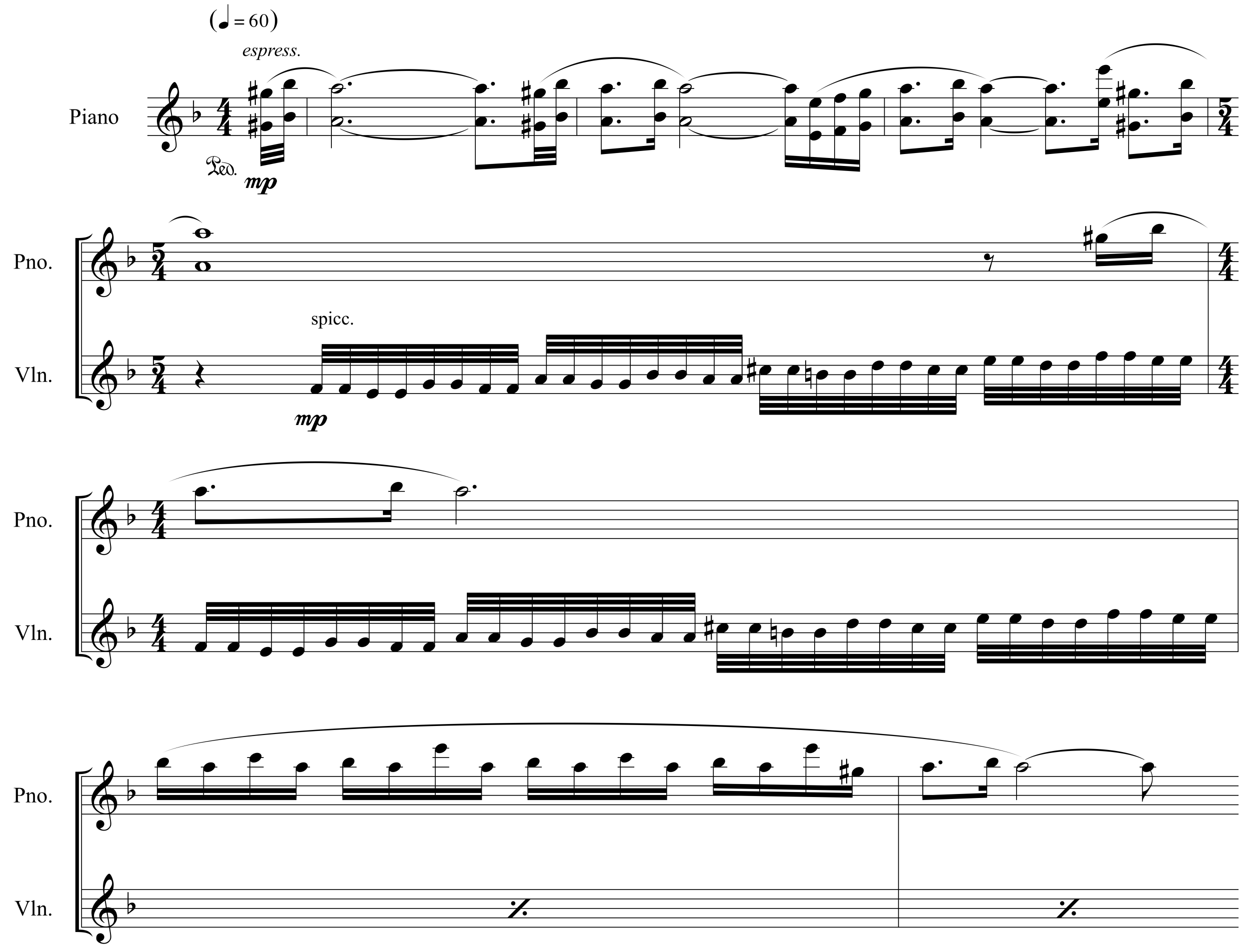
Catwoman, also known as Selina Kyle, appears in the final film (*The Dark Knight Rises*, 0:10:51 – 0:12:53) (figure 4.7).

Figure 4.7. Selina Kyle Kicks Bruce's Cane

It is not clear until late in the film if she is a force for good or evil. Example 4.11 shows Catwoman's leitmotif. Catwoman's leitmotif is in $\frac{4}{4}$ (the measure in $\frac{5}{4}$ results from a cue point and is not indicative of chaos).[8] The stability of this meter is reinforced with regular melodic accents that correspond to the equal divisions of the beat in this meter. This regularity and stability signal that she is a force for good. While her intentions are mostly good, her methods are less than scrupulous at times. Unlike Batman, she has no problem with stealing or killing to accomplish her goals. The pitch instability resulting from the inflection of $\hat{4}$ (G♮ versus G♯) and $\hat{6}$ (B♭ versus B♮) in D minor highlights the doubts the audience may have as to her intentions or morality. The accompaniment line ascends an octave, similar to the glissando associated with the Joker in *The Dark Knight*. The effects of melodic gravity are apparent in the pattern of one step down, two steps up. The descending motion indicates a downward force that impedes an otherwise uninhibited ascent. Unlike the glissando, however, one does not feel a strong sense of

[8] The rising accompaniment line begins as Selina Kyle kicks Bruce's cane out from under him.

dissonance with this melody. The rising melodic line describes both her catlike agility, but also her attempt to start fresh and rise above the gravity of her past.



Example 4.11. Catwoman's Leitmotif

Toward the middle of the film, Batman fights against Bane and loses. Bane holds him captive in a deep pit (*The Dark Knight Rises*, 1:53:08 - 1:57:09).   It is in this pit that the audience discovers the diegetic source for the chant. This pit is a prison designed with the intention of breaking the will of its captives. It offers a way of escape; however, the way is impassable (figure 4.8). Only one person has every successful escaped. After a climb, the

prisoner must make a leap from one ledge to another in order to escape. Each time a prisoner attempts the climb, the other prisoners chant "deshi basara."

Figure 4.8. Bruce Attempting to Climb Out of the Pit

Bruce, fueled by anger, decides that he will attempt to climb and escape from the pit. The blind man tells him that fear is why he will fail in making the leap. Bruce responds by saying that he is not afraid, but is instead angry. With these words, the chant rhythm appears diegetically as the prisonsers chant "deshi basara" and nondiegetically in the orchestra. On his first two attempts, Bruce makes the climb and falls. With each fall, the chant and score go silent or die away slowly.

Before the last escape attempt, Bruce experiences a true transformation of character (*The Dark Knight Rises*, 1:54:09 – 1:57:09). Previously, Bruce learned to put away his fears, particularly his fear of bats. Bruce recalls his father asking, "why do we fall?" to which his father rhetorically answers, "to learn to pick ourselves back up." This notion of self-resurrection has been a running theme throughout the entire trilogy. Bruce, having now hit rock bottom, must rise up. The blind prisoner tells Bruce that he fears nothing, and that is his weakness. He states

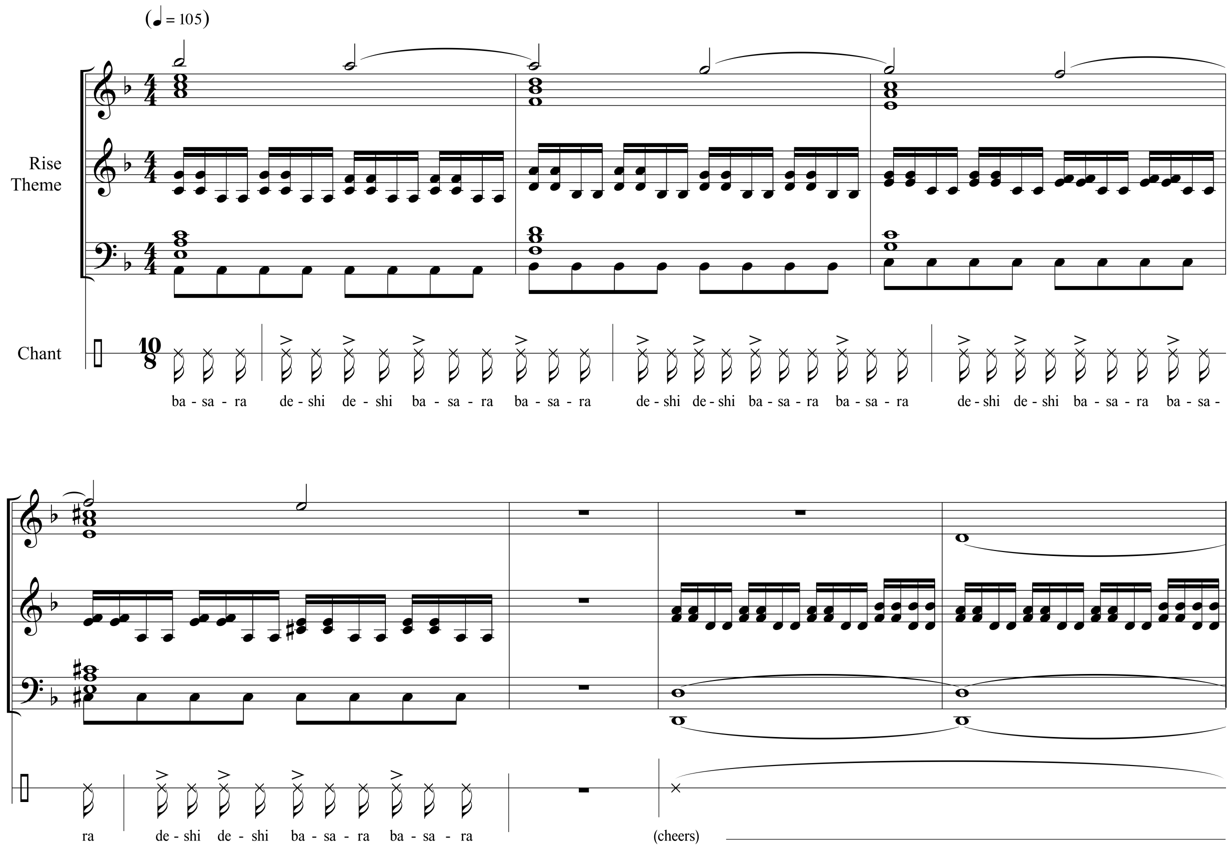
that he lacks “the most powerful impulse of the spirit: the fear of death” (*The Dark Knight Rises*, 1:54:34) (figure 4.9).

Figure 4.9. “the most powerful impulse of the spirit: the fear of death”

Bruce realizes that he fears dying in the prison while Gotham burns with no one there to save it. Bruce must now attempt the climb and leap without the safety of a rope. As Bruce makes his way to the wall of the pit, the chant reemerges. He asks a prisoner what it means, to which the prisoner responds, “rise” (*The Dark Knight Rises*, 1:55:32).

The chant appears diegetically in this scene, purely as a chant, not as an underscoring element. The chant is in the same rhythm as before. A variant of the Batman theme that contains an ascending line plays alongside the chant, however the two are asynchronous. Example 4.12 is an excerpt from this theme, labeled here as the “rise theme.” The chant contains syncopation and asymmetry in $\frac{10}{8}$ while the melody rhythm is consistent and even in $\frac{4}{4}$. This music contrasts to that of Bruce’s previous unsuccessful escape attempts, where the theme that accompanied the chant was playing the chant rhythm. The asynchronicity of the theme and chant create musical chaos, the chant signaling Bruce’s fear, while the rise theme signals his

determination. The chaos of these two conflicting musical ideas parallel the inner struggle going on within Bruce's mind. The musical conglomerate grows louder and faster as Bruce makes his way to the ledge.



Example 4.12. Reduction of an Excerpt from the Rise Theme from *The Dark Knight Rises*[9]

As Bruce makes the leap, the chants and score fall silent (for one measure of the score) (figure 4.10). Silence, as it appears here, can be highly energetic, especially when it occurs at a climatic point in the music and/or the film. As Bruce makes the leap, the silence almost wills the

9 In example 4.12 the alignment of notes between the "rise theme" and the chant may not be exact.

audience to hold their breath (*The Dark Knight Rises*, 1:56:38). Bruce completes the leap, at which point the Batman theme resumes and the chant turns into applause and cheers. The musical representation of fear in this scene ends with the leap, but the more stable, triumphant Batman thematic material continues. The associated fear does not stop Bruce's rise and escape.

Figure 4.10. Bruce Leaps from One Ledge to Another

As each film title indicates, the trilogy marks Batman's beginning, fall, and rise. The unstable and irregular rhythms and meters presented in this analysis represent the agents of chaos in the trilogy. In so doing, however, they also represent the need for Batman to exist. The first instance of rhythmic and metric chaos appears in the temple fight scene in *Batman Begins*. The fight occurs just after Bruce overcame his worst fear (bats) and presumably all fear. The League of Shadows has taught him that fear clouds one's judgment in battle and is a sign of weakness; therefore, he must rid himself of all fear to be truly effective in the fight against evil. Disagreeing with the League's plans to destroy Gotham, Bruce fights the person that he believes at the moment to be Ra's Al Ghul, the leader of the vigilante group. Batman was created at this moment out of the notion of using his now-conquered fear of bats to terrify enemies, thus the

rhythmic and metric chaos appears in the trilogy. In *The Dark Knight*, rhythmic and metric chaos continues to represent the enemies that make Batman necessary. In Bruce's escaping the pit in *The Dark Knight Rises*, however, he realize that fear is not necessarily a weakness. The blind prisoner asks him, "How can you move faster than possible; fight longer than possible without the most powerful impulse of the spirit?" Fear, as the blind prisoner tells him, makes him stronger and more agile in dangerous situations. Bruce learns to embrace his fears and use that to his advantage rather than conquer them. In escaping, he learns to own the fear. Following the leap, the chant turns to cheers, while the stable $\frac{4}{4}$ meter continues. Interestingly, the first appearance of rhythmic and metric chaos appears approximately 38 minutes into the first film. Bruce's final transformation of character occurs approximately 42 minutes before the end credits of the final film. Musical chaos marks these two pivotal moments in Bruce's character development, almost forming bookends to the trilogy. Fear is no longer something that inhibits Batman's ability to fight crime. In fact, the fear now fuels him to fight stronger and longer. The more fear and danger Batman feels, the greater his drive to end it becomes.

Although Bruce experiences a transformation of character, the need for Batman still exists; thus, rhythmic and metric chaos appear later in the film. The chant appears as the police battle against Bane's army, and consequently, as Batman battles Bane. Chaos is apparent in the onscreen battle between good and evil. Batman's resurgence and reappearance has ignited the people against Bane and his control over Gotham City. A more stable $\frac{4}{4}$ meter appears over the chant rhythm as Batman gains control over the fight with Bane. With Batman's defeat of Bane, the chant rhythm ceases. Short instances of syncopation appear in the remainder of the film, but the music remains a stable and consistent $\frac{4}{4}$ meter. The chant rhythm reappears one last time in the film as Batman attempts to lift the bomb with the Bat (Batman's flying vehicle) in order to

fly it over the bay before detonation. As the bomb lifts from the ground and clears a few obstacles, the stable $\frac{4}{4}$ meter resumes, signaling that Batman will be successful in saving Gotham one final time.

The energetic models simply highlight the musical gestural qualities that might otherwise be difficult to analyze. This approach creates a musical narrative that parallels the film's overall narrative, establishing associations between musical gestures and extramusical events. The musical chaos in the trilogy immediately signifies the chaos depicted on screen; however, the greater significance of these instances of musical chaos chart Bruce's growth and eventual change of character. The narrative of the film now illuminates the narrative of the score, while the score provides a deeper understanding of the film's characters and narrative. Together, these paralleling narratives expose the latent structure in the film's apparent chaos and foreshadow the film's outcome.

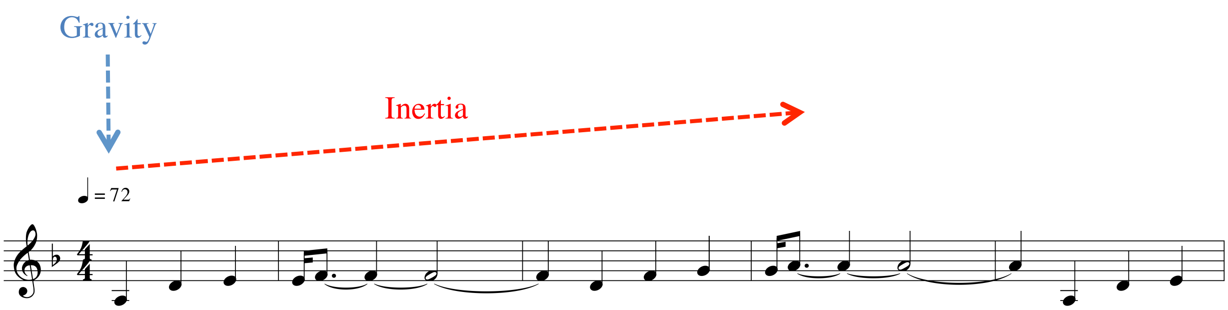
CHAPTER 5 – *THE LAST SAMURAI* (2003)

THE LAST SAMURAI (2003)
DIRECTED BY EDWARD ZWICK
MUSIC BY HANS ZIMMER

The analyses of the *Signs* and *Dark Knight Trilogy* demonstrated how energetic gestural analysis could be used to find musical narratives that parallel the plot of a film or the changes in a character. This musical narrative may depict conflicts between musical forces similar to the conflict between a film's protagonist(s) and antagonist(s). This analysis of *The Last Samurai* (2003) demonstrates how Hans Zimmer's score embodies musical conflicts as a way of reflecting the film's actions and drama. The samurai are of an ancient line of Japanese warriors that hold to their traditions and oppose the industrialization of Japan The film tells the story of the modernizing Japan of the late 19th century, a change which threatens to destroy the samurai way of life. The film's climax is the final battle sequence as the samurai make their last stand against the Imperial Japanese Army. This analysis explores Zimmer's score, and uses conflicts of pitch, rhythm, and meter to embody the dramatic conflict in the final battle sequence of *The Last Samurai*.

In the final battle sequence, the samurai and Imperial army charge toward one other to engage in hand-to-hand combat (2:01:06 – 2:05:52) (figure 5.1). The music that accompanies the "charge" scene, labeled here as the "battle" leitmotif, contains conflicts within the parameters of melody, harmony, and rhythm. Zimmer represents the samurai with this recurring modal melody, shown in example 5.1.

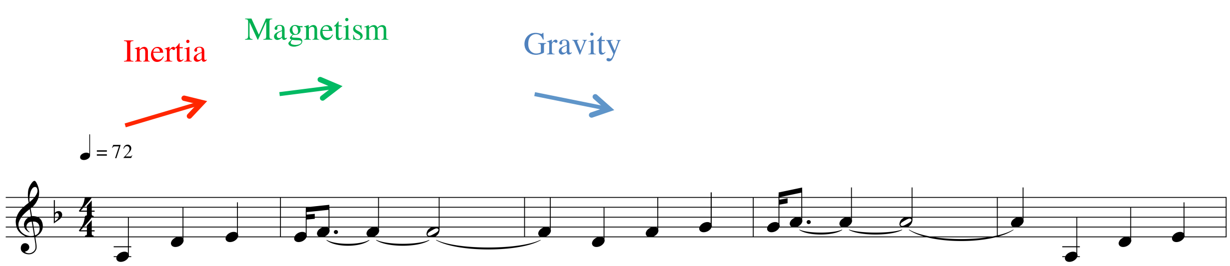
Figure 5.1. The Charge



Example 5.1. Global Energies of the "Battle" Leitmotif

This melody contains a conflict of energies that characterize the melodic trajectory. The arrows in the example indicate the melodic forces in play on the melodic line. In the opening four measures, the melody moves from A3 at the beginning to A4 in m. 3, thus establishing an overall ascending melodic line. The first instance of motion in this excerpt is the opening interval of an ascending perfect-fourth leap from A3 to D4. This opening leap is a catalyst that initiates an ascending inertial trajectory that the subsequent pitches follow. As the line ascends, note that the trajectory beings to flatten. The initial ascending perfect fourth is followed by a major second. The following E4 extends into m. 1 before moving up by a minor second to F4. This slowing of

the upward momentum and resultant flattening of the ascending inertial trajectory metaphorical owes to the opposing downward pull of gravity. Larson relates this interaction of forces to the physics of throwing a ball through the air. "The smooth, arch-like path taken by a thrown ball shows the interaction of various factors, including impetus, inertia, wind resistance, and gravity. As it ascends, inertia and gravity oppose each other. As it descends, inertia and gravity work together."[1] From the beginning of the excerpt through m. 1, even without an actual melodic descent, one can already see evidence of gravity's presence, foreshadowed in the flattening of the rising line. In m. 1, as the repeated E4 moves up to F4, one experiences an instance of melodic magnetism, shown in example 5.2.



Example 5.2. Local Energies of the Samurai Melody in the "Battle" Leitmotif

In m. 1, the dissonant E4 resolves upward to the nearest stable note, F4. In m. 2, there is a relaxation of the upward ascent as the line temporarily gives in to gravity, descending from F4 to D4. At this moment, the downward pull of gravity overpowers the upward push of inertia. Inertia takes back over on beat 2 of m. 2 as a sequential repetition of the opening musical gesture reinitiates the overall ascent of the melody from A3 at the beginning to A4 in m. 3. As Larson

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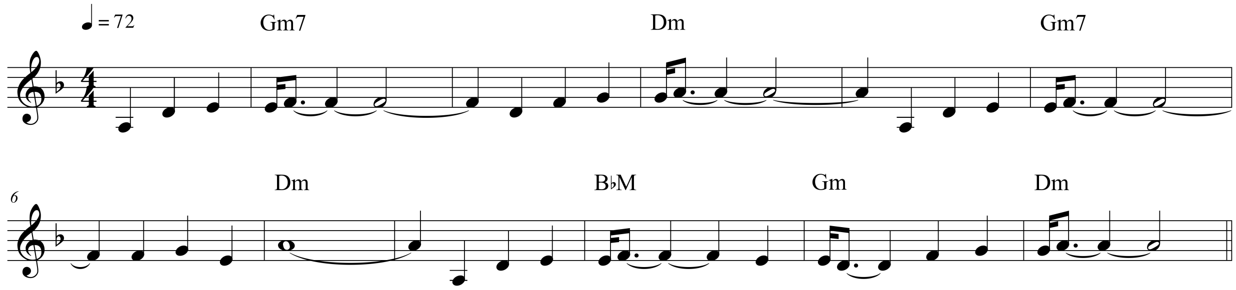
[1] Steve Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music* (Bloomington, IN: Indiana University Press, 2012), 104.

states, "all 'sequences' can be heard as giving in to inertia."[2] This sequential motion reinforces this reading of an overall ascending melodic line that gives in to inertia. The melody uses this temporary descent to gain momentum and complete the overall ascent to A4 in m. 3. The interplay of the ascending, inertial tendency of the melody and the downward pull of gravity form a musical conflict in this passage.

The harmonies of this passage exhibit what Kurth would consider a conflict with the flow of the melody. Example 5.3 gives music of the "battle" leitmotif with the chords that accompany the melody.



Example 5.3. Harmonic Layout of the "Battle" Leitmotif

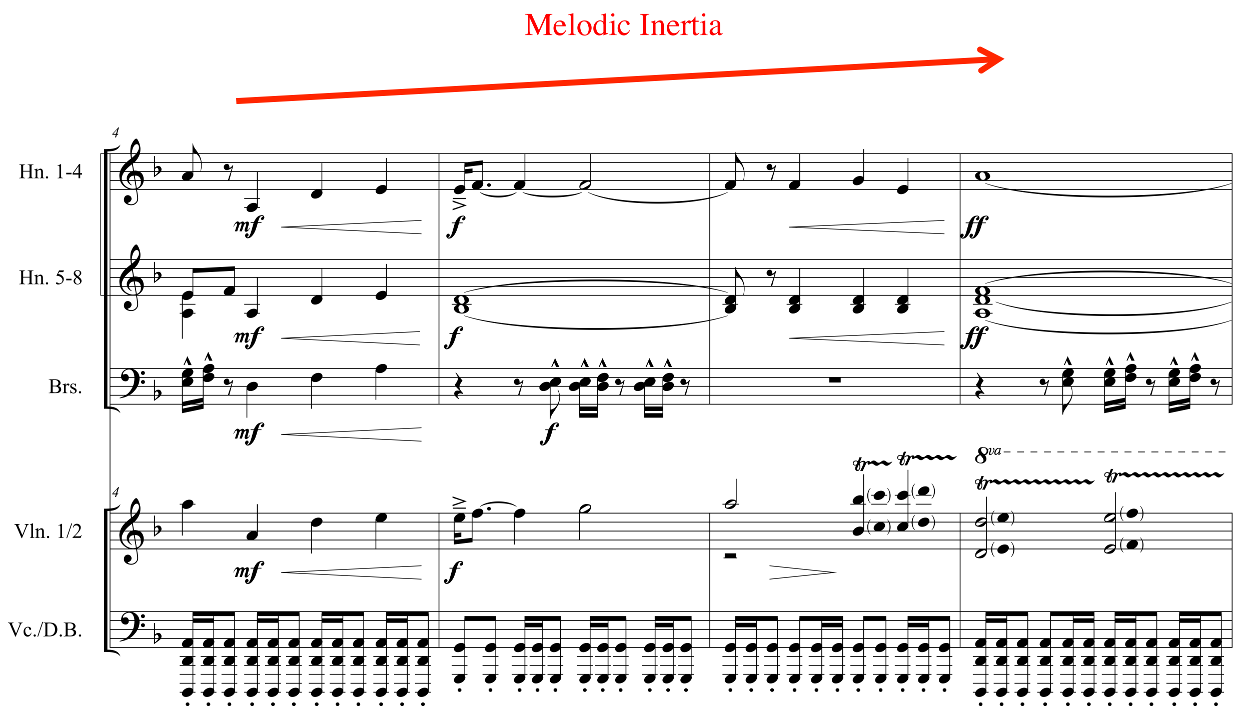
The repeated G-minor-seventh chord in this passage functions as an example of Kurth's sensuous harmony, a stacked tertian chord that provides harmonic resistance that the melodic energy must penetrate. Kurth generally refers to extended tertian harmonies with five or more notes (i.e., ninths, elevenths, and thirteenths) as sensuous harmonies. In this case, however, the G-minor-seventh chord functions much in a similar way to said extended harmonies. The seventh—or the chord for that matter—does not resolve as expected, and this seventh is a prominent melodic feature. In this sense, the stack of thirds in the chord creates a thick harmonic

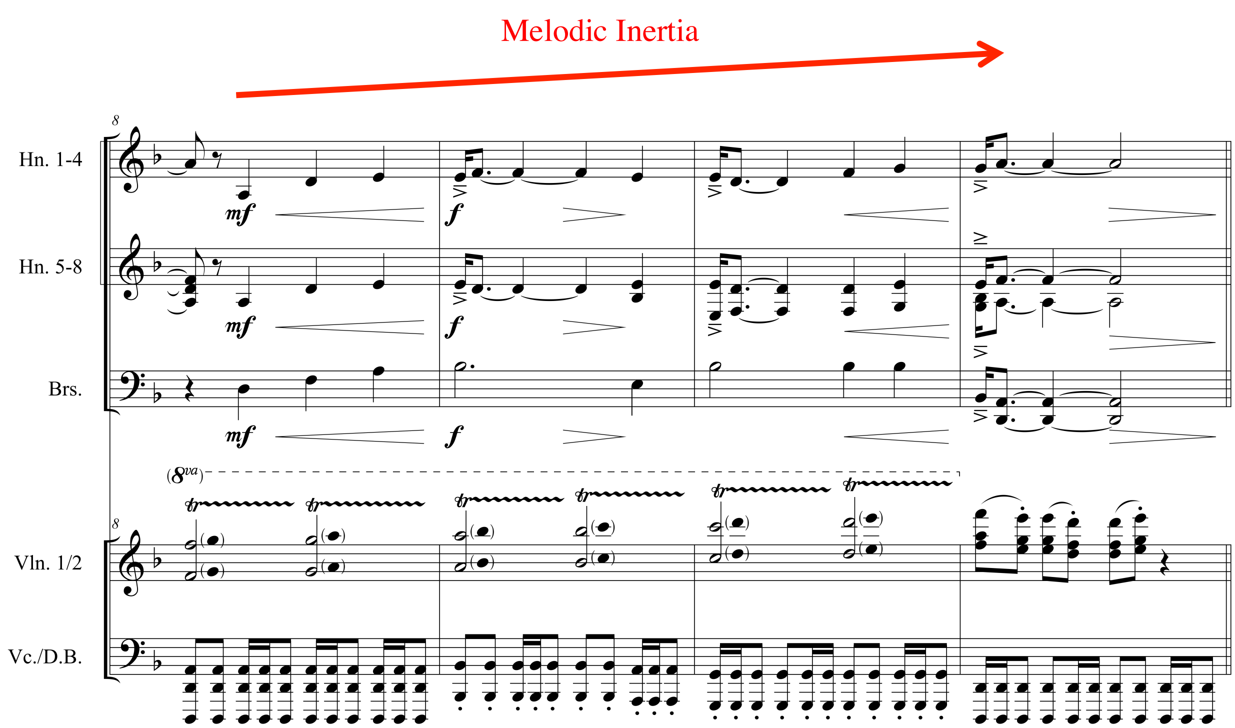
[2] Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* 96.

texture, which the melody must penetrate. The harmonies throughout this passage lack a strong sense of tonal progression, which inhibits the kinetic energy of the melody. The G-minor-seventh and B♭-major chords in this passage share two common tones with the D-minor chord, and thus contain no melodic tension. These two chords prolong the D-minor chord, functioning more as colorful variations than sources of dissonance that propel the music forward. The G-minor-seventh chord in m. 1 appears as the upward ascent of the melodic line begins to stall, holding at F4 before descending shortly in m. 2. Here, the lack of harmonic support of the melody and a lack of a strong tonal progression provides strong enough harmonic material resistance to which the inertia of the melody must concede. The weak and undirected harmonic structure interrupts the strong melodic motion.

Shown in example 5.4 is a reduction of the "charge" scene music.

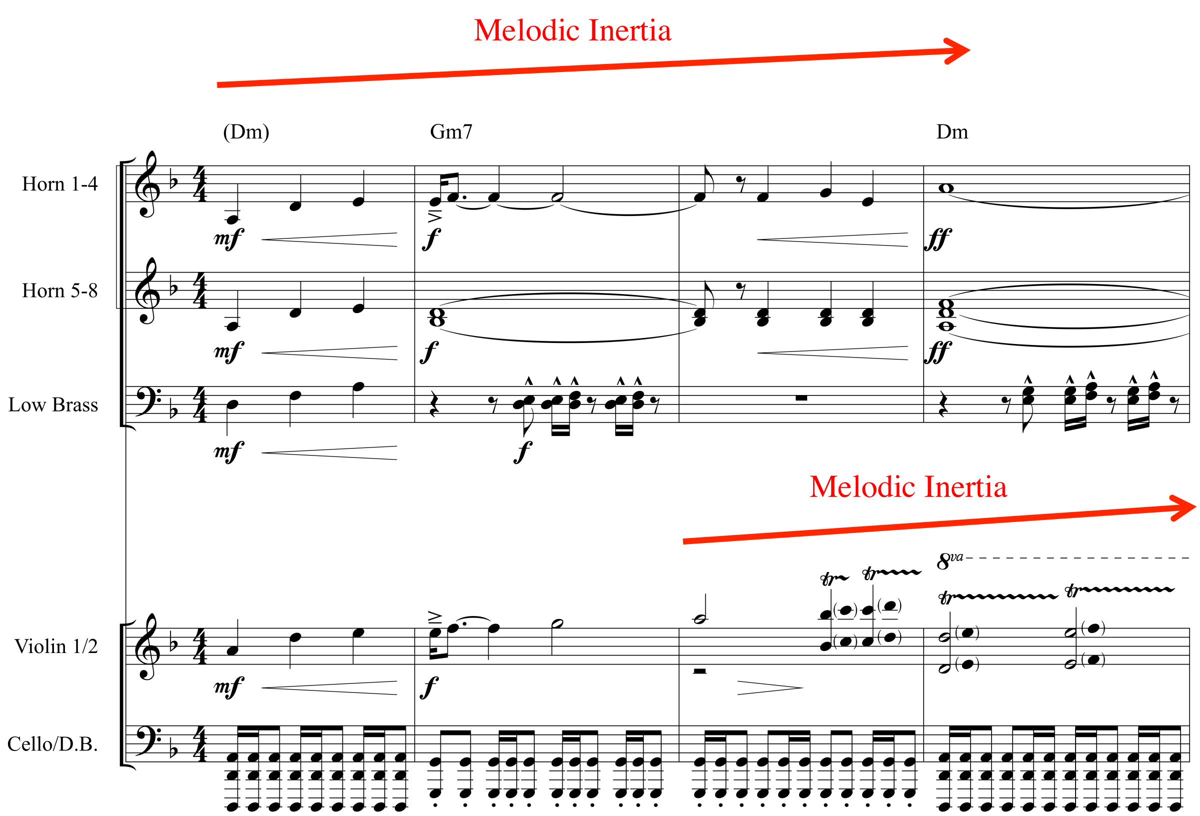
Example 5.4. Reduction of the "Charge" Scene Music



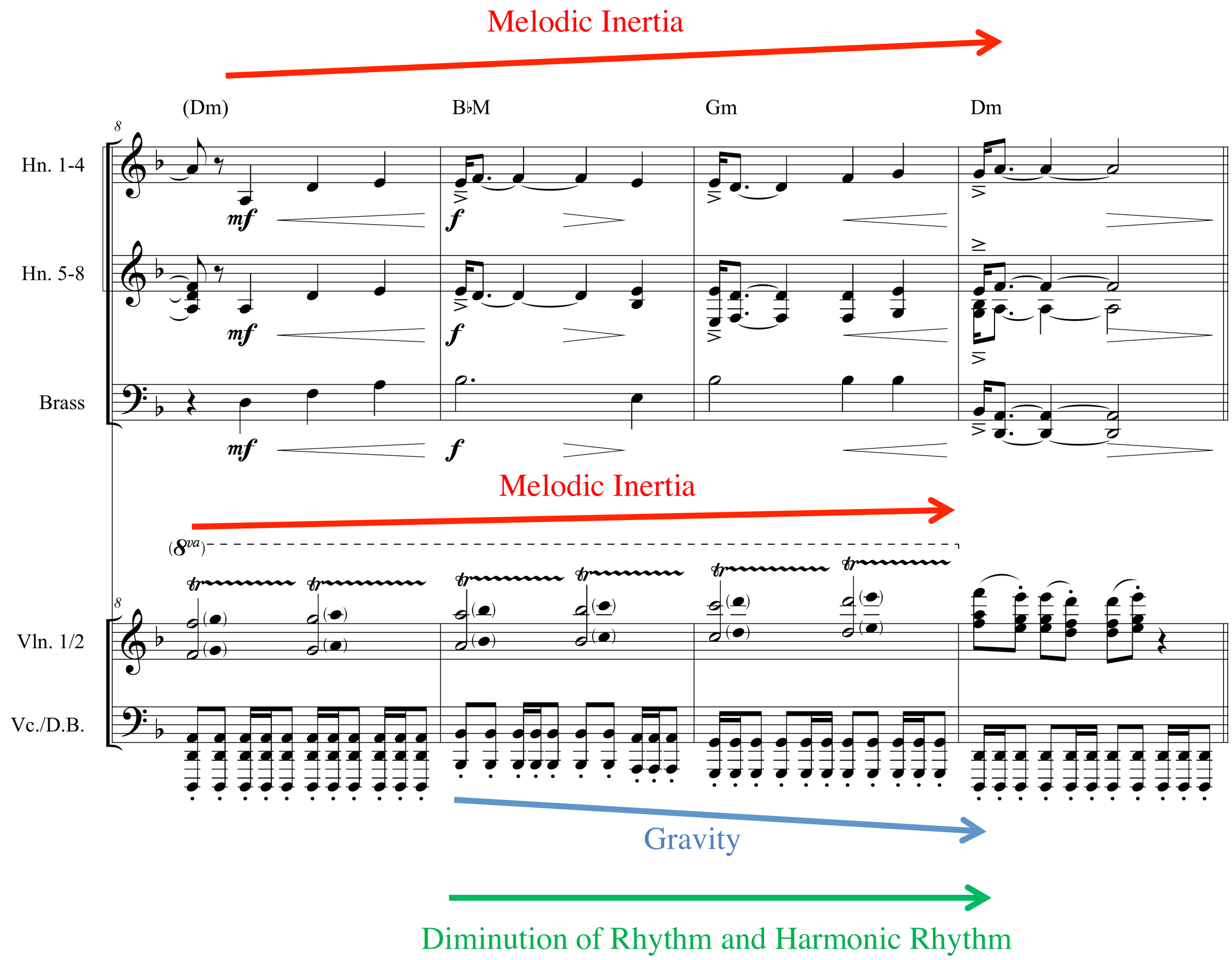


(Example 5.4 continued)

This example shows the global gain of energy as the two opposing forces charge toward one another and eventually collide. The melodic ascent from A3 to A4 repeats three times: mm. 1-3, 4-7, and 8-11. During the second ascent of the melody, an ascending violin accompaniment voice begins in m. 6 on A5 (example 5.5). The melody consonantly achieves the A4 on the downbeat of m. 7, while, simultaneously, the violin accompaniment reaches D6 (and D5 at the octave). One feels some sense of completion at this second arrival on A4 in m. 7. The trilling violin accompaniment, however, creates forward motion as it continues past D6 to E6, destabilizing the repose. This superposed violin line continues upward to A6, which appears as a dissonant tone against the B♭-major triad.



Example 5.5. Energetic Analysis of the “Charge” Scene Music (mm. 4-11)



(Example 5.5 continued)

Thus, the melody must continue its forward motion until it achieves a stable sense of repose, which comes in m. 11 with the consonantly supported F6—achieved by octave displacement.[3] The appearance of the ascending superposed line creates melodic motion that reinforces and drives the melody forward through the resistance of the harmonic material.

As anticipation intensifies, building up to the moment the two armies collide, the momentum created by the building dissonance pushes toward repose. Measure 11 marks the

[3] The resoltuion of E6/E7 to F5/F6 results from an instrument necessity and puts the melody back into an audible register.

strongest sense of arrival throughout this passage. Note the melody as it approaches m. 11. This third energetic ascent of the melody is a rhythmically diminished form of its previous statements, which intensifies its forward momentum. The diminution of the harmonic rhythm in mm. 8-11 underlines and intensifies the rhythmic diminution of the melodic ascent. The arrival of a new, higher note in the bass line, B♭2, further emphasizes these rhythmic changes. Descending stepwise motion immediately follows the arrival to B♭2 in the bass. This descending stepwise motion further intensifies the forward momentum. Note that the outer voices form an expanding wedge. Together, the inertia of the melody; the expanding outer-voice wedge; the appearance of new chords and a new bass motion; and a contraction of the melodic and harmonic rhythm intensify the kinetic-energy push towards a sense of arrival at the downbeat of m. 11. The energetic push of mm. 9 and 10 creates an increased sense of repose despite the absence of a strong tonal cadence.

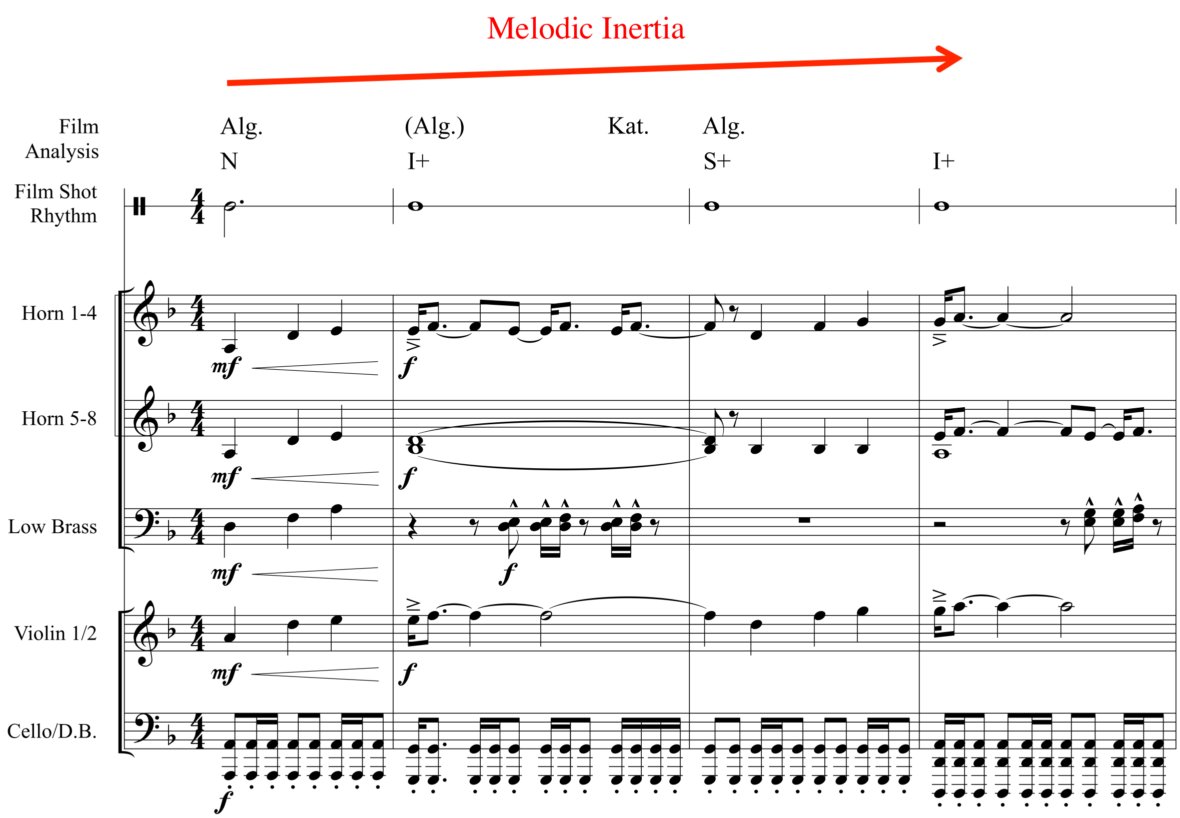
The conflict of melodic inertia and gravity, as well as the conflict of melodic and harmonic energies, suggest the conflict between the samurai and Imperial forces. Example 5.6 shows these correlations. Note the rhythm staff at the top of each system. This staff provides a way of charting the correlations graphically between the score, screen actions, and film shot changes. The rhythm charted in this staff tracks the film shot changes. The annotations above the staff correlate to the film shot changes, indicating the general character of each film shot event and salient screen actions. Through this innovation, one can view the film shot rhythm as a synesthetic instrument, which allows one to easily map correlations between film actions and music through time.

The melodic line at m. 2 could just as easily follow a different path that descends, supported by a chord change. Instead, it continues its ascent as a compositional choice due to

extramusical factors. As indicated by the "S+" notation, up until the end of m. 2, only pro-samurai film shots occur. The images of the samurai pulling their swords and charging over the hill correlate directly with the ascending D-Aeolian melody. This correlation between the D-Aeolian melody and the samurai appears several times throughout the battle sequence.

Key

S+	Pro-samurai film shot	**Alg.**	Nathan Algren
I+	Pro-Imperial Army film shot	**Kat.**	Katsumoto
N	Neutral film shot		



Example 5.6. Analysis of the "Charge" Scene and its Music

(Example 5.6 continued)

Look now at mm. 9-11, which correspond to the moment the two military forces collide. In mm. 9 and 10, the melody descends to D4. The B♭-major and G-minor chords in these measures provide harmonic-material resistance that impedes the inertial ascent. As gravity pulls the line down in m. 10, two pro-Imperial Army film shots, marked by the "I+" notation, appear as the melodic line descends from E4 to D4. The following two beats of m. 10 correspond to pro-samurai actions, as two samurai strike Imperial soldiers with swords. The appearance of Nathan Algren, the film's protagonist, reaffirms the pro-samurai moment found in the preceding downbeat. While the music slides into a restatement of the "battle" leitmotif, the dissolution of the superposed violin accompaniment into eighth notes at m. 11 ends unresolved, reaffirming that the battle is not yet over. At the climactic moment of the clash, the melodic descents correspond to pro-Imperial Army film shots, while melodic ascents correspond to pro-samurai film shots.

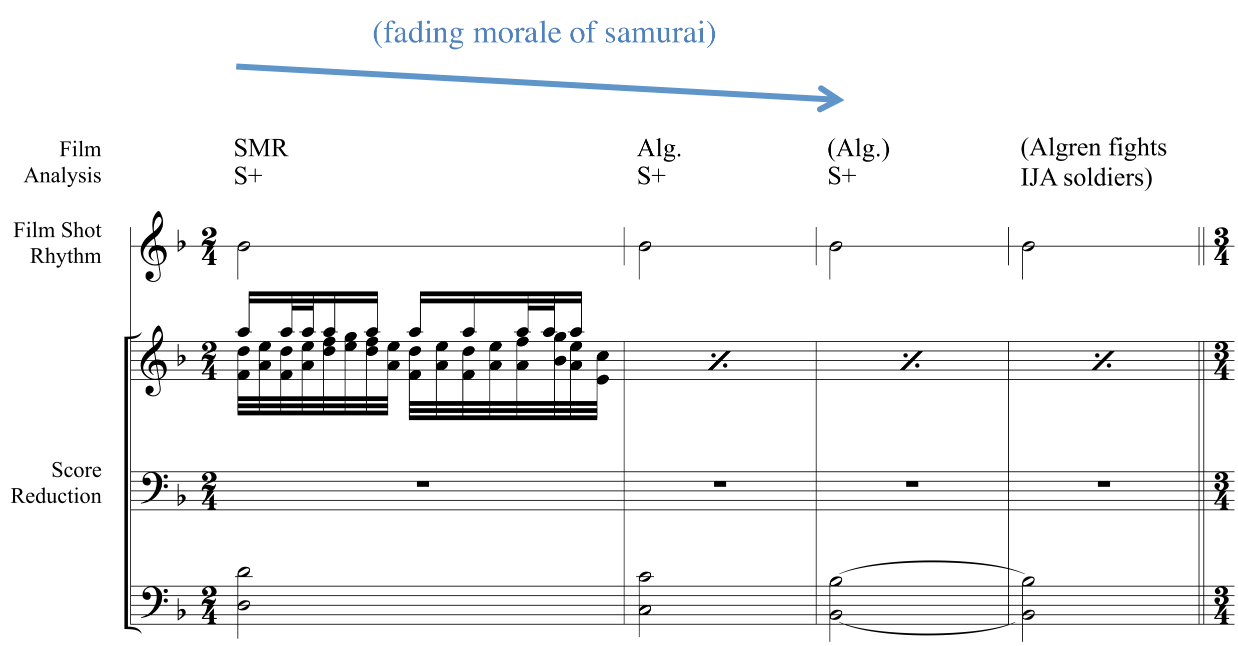
The music for this next scene, titled the "reinforcements" scene, contains conflicts of melody, harmony, rhythm, and meter (2:03:07 – 2:04:28) (figure 5.2).

Figure 5.2. The Reinforcements

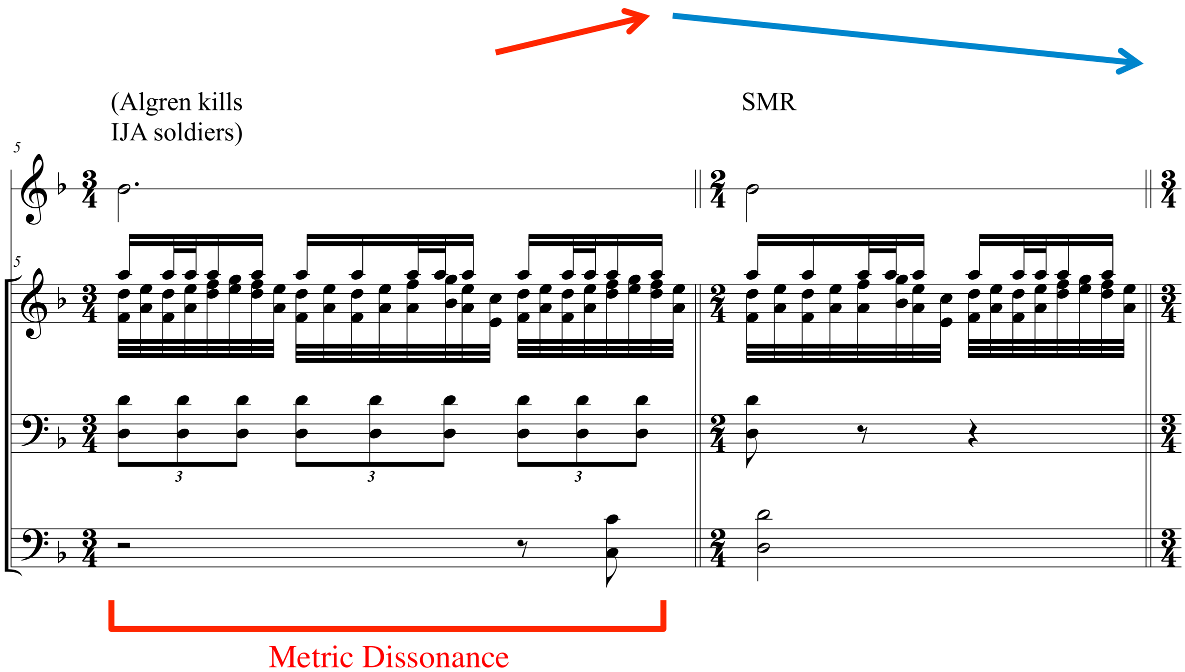
This scene occurs during the midst of the battle between the samurai and the Imperial Army as samurai reinforcements arrive at the battle. Here, metric dissonance appears, representing not only a disruption of the regular musical flow, but also of the fading morale of the samurai, as the outcome of the skirmish is not clear. Statements of metric dissonance form a musical and narrative dialogue with the descending melodic figure of this scene. Example 5.7 shows the music from this scene and illustrates the musical energetics that accompanies the arrival of the samurai reinforcements.

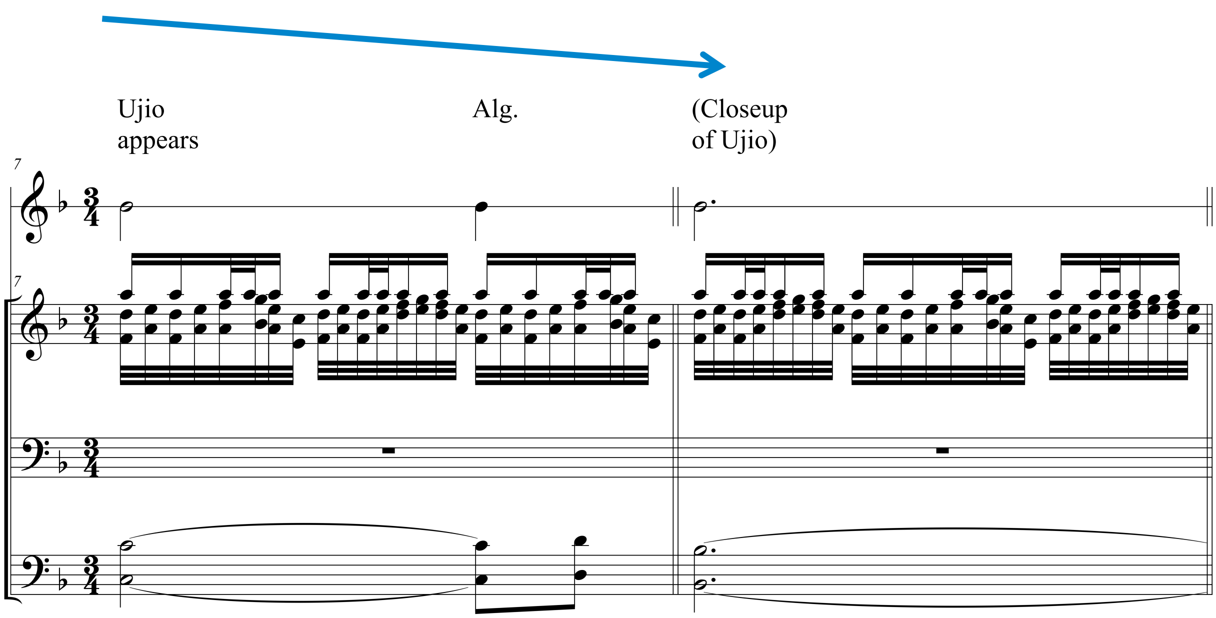
Key

S+	Pro-samurai film shot	**IJA**	Imperial Japanese Army
S-	Anti-Imperial Army film shot	**SMR**	Samurai
I+	Pro-Imperial Army film shot	**Alg.**	Nathan Algren
N	Neutral film shot	**Kat.**	Katsumoto

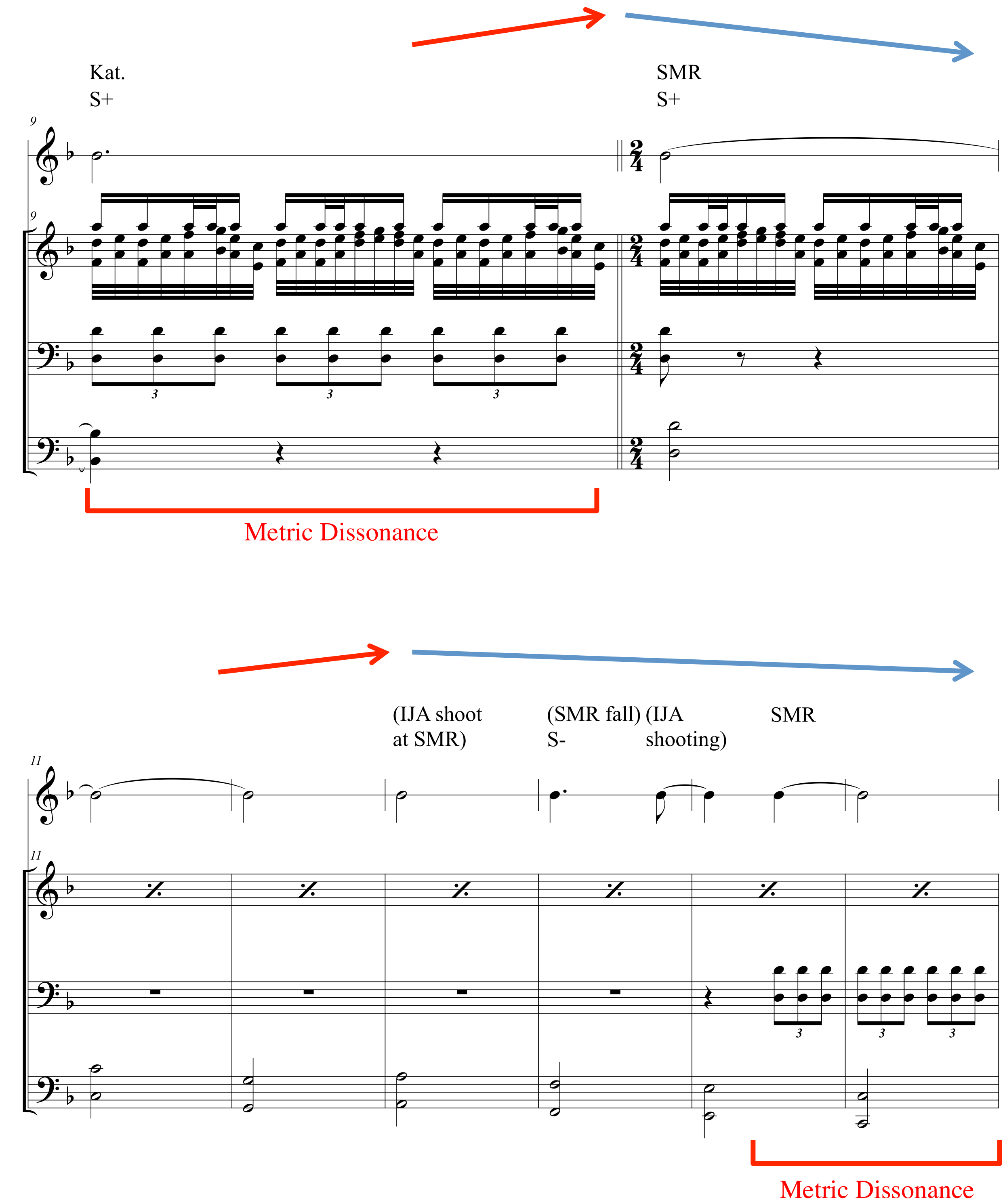


Example 5.7. Energetic Analysis of "The Reinforcements" Scene and its Music

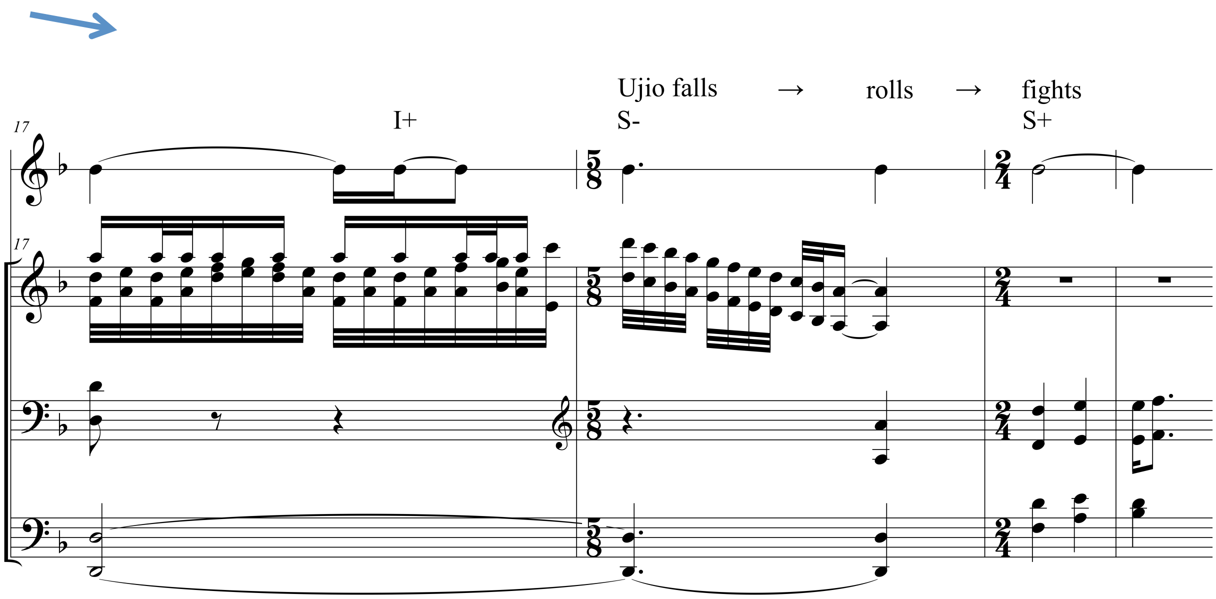




(Example 5.7 continued)



(Example 5.7 continued)



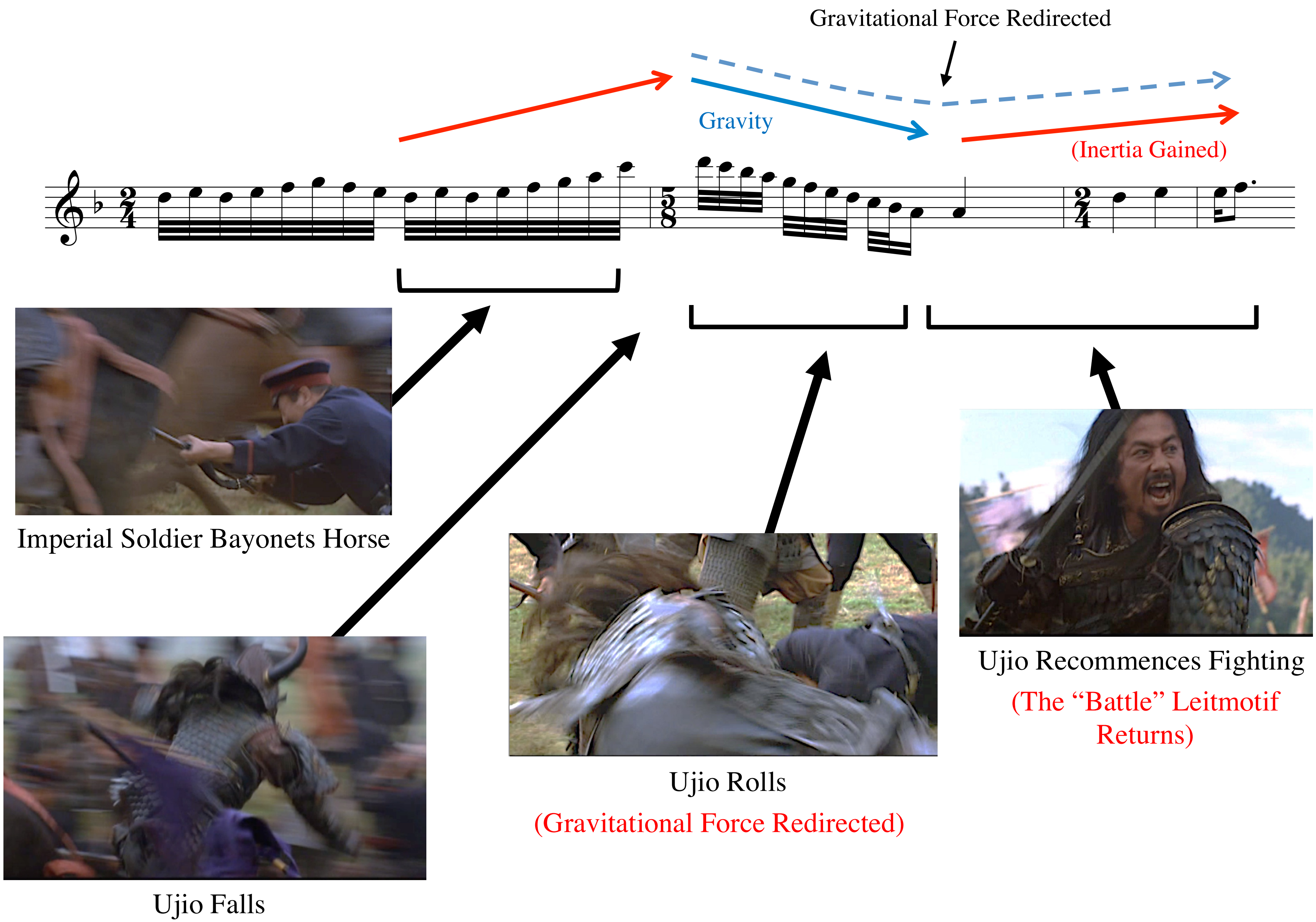
(Example 5.7 continued)

The fading morale of the samurai is reflected by the descending contour of the melodic line. As these reinforcements engage in battle, the melodic line descends from D4 toward D3 (and at the octave below). As the melodic line descends, however, it stalls on B♭3 in m. 3 before reinitiating the motion in m. 6. In m. 5, there is a change in meter accompanied by a rhythmically disruptive group of triplet Ds. This interruption compels the melodic line to reinitiate the downward descent in m. 6, stalling on B♭3 in mm. 8 and 9. Yet again, in m. 9, triplet Ds interrupt the descent and the line restarts for a third attempt to descend the octave to D3. Now, in mm. 10-13, the line takes an altered path that bypasses B♭3 to arrive at A3, and then continues its descent toward D3. Before completing its descent to the D3, however, the triplet Ds interrupt the melodic line again. This final statement of the triplet Ds is stated over three beats as before, but now this rhythm is in a duple meter, beginning on a weak beat. In each case, these triplet figures constitute metric dissonance—the compound division of the beat presented by the triplet Ds

conflicts with the previously established simple division of the beat. Additionally, the irregular triple-meter insertions associated with the appearance of triplet Ds interrupt the flow of the established duple meter.

Throughout this scene, there is a close correlation between these musical interruptions and the screen actions. The triplet Ds work as agents against the octave B♭s with enough energy to resist conformity to the melodic line, the rhythmic structure, and the metric structure. This strong interruption temporarily prohibits the melodic descent, requiring a renewed attempt at a continuous melodic descent. These interruptions occur in conjunction with the appearance of samurai reinforcements, signaling a renewed hope for the samurai. Here, the arriving samurai reinforcements (the triplet Ds) break the order and ranks of the Imperial Army battle formations, spinning the battle and music into chaos.

At the climax of the "reinforcements" scene, there is a close correspondence between the actions of one of the commanding samurai, Ujio, and the energetics of the superposed ostinato line (0:02:36 – 0:04:28). Example 5.8 depicts these energies using screenshots of the visual motions of Ujio as he falls and redirects his energy. In m. 17, the ostinato line breaks, ascends to D6 in m. 18, and immediately undergoes a rapid descent. This climax on D6 and descent occur just as an Imperial soldier brings down Ujio and his horse. In the music, this descent precedes a recurrence of the "battle" leitmotif. Like the melody, Ujio's fall is due to a gravitational force. Ujio redirects this gravitational force as he transfers the fall into a roll on the ground. Rising out of this rolling maneuver, Ujio instantly recommences fighting. Likewise, the momentum gained from the gravitational descent redirects and transfers into an ascending, inertial motion as the previously heard "battle" leitmotif returns.



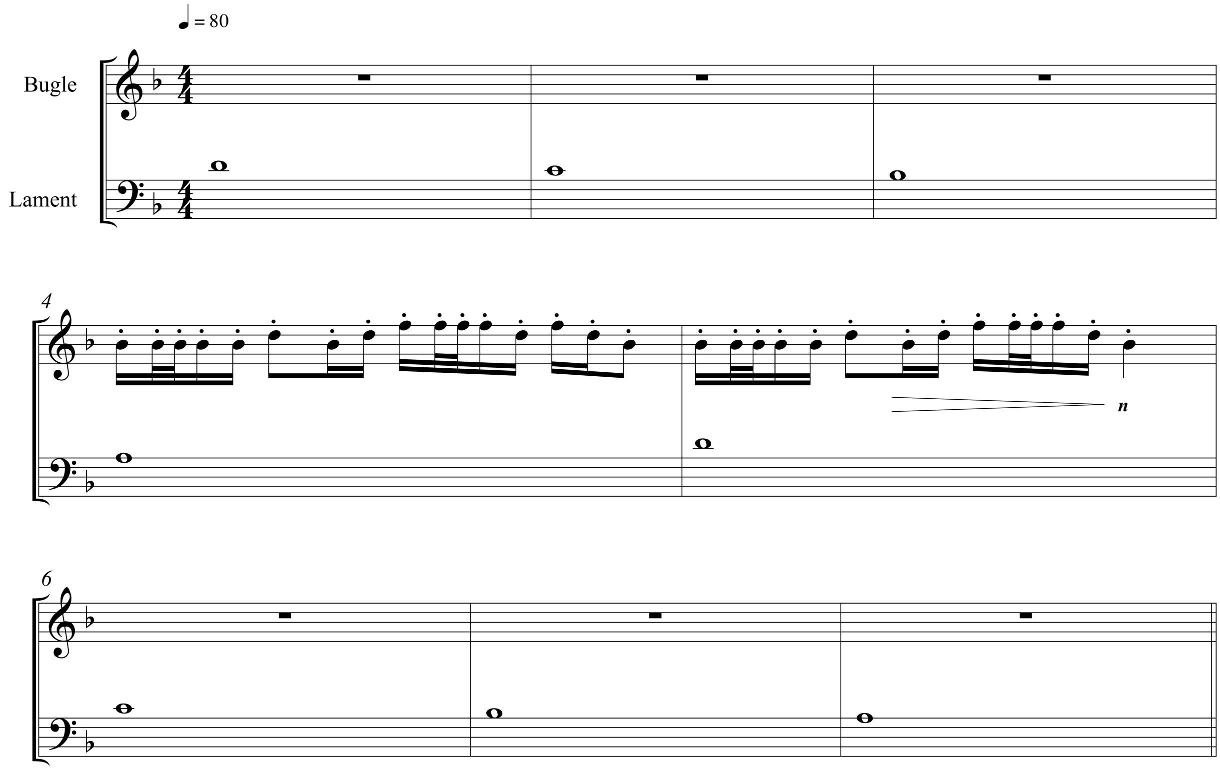
Example 5.8. Ujio vs. Gravity ("Reinforcements, mm. 17-19)

The conflicts between D and B♭ that were evident in the previous scenes are manifest in the lament scene that follows the first skirmish of the final battle (figure 5.3). Unlike the previous conflicts, however, this lament scene reveals a musical conflict that spans the diegetic space of the film.[4] Example 5.9 shows a descending, melodic lament gesture that occurs as the skirmish ends and many samurai lie dead on the battlefield.

Figure 5.3. The Lament

This same melody accompanied the moment in the film when the samurai first captured Algren. As he cries out for sake (Japanese liquor) while going through alcohol withdrawal, he recalls the atrocities that occurred at the Battle of Bull Run under the leadership of Lieutenant Colonel Custer. In both instances, the lament serves as Algren's reflection of the aftermath of a battle that has taken place and the remorse he feels in connection with the losses in battle.

[4] Diegetic sounds are those that appear within the diegesis of the film, i.e., diegetic sounds are those that the characters capable of hearing. By contrast, nondiegetic sounds are those that appear outside of the diegesis of the film, heard only by the audience (and presumably the narrator, if any).



Example 5.9. Lament vs. Bugle Call

The melodic line repeatedly descends from D4 down to A3. Note that this melodic line descends beyond B♭3 to A3 without interruption, standing in opposition to the descent in the "reinforcements" scene music. As the fighting breaks, the descent to A3 suggests the resoluteness and survivability of the samurai thus far in the battle. The descending D-Aeolian line, suggestive of the lamenting samurai, is nondiegetic. As the line reaches A, however, the Imperial Army sounds a diegetic bugle call of retreat, sounding in the key of B♭ major against the nondiegetic, D-Aeolian lament melody. Here again, a B♭-major harmony interrupts the melodic flow of the D-Aeolian line. In this instance, the conflict not only spans tonal space, but it also spans across diegetic and nondiegetic space.

These energetic analyses of the “charge” and “reinforcements” scenes in *The Last Samurai* illustrate how the musical energies directly relate to the energies of the actions on screen and the narratives of those scenes. Consequently, this analysis provides a glimpse into the compositional process. Beyond giving one a greater appreciation for the scenes in particular, such connections between the music and film enhance one’s understanding of the film as a whole. The music that accompanies the “charge” scene appears three times earlier in the film. The music first appears as Algren, a hired Imperial contractor and commander at the time, fights against the samurai (0:23:44 - 0:30:35) (figure 5.4).

Figure 5.4. Algren and the Imperial Japanese Army Battle the Samurai

The samurai defeat the Imperial Army and Algren becomes a captive. Before becoming a captive, the abandoned Algren attempts to fend off the samurai alone and intends to resist them until he can no longer fight. The energetic connections in this scene depict Algren's stand against the overwhelming power of the samurai. Algren (i.e., the inertial melodic ascent) fight against the samurai (i.e., melodic gravity). At this point in the film, the samurai are Algren’s enemies.

The "battle" leitmotif illustrated in the "charge" scene appears again as Algren, now a captive of the samurai, fights Ujio with a wooden sword (0:46:13 – 0:49:34) (figure 5.5).

Figure 5.5. Algren and Ujio Fight with Wooden Swords

Ujio continuously beats Algren down into the mud. As before, Algren's strong, American willpower drives him to continue fighting. Eventually, however, Algren is incapacitated, the music fades, and the scene ends. The musical material that accompanied the "charge" scene appears in its full form with Algren's final attempt to rise from the mud and fight. Here again, the music's energetic connections to the actions and narrative of this scene reveal that the rising inertia represents Algren, who is fighting the oppression of his captors, the samurai. In these first two occurrences of the "battle" leitmotif, the oppressive melodic gravitational and harmonic forces represent the samurai.

The third statement of the "battle" leitmotif occurs as Nobutada, Kotsumoto's son, has his topknot disgracefully cut off in public by Imperial Japanese soldiers (1:24:39 – 1:26:39) (figure 5.6). A topknot is a traditional hairstyle worn by Japanese men, samurai in particular. The topknot is a sign of their status and commitment to the samurai way of life. Unlike the other

three statements of the “battle” motif, there is no fighting taking place in this scene. However, there is certainly hostility between Algren, Nobutada, and the Imperial soldiers. Algren, being held at gunpoint, convinces Nobutada to not fight the Imperial soldiers and submit. Having shamed and bullied Nobutada by cutting off his topknot, the Imperial soldiers walk away.

Figure 5.6. Imperial Soldiers Cutting Off Nobutada’s Topknot

As the Imperial soldiers walk away, the leitmotif fades away and contains a slight ritardando. This musical fade suggests that the Imperial soldiers have won this battle and that no other fighting will take place at this moment in the film. This statement of the “battle” leitmotif is the shortest and most thinly orchestrated in the film, perhaps paralleling the restraint of Algren and Nobutada in the face of an ensuing conflict.

There are differences between the first three occurrences of the “battle” leitmotif and the final, more complete occurrence of this musical material that accompanies the “charge” scene. The oppressive, gravitational and harmonic forces previously shown to correspond to the Imperial Army in the last two instances of this leitmotif actually parallel the samurai in the first two occurrences of the theme. The correlation between the narrative forces and their

metaphorical musical forces inverts between the second and third occurrences of this leitmotif. This role reversal leads one to ask, what initiates this inversion of polarity? The answer lies in the common ground between the four occurrences of this musical theme. The common element in each of the theme's four occurrences is Algren and his association with the ascending melodic inertia. The ascending inertial energy in all four instances represents Algren regardless of this current military allegiances. The rising inertial line always represents Algren and his conflict with his enemy at that particular moment in the film. Considering all four instances of the "battle" motif, one can see that there is a change in Algren that occurs between the second and third statements of this musical material. During this point in the film, Algren gains an understanding, appreciation, and love for the samurai way of life. Having learned their ways, Algren now associates himself with the samurai—to the extent that he counts himself amongst their ranks in the final battle. Algren, who may be depicted as either a traitor or convert depending upon the point of view, changes allegiances. The music that accompanies Algren's struggles likewise changes allegiances. Thus, the polarity of connections between musical energies and the action and narrative energies inverts.

Besides the music that precedes and follows each statement of the "battle" leitmotif, there are no significant musical differences between the four occurrences. The scenes in the film depict Algren fighting against an opposing force, whether that is the samurai or the Imperial Army. When viewed together, the musical and visual aspects of these scenes help one gain a deeper understanding and appreciation for the film. As this analysis has demonstrated with the overall arch of the "battle" leitmotif statements, these energetic and gestural suggestions go a step further than a typical leitmotivic analysis in film music scholarship. In this instance, the energetics approach has provided details that reveal a complex musical story to enhance one's

understanding of the film as a whole. A typical leitmotivic analysis would simply note the connection between musical material and a particular character or situation. This analysis has shown how the energetic-gestural approach has revealed the finer details of Algren's character development. The energetic-gestural approach has decoded the music to expose it as a narrator that tells its own story parallel to the action on screen. Through an understanding of the music, one better understands Algren, his development, and the film as a whole.

CHAPTER 6 – CONCLUSION

Summary of Research

This dissertation presents several energetic models for describing musical gestures. The energetics approach to analysis provides a method for understanding various musical occurrences as embodiments of gestures and events found in other domains of a film, such as onscreen actions or the narrative structure. The models provide a taxonomy for differentiating the many gestures, which allows one to attach different meanings and associations to each gesture in the context of the film. By better understanding the music and its extramusical relationships, one may realize latent structure and hidden meaning in the music and film.

The compositional process and output of film composers is unique. This system of analysis reflects the manner in which the music was written: as energetic gestures meant to parallel extramusical events and factors in the film, such as onscreen actions or narrative events. An energetic gestural analysis takes into consideration the many extramusical factors that dictate musical decisions. Understanding such compositional factors uncovers the complexities of film music as a unique collaborative art form.

Many view film scores as being simplistic and unsophisticated. Extramusical connections, however, make film music complex in ways that are unique to this genre of music. This dissertation highlights these distinctive features. By shedding light on these multifaceted relationships, this study demonstrates the legitimacy of studying film music.

Film composers must account for several external factors, many of which constrain their compositional output in ways not experienced by other types of

composers.[1] Because film music composition takes place in post-production, the film greatly dictates the gestures which composer must write. Additionally, the film composer must collaborate with the director, music department director, film producers, and music producers among others, which may influence the final musical product. Even after a composer completes a score, orchestrators and editors may make drastic edits, which often alter the way music relates to a film. The analyses of film music gestures and their connections to the film in this study demonstrate how, despite these compositional difficulties, film composers maintain a great level of sophistication.

Implications for Future Study

This study implies many avenues for future study. One area of interest concerns how energetics more deeply relates to other music analytical approaches (e.g., Schenkerian theory, set class theory, transformation theory). These more traditional systems are not innately equipped to relate music to other elements of the film. Some mode of description or connection must bridge this gap for a full and thorough analysis to take place. The benefit of many systems of analysis is that they focus on a very specific type of music; however, in some ways, this is also a weakness. The energetic models describe musical features that adhere to natural laws of music; therefore, one may apply these models to a number of musical genres, styles and theories of analysis. Many theories already represent and explain energetic qualities of music. For example, Schenker's descending *Urline* exhibits musical gravity. Energetic connections relate the musical gestures and compositional techniques associated with other theories to the

[1] For a more on these compositional difficulties, see Kathryn Marie Kalinak, *Film Music: A Very Short Introduction* (Oxford, United Kingdom: Oxford University Press, 2010), 93-98.

energetic models in this dissertation; consequently, these models provide a foundation for connecting such theories to extramusical events and factors.

There are several other types of music that could benefit from the approaches in this dissertation. A great portion of this study can be extended to other collaborative art forms that involve music and a visual aspect, namely, opera, ballet, and Broadway. Perhaps the most intriguing analytical applications of this study concern music that presents difficulties for other analytical systems. Consider Krzysztof Penderecki's sound mass composition from the 1990s and 2000s, which often ventures outside of a twelve-pitch-class space. Penderecki's music contains gestures that are similar to the glissandi across continuous pitch space found in the analysis of *The Dark Knight Trilogy*. Atonal music, microtonal music, music in a continuous pitch space, and various tuning and temperaments offer opportunities for expanding the current theory of energetics.

The current study primarily involves pitch, rhythm, and meter. However, one may also apply the current models to other musical elements, such as dynamics, instrumentation, orchestration, and texture. Lyrics in vocal music provide an additional dimension of potential energetic connections. Energetics allows one to connect a gesture from one musical domain to another using a common metaphor as a link. The current study also emphasized latent connections to narrative imagery. Of further interest are the connections to filmic imagery, particularly the mickey-mousing model, where musical gestures very literally map onto onscreen actions. Musicals (musical comedies) and films that implement preexisting music offer potential opportunities for expanding the current research.

Silence in music is of particular interest, especially in the context of a film. The current study does not provide models that correspond to the absence of a substance. As the analysis of *The Dark Knight Rises* demonstrates, the absence of sound may be very energetic. For instance, an abrupt moment of silence amongst musical activity may imply changes of musical energy, slowing or stopping musical motion. At a musical climax, however, such silence may suspend or increase the perception of energy. Creating models, such as a vacuum, for describing these energetic qualities of silence may expand this theory and applications significantly.

This study is limited in regards to the types of film music analyzed. A large variety of film music exists, necessitating some limitation in that regard. This study limits the large analyses to recent films to focus on modern compositional techniques and unique applications of the models (e.g., atonality, continuous pitch space, syncopated rhythms, frequent meter changes). However, one may apply these models to several other styles and types of film music. One may find the models particularly useful for analyzing the deliberately obvious musical gestures famous in early film scores known as mickey-mousing. Besides the music analyzed here, one may apply these models to a variety of scores which include but are not limited to the swashbuckling scores of Erich Korngold, the motivic-developmental scores of Max Steiner and John Williams, the minimalist scores of Philip Glass, and the electronic scores of Don Davis.

Implications for Practical Application

Several potential applications for the models and approaches in this study exist. Most of the implications for future research concern potential analytical studies, however,

composers, performers, and teachers may also find practical, everyday applications for the energetic models found in this dissertation.

Because this analytical system reflects the compositional process of many film composers, these models are naturally suited for use by film composers. Film composers often create sync points or cues to match particular events in the film. In so doing, film composers start the composition process by creating musical gestures. Together, these models provide a stock catalog of compositional tools for composers. The models are ambiguous until placed into a musical context; therefore the applications of these models are flexible. For example, if a composer decides to parallel a growing struggle in the film with a melodic line that rises to a climax, the melodic and rhythmic gravity models may help him or her conceptualize and create an appropriate sense of struggle in the music. A composer in search of more dissonance may consider the compression or tension models for ways of creating dissonances to match certain cues. These models may be particular useful in giving significance and structure to small motifs. Metaphors of energetics offer a method for composers to convert adjectives that describe a character or situation into a theme or leitmotif. This collection of models forms a composer's toolbox of expression for creating everything from global tonal relationships to local pitch relationships.

The models in this dissertation may prove useful to composers in their compositional process. One mode of composing music is to first construct gestures or shapes, using the notes simply as a means for composing out those ideas.[2] Besides the analytical uses, though, the energetic models may prove useful to the composer—not just film composers. Composers can use these models to create energetic narratives that

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[2] Robert Hatten, *Interpreting Musical Gestures, Topics, and Tropes: Mozart, Beethoven, Schubert* (Bloomington, IN: Indiana University Press, 2004), 301, endnote 6.

supply structure to the composition. The combinations of models provide basic templates for combining pitches in various ways, creating contrast between consonance and dissonance, guiding melodic lines, relating harmonies and creating nonharmonic tones, among other ideas. Additionally, these models allow a composer to think of the music abstractly, guarding them against conventional formulas and making them more creative. Similarly, such an application may be useful to the improvising performer of jazz or aleatoric music.

The metaphorical models provide a taxonomy and lexicon for describing music to non-musicians without the need for a deep technical understanding of music. Because the models rely on an embodiment of music gestures and not the notes themselves, one can describe music to those with very little knowledge of music theory. This means for musical description may prove valuable in collaborative and cross-disciplinary work concerning music. Music is rooted in the arts and sciences; however, these two aspects of music are often isolated in research and practical experience. The metaphors bring these aspects closer together by establishing a means for describing music details in a way that is true to one's perceived embodiments of music as an art.

Similarly, music teachers may find the energetics approach useful for describing musical phenomena to students in an easily digestible form before delving further into technicalities. By appealing to a student's embodiment of a musical feature, one can convey quickly and easily a general sense of a musical concept. Such an approach allows a teacher to frontload the concept, which provides the student a general foundation upon which they can build the details of the concept or topic.

BIBLIOGRAPHY

Adorno, Theodore and Eisler, Hans. *Composing for the Films*. London: Continuum, 1947, 2007.

Avison, John, ed. *Hutchinson Pocket Dictionary of Physics*. Abingdon, Oxfordshire, United Kingdom: Helicon Publishing, 2005.

Barsam, Richard and Dave Monahan. *Look at Movies: An Introduction to Film*. 3rd ed. New York: W. W. Norton & Company, 2010.

Bazelon, Irwin. *Knowing the Score: Notes on Film Music.* New York: Van Nostrand Reinhold Company, 1975.

Brown, Blain. *Cinematography, Theory and Practice: Image Making for Cinematographers and Directors*. 2nd ed. Waltham, MA: Focal Press, 2012.

Brown, Marshall. "Unheard Melodies: The Force of Form." *Publications of the Modern Language Association of America* 107, no. 3, Special Topic: Performance (May, 1992): 465–81.

Brown, Royal S. *Overtones and Undertones: Reading Film Music.* Berkeley: University of California Press, 1994.

Buhler, James, Caryl Flinn, and David Neumeyer, eds. *Music and Cinema*. Middletown, CT: Wesleyan University Press, 2000.

Buhler, James, David Neumeyer, and Rob Deemer. *Hearing the Movies: Music and Sound in Film History*. Oxford, United Kingdom: Oxford University Press, 2010.

Burt, George. *The Art of Film Music*. Boston: Northeastern University Press, 1994.

Cazden, Norman. "The Definition of Consonance and Dissonance." *International Review of the Aesthetics and Sociology of Music* 11, no. 2 (December 1980): 123–68.

Chattah, Juan Roque. "Semiotics, Pragmatics, and Metaphor in Film Music Analysis." PhD diss., The Florida State University, 2006.

Chion, Michel. *Audio-Vision: Sound on Screen*. Translated by Claudia Gorbman. New York: Columbia University Press, 1994.

Christensen, Jean and Jesper Christensen. *From Arnold Schoenberg's Literary Legacy: Catalog of Neglected Items*. Detroit, MI: Harmonie Park Press, 1988.

Christensen, Thomas, ed. *Cambridge History of Western Music* Theory. Cambridge, United Kingdom: Cambridge University Press, 2002.

Christensen, Thomas. *Rameau and Musical Through in the Enlightenment*. Cambridge, United Kingdom: Cambridge University Press, 1993.

Cochran, Alfred. “Style, Structure, and Tonal Organization in the Early Film Scores of Aaron Copland.” PhD diss., Catholic University of America, 1986.

Cochran, Alfred. “The Spear of Cephalus: Observations on Film Music Analysis.” *Indiana Theory Review* 11 (Spring-Fall 1990): 65–80.

Cohen, David E. “‘The Imperfect Seeks its Perfection’: Harmonic Progression, Directed Motion, and Aristotelian Physics.” *Music Theory Spectrum* 23, no. 2 (2001): 139–69.

Coker, Wilson. *Music and Meaning*. New York: Free Press, 1972.

Cone, Edward T. “Schubert’s Promissory Note: An Exercise in Musical Hermeneutics.” *Schubert: Critical and Analytical Studies*. Edited by Walter Frisch, 13–30. Lincoln, NE: University of Nebraska Press, 1986.

Cook, Nicholas. *Analysing Musical Multimedia*. Oxford, United Kingdom: Oxford University Press, 2001.

Cook, Norman D. “The Sound Symbolism of Major and Minor Harmonies.” *Music Perception* 24, no. 3 (February 2007): 315–19.

Cooke, Deryck. *The Language of Music.* Oxford, United Kingdom: Oxford University Press, 1990.

Cooke, Mervyn. *A History of Film Music.* Cambridge, United Kingdom: Cambridge University Press, 2002.

Cooke, Mervyn. *The Hollywood Film Music Reader*. Oxford, United Kingdom: Oxford University Press, 2010.

Copland, Aaron. *What to Listen for in Music*. New York: Penguin Group Inc., 1939, 2009.

Coyle, Rebecca, ed. *Drawn to Sound: Animation Film Music and Sonicity*. London: Equinox, 2010.

Dahlhaus, Carl. *Studies on the Origin of Harmonic Tonality*. Translated by Robert O. Gjerdingen. Princeton, NJ: Princeton University Press, 1991.

The Dark Knight Trilogy. Blu-ray. Directed by Christopher Nolan. Music by James Newton Howard and Hans Zimmer. Burbank, CA: Warner Brothers Entertainment, Inc., 2012.

Davis, Richard. *Complete Guide to Film Scoring: The Art and Business of Writing for Movies and TV*. Edited by Jonathan Feist. Boston, MA: Berklee Press, 1999.

Deaville, James, ed. *Music in Television: Channels of Listening*. Routledge Music and Screen Media Series. New York: Routledge, 2011.

Deeson, Eric. *Collins Internet-Linked Dictionary of Physics: Physics Defined and Explained*. London: HarperCollins Publishers, 2007.

DesJardins, Christian. *Inside Film Music: Composers Speak.* Foreword by Christopher Young. Los Angeles: Silman-James Press, 2006.

Dickinson, Kay. *Off Key: When Film and Music Won't Work Together*. Oxford, United Kingdom: Oxford University Press, 2008.

Dineen, Phillip Murray. "Problems of Tonality: Schoenberg and the Concept of Tonal Expression." PhD diss., Columbia University, 1989.

Donnelly, Kevin J., ed. *Film Music: Critical Approaches*. New York: The Continuum International Publishing Group, 2001.

Eaton, Rebecca. "Unheard Minimalisms: The Functions of the Minimalist Technique in Film Scores." PhD diss., University of Texas Austin, 2008.

Eisenstein, Sergei. *The Film Sense*. Translated and edited by Jay Leyda. London: Farber and Farber Limited, 1943.

Elsaesser, Thomas and Malte Hagener. *Film Theory: An Introduction Through the Senses*. New York: Routledge, 2010.

Erickson, Robert. *The Structure of Music: A Listener's Guide*. New York: The Noonday Press, 1955.

Farbood, Morwaread M. "A Parametric, Temporal Model of Musical Tension." *Music Perception: An Interdisciplinary Journal* 29, no. 4 (April 2012): 387-428

Ferguson, Donald N. *Music and Metaphor*. Minneapolis: University of Minnesota Press, 1960.

Festinger, Leo. *A Theory of Cognitive Dissonance*. Redwood City, CA: Stanford University Press, 1957.

Fiegel, E. Todd. "Bernard Herrmann as Musical Colorist: A Musicodramatic Analysis of His Score for *The Day the Earth Stood Still*." *Journal of Film Music* 1.2–3 (2003): 185–215.

Forte, Allen. "Paul Hindemith's Contribution to Music Thoery in the United States." *Journal of Music Theory* 42, no. 1 (Spring 1998), 1–14.

Gallez, Douglas W. “Theories of Film Music.” *Cinema Journal* 9.2 (1970): 40–47.

Gitten, Anthony and Elaine King. *Music and Gesture*. Burlington, VT: Ashgate Publishing, 2006.

Gitten, Anthony and Elaine King. *New Perspectives on Music and Gesture.* Burlington, VT: Ashgate Publishing, 2011.

Goldmark, Daniel, Lawrence Kramer, and Richard Leppert, eds. *Beyond the Soundtrack: Representing Music in Cinema.* Berkeley: University of California Press, 2007.

Gorbman, Claudia. *Unheard Melodies: Narrative Film Music*. Bloomington: University of Indiana Press, 1987.

Granot, Roni Y. and Zohar Eitan. “Musical Tension and the Interaction of Dynamic Auditory Parameters.” *Music Perception* 28, no. 3 (February 2001): 219–46.

Halfyard, Janet K, ed. *Music of Fantasy Cinema.* London: Equinox, 2012.

Hasty, Christopher F. *Meter as Rhythm*. Oxford, United Kingdom: Oxford University Press, 1997.

Hatten, Robert. *Interpreting Musical Gestures, Topics, and Tropes: Mozart, Beethoven, Schubert*. Bloomington, IN: Indiana University Press, 2004.

Hatten, Robert. “Musical Forces and Agential Energies: An Expansion of Steve Larson’s Model.” *Music Theory Online* 18, no. 3 (September 2012).

Hatten, Robert. *Musical Meaning in Beethoven: Markedness, Correlation, and Interpretation*. Bloomington, IN: Indiana University Press, 1994.

Hayward, Philip, ed. *Terror Tracks: Music, Sound and Horror Cinema*. London: Equinox Publishing, 2009.

Hepokoski, James. “Framing Till Eulenspiegel.” *19th-Century Music* 30, no. 1 (Summer 2006): 4–43.

Hickman, Roger. *Reel Music: Exploring 100 Years of Film Music*. New York: W. W. Norton & Company, 2006.

Hindemith, Paul. *The Craft of Musical Composition*. Revised 4th edition. 2 vols. Translated by Arthur Mendel. New York, Associated Music Publishers, 1945.

Hindemith, Paul. *Unterweisung im Tonsatz*. 2 vols. Mainz: B. Schott, 1937.

Hoffman, Richard Mark. “A Theory of Musical Tension in Renaissance Music: A Study of Early Sixteenth-Century German Polypony.” PhD diss., University of Kentucky, 1994.

Howe, Blake. “Music and the Embodiment of Disability.” PhD diss. The City University of New York, 2010.

Howe, Blake. “The Allure of Dissolution: Bodies, Forces, and Cyclicity in Schubert’s Final Mayrhofer Settings.” *Journal of the American Musicological Society* 62, no. 2 (Summer 2009): 271-322.

Hubbert, Julie. *Celluloid Symphonies: Texts and Contexts in Film Music History*. Berkeley: University of California Press, 2011.

Huron, David. *Sweet Anticipation: Music and the Psychology of Expectation*. Cambridge, MA: The MIT Press, 2006.

Johnson, Mark. “Embodied Musical Meaning.” *Theory and Practice: Journal of the Music Theory Society of New York State* 22-23 (1997-1998): 95-102.

Johnson, Mark. *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press, 1987.

Juslin, Patrik N. and John A. Sloboda. *Music and Emotion: Theory and Research*. Oxford, United Kingdom: Oxford University Press, 2001.

Juslin, Patrik N. and John A. Sloboda, eds. “Psychological Perspectives on Music and Emotion.” *Music and Emotion: Theory and Research*. Oxford, United Kingdom: Oxford University Press, 2001: 71–104.

Kalinak, Kathryn Marie. *Film Music: A Very Short Introduction*. Oxford, United Kingdom: Oxford University Press, 2010.

Karl, Gregory. “Structuralism and Musical Plot.” *Music Theory Spectrum* 19, no. 1 (Spring 1997): 13–34.

Karlin, Fred and Rayburn Wright. *On the Track: A Guide to Contemporary Film Scoring*, 2nd Edition. Foreword by John Williams. New York: Routledge, 2004.

Keller, Hans and Christopher Wintle eds. *Film Music and Beyond: Writings on Music and the Screen, 1946–59*. London: Plumbago Books and Arts, 2006.

King, Elaine and Anthony Gritten, eds. *New Perspecives on Music and Gesture*. Farnham, Surrey, United Kingdom: Ashgate Publishing, 2011.

King, Geoff. *New Hollywood Cinema: An Introduction*. New York: I.B. Tauris & Co Ltd., 2002.

Kramer, Lawrence. *Interpreting Music*. Berkeley: University of California Press, 2011.

Kramer, Lawrence. “Musical Narratology: A Theoretical Outline.” *Indiana Theory Review* 12 (Spring-Fall 1991): 141–62.

Krebs, Harald. *Fantasy Pieces: Metrical Dissonance in the Music of Robert Schumann*. Oxford, United Kingdom: Oxford University Press, 1999.

Krebs, Harald. “Robert Schumann’s Metrical Revisions.” *Music Theory Specturm* 19, no. 1 (Spring 1997): 35-54.

Krebs, Harald. “Some Extensions of the Concepts of Metrical Consonance and Dissonance.” *Journal of Music Theory* 31, no. 1 (Spring 1987): 99-120.

Krumhansl, Carol. L. “A Perceptual Analysis of Mozart’s Piano Sonata K. 282: Segmentation, Tension, and Musical Ideas.” *Music Perception* 13, no. 3 (1996): 401–32.

Krumhansl, Carol L. *Cognitive Foundations of Musical Pitch*. Oxford, United Kingdom: Oxford University Press, 1990.

Krumhansl, Carol L. “Music: A Link between Cognition and Emotion.” *Current Directions in Psychological Science* 11, no. 2 (April 2002): 45–50.

Kurth, Ernst. *Die Voraussetzungen der theoretischen Harmonik und der tonalen Darstellungssystem*. 1913. Reprint: Schriften zur Musik, Vol. 14. Munich, Germany: Katzbichler, 1973.

Kurth, Ernst. *Grundlagen des linearen Kontrapunkts: Bachs melodische Polyphonie*. 3rd ed. 1917. Reprint. Hildesheim, Germany: George Olms, 1977.

Kurth, Ernst. *Romantische Harmonik und ihre Krise in Wagners Tristan*, 3rd ed. Berlin: M. Hesse, 1923. Facsimile of the first edition. Hildesheim: Georg Olms Verlag, 1998.

Lakoff, George and Mark Johnson. *Metaphors We Live By.* Chicago: University of Chicago Press, 1980.

Larsen, Peter. *Film Music*. Translated by John Irons. London: Reaktion Books, 2008.

Larson, Steve. “Modeling Melodic Expectation: Using Three ‘Musical Forces’ to Predict Melodic Continuations.” *Proceedings of the Fifteenth Annual Conference of the Cognitive Science Society*. Institute of Cognitive Science, University of Colorado, Boulder, CO, June 18–21, 1993. Hillsdale, NJ: Lawrence Erlbaum Associates, 1993: 629-34.

Larson, Steve. “Musical Forces and Melodic Patterns.” *Theory and Practice: Journal of the Music Theory Society of New York State* 22-23 (1997-1998): 55-72.

Larson, Steve. "Musical Forces, Melodic Expectation, and Jazz Melody." *Music Perception* 19, no. 3 (Spring 2002): 251-385.

Larson, Steve. *Musical Forces: Motion, Metaphor, and Meaning in Music*. Bloomington, IN: Indiana University Press, 2012.

Larson, Steve. "Musical Forces, Step Collections, Tonal Pitch Space, and Melodic Expectation," *Proceedings of the Third International Conference for Music Perception and Cognition* (Université de Liège, 1994). Edited by Irène Deliège. Belgium: European Society for the Cognitive Sciences of Music (ESCOM), 1994: 227–29.

Larson, Steve. "The Problem of Prolongation in 'Tonal" Music: Terminology, Perception, and Expressive Meaning," *Journal of Music Theory* 41, no. 1 (Spring 1997): 101–36.

Larson, Steve and Leigh Vanhandel. "Measuring Musical Forces." *Music Perception* 23, no. 2 (December 2005): 119–36.

The Last Samurai. Blu-ray. Directed by Edward Zwick. Music by Hans Zimmer. Burbank, CA: Warner Brothers Entertainment, Inc., 2003.

Lehman, Frank Martin. "Frame-Scapes: Exploring Boundaries in Goldsmith's *Star Trek*." Paper presented at the annual meeting of the Music and the Moving Image Conference, New York, May 2011.

Lehman, Frank Martin. "Reading Tonality through Film: Transformational Hermeneutics and the Music of Hollywood." PhD diss., Harvard University, 2012.

Leinberger, Charles. "Thematic Variation and Key Relationships: Charlotte's Theme in Max Steiner's Score for *Now, Voyager*." *Journal of Film Music Studies* 1, no. 1 (Summer 2002): 63–77.

Lerdahl, Fred. "Calculating Tonal Tension," *Musical Perception* 13, no. 3 (1996): 319–63.

Lerdahl, Fred. "Genesis and Architecture of the GTTM Project." *Music Perception* 26, no. 3 (February 2009): 187–194.

Lerdahl, Fred and Ray Jackendoff. *A Generative Theory of Tonal Music*. Cambridge, MA: MIT Press, 1983.

Lerdahl, Fred and Carol L. Krumhansl. "Modeling Tonal Tension." *Music Perception: An Interdisciplinary Journal* 24, no. 4 (April 2007): 329-66.

Lerner, Neil, ed. *Music in the Horror Film: Listening to Fear.* Routledge Music and Screen Media Series. New York: Routledge, 2010.

Leydon, Rebecca. "Debussy's Late Style and the Devices of the Early Silent Cinema." *Music Theory Spectrum* 23, no. 2 (Fall 2001): 217–41.

MacDonald, Laurence E. *The Invisible Art of Film Music: A Comprehensive History.* New York: Ardsley House Publishing, 1998.

Malin, Yonatan. "Metric Analysis and the Metaphor of Energy: A Way into Selected Songs by Wolf and Schoenberg." *Music Theory Spectrum* 30, no. 1(Spring 2008): 61–87.

Margulis, Elizabeth Hellmuth. "A Model of Melodic Expectation." *Music Perception* 22, no. 4 (Summer 2005): 663–714.

Margulis, Elizabeth Hellmuth. "Silences in Music are Musical Not Silent: An Exploratory Study of Context Effects on the Experience of Musical Pauses." *Music Perception* 24, no. 5 (June 2007): 485–506.

Marks, Martin. *Music and the Silent Film: Contexts and Case Studies 1895–1924*. Oxford, United Kingdom: Oxford University Press, 1997.

McAdams, Stephen. "Musical Forces and Melodic Expectations: Comparing Computer Models and Experimental Results." *Music Perception: An Interdisciplinary Journal* 21, no. 4 (June 2004): 457-98.

McCreless, Patrick. "Contemporary Music Theory and the new Musicology: An Introduction." *The Journal of Musicology* 15, no. 3 (Summer 1997): 291–96.

McCreless, Patrick. "Ernst Kurth and the Analysis of the Chromatic Music of the Late Nineteenth Century." *Music Theory Spectrum* 5 (Spring 1983): 56–75.

McCreless, Patrick. "Motif and Magic: A Referential Dyad in 'Parsifal.'" *Music Analysis* 9, no. 3 (Oct. 1990): 227–65.

Meyer, Leonard B. *Emotion and Meaning in Music*. Chicago: University of Chicago Press, 1956.

Meyer, Leonard B. *Explaining Music: Essays and Explorations*. Berkeley, CA: Univeristy of California Press, 1973.

Meyer, Leonard B. *Music, the Arts, and Ideas: Patterns and Predictions in Twentieth-Century Culture*. Chicago: University of Chicago Press, 1967.

Murphy, Scott. "Ernst Kurth at the Movies: Syntax and Semantics of Absolute Progressions in Recent American Film Music." Paper presented at the annual meeting of the Society for Music Theory National Conference, Toronto, ON, November 2000.

Murphy, Scott. "The Major Tritone Progression in Recent Hollywood Science Fiction Films." *Music Theory Online* 12, no. 2 (May 2006).

Murphy, Scott. Forthcoming. “Transformational Theory and the Analysis of Film Music.” *The Oxford Handbook of Music in Film and Visual Media*. Edited by David Neumeyer. Oxford, United Kingdom: Oxford University Press.

Narmour, Eugene. *The Analysis and Cognition of Basic Melodic Structures: The Implication-Realization Model*. Chicago: University of Chicago Press, 1990.

Narmour, Eugene. *The Analysis and Cognition of Melodic Complexity: The Implication–Realization Model.* Chicago: University of Chicago Press, 1992.

Neumeyer, David. “Melodrama as a Compositional Resource in Early Hollywood Sound Cinema.” *Current Musicology* 57 (Spring 1995): 61–94.

Neumeyer, David. “Film Music Analysis and Pedagogy.” *Indiana Theory Review* 12 (Spring-Fall 1990): 1–27.

Neumeyer, David. “Tonal Design and Narrative in Film Music: Bernard Herrmann’s The Trouble With Harry and Portrait of Hitch.” *Indiana Theory Review* 19.1–2 (Spring-Fall 1998): 87–123.

Nielsen, Frede V. “Musical ‘Tension’ and Related Concepts.” *Basic Concepts of Studies in Musical Signification: A Report on a New International Research Project in Semiotics of Music* (1987): 491-513.

Ostwald, Wilhelm. “The Modern Theory of Energetics.” *The Monist* 17, no. 4 (October 1907): 481–515.

Persson, Per. *Understanding Cinema: A Psychological Theory of Moving Imagery*. Cambridge, United Kingdom: Cambridge University Press, 2003.

Pool, Jeannie Gayle, and Stephen H. Wright. *A Research Guide to Film and Television Music in the United States*. Foreword by Leonard Maltin. Lanham, MD: Scarecrow Press, 2011.

Powrie, Phil and Robynn J. Stilwell, ed. *Changing Tunes: The Use of Pre-existing Music in Film*. Ashgate Popular and Folk Music Series. Farnham, Surrey, United Kingdom: Ashgate Publishing Limited, 2006.

Prendergast, Roy M. *Film Music: A Neglected Art*. 2nd ed. New York: W. W. Norton & Company, 1992.

Rodman, Ronald. “Tonal Closure and Design in the Wizard of Oz.” *Indiana Theory Review* 19.1–2 (Spring-Fall 1998): 125–43.

Rodman, Ronald. *Tuning In: American Narrative Television Music*. Oxford, United Kingdom: Oxford University Press, 2010.

Rosar, William H. "Film Music—What's in a Name?" *The Journal of Film Music* 1.1 (2002): 1–18.

Rosar, William H. "Music for Martians: Schillinger's Two Tonics and Harmony of Fourths in Leith Steven's Score for *War of the Worlds*." *Journal of Film Music* 1.4 (2006): 395–438.

Rothfarb, Lee. "Ernst Kurth's *Die Voraussetzungen der theoretischen Harmonik* and the Beginnings of Music Psychology." *Theoria* 4 (1989): 10–33.

Rothfarb, Lee. "Hermeneutics and Energetics, Music-Theoretical Alternatives in the Early 1900s." *Journal of Music Theory* 36 (1992): 43–68.

Rothfarb, Lee. *Ernst Kurth as Theorist and Analyst*. Philadelphia: University of Pennsylvania Press, 1988.

Rothfarb, Lee, ed. and trans. *Ernst Kurth, Selected Writings*. Cambridge, United Kingdom: Cambridge University Press, 1991.

Rothstein, William. *Phrase Rhythm in Tonal Music.* New York: Schirmer Books, 1989.

Sabaneev, Leonid. *Music for the Films: A Handbook for Composers and Conductors*. London: Sir Isaac Pitman and Sons Ltd., 1935.

Saslaw, Janna K. "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the Conceptualization of Music." *Journal of Music Theory* 40, no. 2 (Autumn 1996): 217–43.

Saslaw, Janna K. "Life Forces: Conceptual Structures in Schenker's *Free Composition* and Schoenberg's *The Musical Idea*." *Theory and Practice: Journal of the Music Theory Society of New York State* 22-23 (1997-1998): 17-34.

Schenker, Heinrich. *Counterpoint.* 1910 and 1922. Translated by John Rothgeb and Jürgen Thym. Edited by John Rothgeb. New York City: Schirmer Books, 1987.

Schenker, Heinrich. *Free Composition* (*Der freie Satz*). 1935. Translated and edited by Ernst Oster. New York City: Longman, 1979.

Schenker, Heinrich. *Harmony* (*Harmonielehre*). 1906. Edited and annotated by Oswald Jonas. Translated by Elisabeth Mann Borgese. Chicago: University of Chicago Press, 1954.

Schoenberg, Arnold. *Fundamentals of Musical Composition.* Edited by Gerald Strang and Leonard Stein. London: Farber & Farber, 1967.

Schoenberg, Arnold. *Harmonielehre*. 3rd ed. Vienna: Universal Edition, 1922.

Schoenberg, Arnold. *The Musical Idea and the Logic, Art, and Technique of its Presentation*. Translated and edited by Patricia Carpenter and Severine Neff. Bloomington, IN: Indiana University Press, 2006.

Schoenberg, Arnold. *Structural Functions of Harmony.* Edited by Leonard Stein. New York: W. W. Norton, 1969.

Schoenberg, Arnold. *Style and Idea: Selected Writings of Arnold Schoenberg*. Edited by Leonard Stein. Translated by Leo Black. Berkeley, CA: University of California Press, 1975.

Schoenberg, Arnold. *Theory of Harmony*. Translated by Roy E. Carter from *Harmonielehre*. 3rd ed. London, England: Farber & Farber, 1978.

Scruton, Roger. *The Aesthetics of Music*. Oxford, United Kingdom: Clarendon Press, 1997.

Sherk, Warren M. *Film and Television Music: A Guide to Books, Articles, and Composer Interviews*. Lanham, MD: Scarecrow Press, 2011.

Signs. Blu-ray. Directed by M. Night Shyamalan. Music by James Newton Howard. Burbank, CA: Touchstone Pictures, Inc., 2002.

Stillwell, Robyn. "Film Music Literature Review." *The Journal of Film Music* 1.1 (2002): 19–61.

Straus, Joseph N. "Response to Larson." *Journal of Music Theory* 41, no. 1 (Spring 1997): 137–39.

Straus, Joseph N. "The Problem of Prolongation in Post-Tonal Music." *Journal of Music Theory* 31, no. 1 (Spring 1987): 1–21.

Temperley, David. *The Cognition of Basic Musical Structures.* Cambridge, MA: The MIT Press, 2001.

Timm, Larry M. *The Soul of Cinema: An Appreciation of Film Music*. Upper Saddle River, NJ: Pearson Education, Inc., 2003.

Tovey, Donald Francis. *Essays in Musical Analysis*. 7 vols. Oxford, United Kingdom: Oxford University Press, 1935–44.

Vines, Bradley W., Regina L. Nuzzo, H Daniel J. Levitin. "Analyzing temporal Dynamics in Music." *Music Perception* 23, no. 2 (December 2005): 137–52

Weis, Elisabeth and John Belton, eds. *Film Sound: Theory and Practice*. New York: Columbia University Press, 1985.

Weiss, Gail and Honi Fern Haber. *Perspectives on Embodiment: The Intersections of Nature and Culture*. New York: Routledge, 1999.

Widgery, Claudia Joan. “The Kinetic and Temporal Interaction of Music and Film: Three Documentaries of 1930’s America.” PhD diss., University of Maryland College Park, 1990.

Wierzbicki, James. *Film Music: A History.* New York: Routledge, 2009.

Wierzbicki, James, ed. *Music, Sound, and Filmakers: Sonic Style in Cinema*. Routledge Music and Screen Media Series. New York: Routledge, 2012.

Wierzbicki, James, Nathan Platte, and Colin Roust, eds. *The Routledge Film Music Sourcebook*. New York: Routledge, 2011.

Zbikowski, Lawrence M. *Conceptualizing Music: Cognitive Structure, Theory, and Analysis*. Oxford, United Kingdom: Oxford University Press, 2002.

Zbikowski, Lawrence M. “*Des Herzraums Abschied*: Mark Johnson’s Theory of Embodied Knowledge and Music Theory.” *Theory and Practice: Journal of the Music Theory Society of New York State* 22-23 (1997-1998): 1-16.

Zbikowski, Lawrence M. “Metaphor and Music Theory: Reflections from Cognitive Science.” *Music Theory Online* 4, no. 1 (1998).

Zuckerkandl, Victor. *Sound and Symbol: Music and the External World*. Translated by Willard R. Trask. 2 vols. Bollingen Series XLIV. New York: Pantheon Books, 1956.

APPENDIX – GLOSSARY OF MUSICAL ENERGETIC TERMS

Musical Energetic Term	Musical Meaning	Primary Definition Source	Dissertation Page Reference
Centrifgual Force	Musical motion *away* from a tonal center.	Schoenberg	44-52
Centripetal Force	Musical motion *toward* a tonal center.	Schoenberg	44-52
Compression	The reduction in volume (squashing) of a musical object from static equilibrium (state of rest).	Hazelwood	62-66
Deformation	The alteration of musical object from its natural state. Associated with musical dissonance.	Hazelwood	60-62
Drag	Generalized resistance or restriction force (along with friction) that often reduces tempo, dynamics, or some other musical quality.	Hazelwood	98-103
Elasticity	The tendency of a deformed musical object to return to static equilibrium (state of rest). Associated with the tendency toward the release of musical compression/tension.	Hazelwood	88-98
Friction	Generalized resistance or restriction force (along with drag) that rsults in a reduced tempo, dynamics, or other musical quality.	Hazelwood	98-103
Gravity (Melodic)	The tendency for a note to descend toward a referential platform.	Larson	25-29
Gravity (Rhythmic)	The quality one associates with leading or "falling" into a downbeat.	Larson	25-26; 29-30; 34-37
Inertia	The tendency for a musical pattern to continue.	Larson	37-43
Kinetic Energy	The energy of musical motion. Particularly melodic motion.	Kurth	20-24
Magnetism (Melodic)	The tendency of an unstable tone to resolve to the nearest stable tone.	Larson	30-33
Magnetism (Metric)	The tendency of motion from an unstable attack point toward a subsequent, more stable attack point.	Larson	30-31; 33-37
Normal Force	Reactionary force of resistance toward musical change. Particularly associated with resistance to changes in mode or tonal center.	Hazelwood	54-57

Plasticity	The permemant change in a musical object without return (or a tendency to return) to static equilibrium.	Hazelwood	88-98
Potential Energy	Stored musical energy—particularly in sensuous harmonies—that generally restrain (or even halt) the free flow of melody.	Kurth	20-24
Shear	The slanting deformation of a musical object. Particularly useful for describing tonal area relationships and the transitions (or lack thereof) between them.	Hazelwood	73-81
Strain	The measurement of dissonance in a deformed musical object. Closely related to musical stress.	Hazelwood	60-62
Stress	The measurement of the musical force producing dissonance. Closely related to musical strain.	Hazelwood	60-62
Tension	The attraction force within a musical object when that object is stretched.	Hazelwood	67-73
Torque	The initial force that creates a tendency toward tonal rotation. Associated with Schoenberg's tonal problem, centrifugal, and centripetal forces.	Hazelwood	52-54
Torsion	The twisting deformation of a musical object. Particularly useful for mapping tonal area relationships and the rotational path of tonal centers as they move through the circle of fifths.	Hazelwood	82-88

VITA

Zachary Hazelwood, a native of Cartersville, Georgia, received his B.A. in music education at Jacksonville State University in 2007. He also received his M.M. in music theory at the University of South Carolina in 2009, where he wrote a master's thesis title, "Schoenberg as Orchestrator: The Role of Timbre in Schoenbergian Theory." His research interests include film music and the approaches to analysis of composer-theorists, such as Schoenberg and Hindemith. He is currently an Instructor of Music at Louisiana State University, where he is a candidate to receive his PhD in music theory in May 2014.