

Music in Motion: A Metaphoric Mapping of Forces in Piano Concertos by
Mozart and Schumann

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Legend

Table 1: Labeling Conventions and Notational Legend

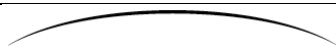
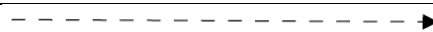
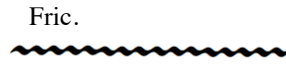
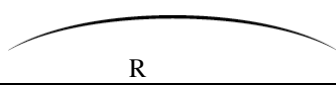
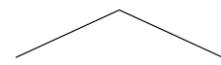
Concept / Force	Symbol/ Notation	Descriptor
Gravity		Solid Line with Arrow showing direction
Rhythmic Gravity		Vertical “V” (Up-bow) which designates the “landing” of the process
Magnetism		Solid Curved Phrase Line
Inertia (Rhythmic)		Square Solid Bracket with Label (Model, Momentum, Inertia)
Inertia (Melodic)		Dotted Line with Arrow
Orbit		Dotted Curved Phrase Line
Friction		Trill Figure with Label (Fric.)
Repulsion		Solid Curved Line with Label (R)
Acceleration		Solid Line with Label (Accel.)
Oscillation		Triangular Bracket

Table 2: Analysis Abbreviations

Symbol / Sign / Abbreviation	Meaning
O	Original
V.L. (MG)	Voice Leading (Middleground)
V.L. (Local)	Voice Leading (Local)
Orch.	Orchestra
FP	Force Profile
32.1 [x,y]	In reference to measure number (x) and beat number (y). For labeling location of processes within the score.
X_n	X is the Tone, and “n” is the register. For example, C_4 is middle C.
$^{\wedge}$	Scale Degree
<i>C-major</i> , <i>a-minor</i>	Key areas are stated in <i>Italics</i> with minor keys in lowercase and major key in upper-case

Abstract

In this thesis, I demonstrate the dynamic way in which musical processes can be described as metaphors. Using Steve Larson's three main metaphors (gravity, inertia, and magnetism) as a starting point, I propose additional metaphors (friction, repulsion, momentum, wave, orbit, and oscillation) to analyze the first movements of Mozart's *Piano Concerto No. 20 in D minor, K 466* and Schumann's *Piano Concerto in A minor, op. 54*. These metaphors provide a means to discuss points of convergence and divergence between the Classical style and the early-Romantic style. Additionally, most theorists of the energeticist tradition only *discuss* motion through prose; I introduce a way to represent these metaphors as musical examples. By focusing on the listener's experience through musical motion, the model proposed in this thesis is useful, not only for the theorist, but for all who wish to communicate ideas about music in a dynamic way.

Keywords: Metaphor, Motion, Larson, Musical Forces, Energetics, Mozart, Schumann, Piano Concerto, Movement, Cross-Domain Mapping, Genre, Classical Style, Romantic Style, Conceptualization, Embodied Knowledge, Gravity, Magnetism, Inertia, Orbit, Oscillation, Friction, Repulsion, Momentum, Wave

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Chapter 1 : INTRODUCTION

Tonal music of western civilization consists of motion, but not motion for its own sake. It represents motion which has an objective, which from the beginning shows direction to a certain goal. On the way to this goal we find details and detours; we hear chords, tones and passages which give form to those details, and serve to make the way to the objective more interesting and colourful. - Felix Salzer¹

Salzer's above quotation captures well the dynamic nature of tonal music. He suggests that music unfolds as directed motion with elements in the music leading the listener to a musical goal. This directed motion primarily results from melodic, harmonic, and rhythmic tendencies. For instance, the resolution of dissonances to consonances creates much of the directed motion in the tonal repertoire. Describing and explaining the anticipated directed motion of a musical event through words can be a challenging task since music unfolds as a series of sounds over time and in space. As a result, some scholars have drawn parallels between directed motion in music and metaphors of physical forces to more effectively describe and understand these events. For example, as trained musicians we often use the phrase "the seventh must fall" when discussing the seventh above the bass in a dominant-seventh chord and its resolution down by stepwise motion. The seventh does not actually fall since it is not bound by the rules of physics, but the resolution "downwards" to the third of the tonic chord is perceived as analogous motion. As such, the process of identifying musical motion through mapping metaphors provides a useful tool when describing musical processes. The music theory subfield known as energetics concerns this aspect of mapping physical forces with conceptual metaphors.

¹ Felix Salzer, *Structural Hearing: Tonal Coherence in Music* (New York: Dover Publications, 1982), 38. [First Published (New York: Charles Boni, 1952).]

This introductory chapter begins with the main objectives and goals of this thesis. I then present an overview of energetics, acting as historical context for Steve Larson's model, followed by an introductory discussion of Larson's work in the field of musical forces. Finally, the last section outlines the overall structure of the thesis.

Objectives

Steve Larson (1955-2011) proposed a model that applies metaphors of motion to music. His model primarily focuses on what he terms "musical forces" and how these forces act in a musical context. To be more specific, Larson maps physical metaphors - such as gravity, inertia, and magnetism - to musical processes in order to describe our perceived motion in music.² Centering on the work of Larson, this thesis examines some of the ways in which these dynamic metaphors can be applied to describe our musical experience and understanding. Case studies support the argument that musical processes can be analyzed as physical metaphors to facilitate our understanding of motion within music.

Moreover, I further explain and refine Larson's model to analyze two piano concertos of different eras. By comparing select excerpts from the two concertos, this study also explores the potential of how musical language and style shift over time. Lastly, I develop visual representations to convey interpretations of musical motion more efficiently.

² This is referred to as domain mapping by using a conceptual metaphor through domain transfer. Here, the source domain is physical in terms of motion and the target domain is musical motion. For additional information, see Lawrence Zbikowski, "Conceptual Models and Cross-Domain Mapping: New Perspectives on Theories of Music and Hierarchy," *Journal of Music Theory* 41 no. 2 (1997), pp. 11-43.

Historical Context: Energetics

Tracing motion within music has an extensive history with many scholars exploring and expanding this field of research. Lee Rothfarb's chapter in *The Cambridge History of Western Music Theory*, entitled "energetics," provides a concise, yet detailed, historical treatment of how motion in music has been discussed.³ A summary of the relevant sections of his study is presented here to trace the developments in this field of research and to contextualize my work.⁴

By describing motion as a fundamental element of music, the study of energetics examines the process and paths of energy within music.⁵ The term, first used in 1934 by Rudolf Schäfke, draws on many concepts from the discipline of physics, and borrows ideas such as force and power.⁶ Scholars, such as August Halm, Heinrich Schenker, Ernst Kurth, Arnold Schering, Hans Mersmann, and Kurt Westphal, have contributed greatly to this field of inquiry.⁷ Primarily, energetics seeks to answer the following questions: What moves music? And, what is movement or motion in music?

As an introduction to energetics, Rothfarb notes five characteristics necessary for the identification of motion in music: (1) thematization of "force," (2) musical logic, (3) centrality of form, (4) anti-historicism, and (5) cultural-ethical mission. Beginning with the thematization of "force," he focuses on the ways in which the force itself is labeled;

³ See Lee Rothfarb, "Energetics," in *The Cambridge History of Western Music Theory*, ed. by Thomas Christensen (Cambridge: Cambridge University Press, 2002), pp. 927-955.

⁴ Another source, outlined in Chapter 2, that references motion and its origins within music theory discourse is an article by David Cohen focusing on harmonic progressions and an early treatise on directed motion. See David E. Cohen, "The Imperfect Seeks Its Perfection: Harmonic Progression, Directed Motion, and Aristotelian Physics," *Music Theory Spectrum* 23, no. 2 (Fall 2001), pp. 139-169.

⁵ Energy here can be interpreted as "directed" motion.

⁶ Rothfarb, "Energetics," p. 927.

⁷ Ibid., p. 928.

that is, what is the nature or characteristic of a “force?”⁸ Essentially, Rothfarb is concerned with discussing and identifying the essence of what constitutes and defines a “force.” For example, does motion itself equal force? Second, musical logic consists of understanding music as a succession or an unfolding of events that arise from our expectations.⁹ Third, the role of a centrality of form presumes musical components that have functional significance and allows for the piece to be understood as one cohesive whole or entity. Fourth, anti-historicism plays a role in removing the extra-musical attributes of a piece. Examples of anti-historicism include the omission of biographical factors, social environment, and other musicological concerns from the analysis.¹⁰ The final characteristic centers on the cultural-ethical mission and concerns of the energeticists themselves.¹¹ This final characteristic reflects the energeticists’ view that their work rescues and revives the musical culture of their time, which they believe is in a dire state of neglect.¹²

The historical contextualization of energetics plays a key role in the development of the different models proposed in the literature. We can trace the roots of energetics to Ancient Greece. Scholars of this time considered music *is [as]* change, and that change itself is the source of motion.¹³ After surveying the texts of the Ancient Greeks, Rothfarb discusses how the treatises of medieval composers required certain tones or intervals to *move* to a resolution.¹⁴ This motion in music appears in the writings of Marchetto of

⁸ Ibid., p. 927.

⁹ Ibid.

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid. This viewpoint is, for the most part, a direct criticism of the music of the late-nineteenth and early-twentieth century and its disregard for traditional forms and tonality.

¹³ Ibid., p. 930. This particular section of Rothfarb’s chapter can be supplemented with further reading of Cohen’s work on harmonic progression and motion in relation to Aristotelian physics.

¹⁴ Ibid., p. 931.

Padua, Boethius, Guido d'Arezzo, and later Gioseffo Zarlino.¹⁵ In the Baroque era in particular, many treatises included the use of musical rhetoric, a rich source of energetic metaphors.¹⁶ Furthermore, Rothfarb argues that, as tonal music progresses in harmonic and melodic complexity, theorists began to use forces to explain harmonic progressions and tone movements.¹⁷ The author continues to trace the roots of energetics through a brief discussion of Jean-Phillipe Rameau's (1683-1764) inclusion of motion in his treatises,¹⁸ François-Joseph Fétis's (1784-1871) theory of energy-laden tones that operate within a dynamic force field, and the historical setting of Hugo Riemann's (1849-1919) idea of a musical "life-force."¹⁹

After situating the emergence of the energeticist thought in a historical context, Rothfarb turns to the contributions of principal scholars associated with this field. In their theoretical and musical texts, August Halm (1869-1929) and Heinrich Schenker (1868-1935) sought to revive the musical traditions of the past from what they perceived as the collapse of the German musical culture. The tension and release structure of traditional tonal writing and the forces associated with this process were, from their perspective, crucial to that "revival." Thus, Halm primarily focused on the analysis of the "ebb and flow" along with "tension and release" in music.²⁰ He was predominantly concerned with the relationships, motions, and organic growth of progressions within music.²¹ Schenker, also a proponent of these ideals, echoed this mode of thinking

¹⁵ See Cohen, "The Imperfect Seeks Its Perfection," pp. 149-152 and 161-165.

¹⁶ Rothfarb, "Energetics," p. 932.

¹⁷ Ibid., p. 935.

¹⁸ For further study of Rameau and his discussion of motion within harmonic progressions, see Cohen, "The Imperfect Seeks Its Perfection," 2001, pp. 140-146.

¹⁹ Rothfarb, "Energetics," pp. 936-937.

²⁰ Ibid.

²¹ For additional information, see Lee Rothfarb, *August Halm: A Critical and Creative Life in Music*, (New York: University of Rochester Press, 2009).

through his description of his *Urlinie* concept in *Harmonielehre* (1906) — it “conceals within itself the seeds of all forces that shape tone-life.” Similarly in his *Free Composition* (1935), he concluded that: “it signifies motion, striving toward a goal, and ultimately the completion of this course.”²²

Ernst Kurth (1886-1946) continued the energetics’ tradition by describing the psychological interpretation of chords where the “feeling of gravity” within a dissonant harmony can still result in a satisfying resolution.²³ According to Kurth, gravity was a force within harmonies that yielded stable sonorities — it “grounded” them.²⁴ In his *Foundations of Linear Counterpoint* (1917), Kurth proposed that melody is motion and therefore a force. He was also concerned with transition and potential energy between tones and harmonies.²⁵ Kurth further elaborated on the dynamic tendencies of music by describing ideas such as ascending or descending drives, upward or downward spirals, and swaying or oscillating motions.²⁶ All of these are representative of what Kurth identified as a dynamic profile²⁷ or dynamic function.²⁸ Finally, Rothfarb argues that a central thought in Kurth’s methodology lies within the concept of a force-wave, which is defined as escalatory and de-escalatory undulations that shape musical flow.²⁹

²² Rothfarb, “Energetics,” p. 939. For a complete reference of publications regarding Heinrich Schenker and his theories, see David Carson Berry, *Topical Guide to Schenkerian Literature: An Annotated Bibliography With Indices*, (New York: Pendragon Press, 2004) and Benjamin McKay Ayotte, *Heinrich Schenker: A Guide to Research*, (New York: Routledge, 2004).

²³ Rothfarb, “Energetics,” p. 939.

²⁴ Ibid.

²⁵ Ibid., p. 940.

²⁶ Ibid.

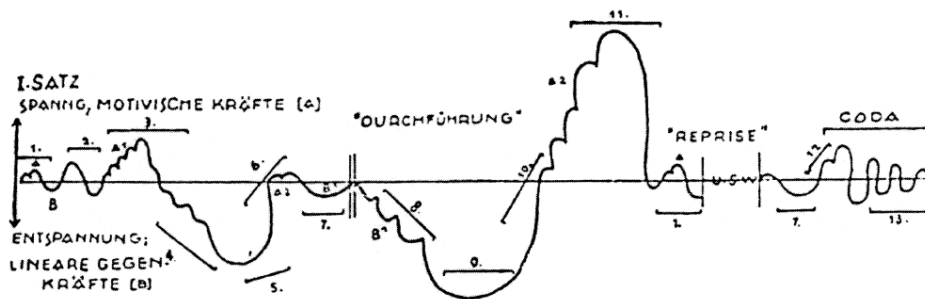
²⁷ Ibid.

²⁸ A dynamic profile or function allows a musical segment to be labeled as an embodiment of a physical motion. See Lee A Rothfarb, *Ernst Kurth as Theorist and Analyst*, (Philadelphia: University of Pennsylvania Press, 1988), p. 191.

²⁹ Rothfarb, “Energetics,” p. 943. These “waves” lie at the center of Kurth’s concept of form and his conceptualization of small and large musical events or processes. For more information on Kurth and his theories, see Rothfarb, “Ernst Kurth as Theorist and Analyst,” pp. 190-192.

Hans Mersmann's (1891-1971) work relates well to the study of energetics because his primary question involved musical forces and how they arise and develop.³⁰ His main goal was "to comprehend all phenomena of the artwork as an evolution of fundamental forces," and he explored this concept with the use of a visual aid – a graphic force-profile (see Figure 1.1).³¹ Kurt Westphal continued with this force-wave idea, incorporating multi-level structures and components to show how they relate on the large scale.³² Rothfarb concludes his chapter on energetics with the influence on and continuation of these ideas by later twentieth-century theorists.

Figure 1.1: Hans Mersmann's "Force-Profile" Graphic: Haydn, Sonata in E $\flat$ major, Hob. XVI: 49, 1st Movement³³



This brief overview of Rothfarb's survey on energetics has provided a context for Larson's "musical forces" model. As discussed below, Larson drew on several key concepts from the work of theorists explored above to derive a model that metaphorically describes motion in music.

The Study of Energetics in the Present Day: Steve Larson

While work within the energeticist tradition has been reviewed to extend as far back as the Ancient Greeks, the study of motion in music is still an endeavor of many

³⁰ Rothfarb, "Energetics," pp. 946-947.

³¹ Ibid., p. 947. This graphic representation essentially consists of an annotated pitch profile. See Figure 30.1 in Rothfarb, "Energetics," p. 947 for an example.

³² Ibid., p. 948.

³³ Ibid., p. 947.

scholars. Born in 1955, Steve Larson was a well-known music theorist, researcher, professor, and jazz pianist.³⁴ He attended the University of Oregon for his Bachelor's and Master's degrees before moving to the University of Michigan for his Doctorate in Music Theory.³⁵ Larson's research expertise covered several areas, including Schenkerian theory, performance and analysis, jazz, and music cognition.³⁶

Robert Hatten describes Larson's work on musical forces as "inspired by the work of Rudolf Arnheim, on visual perception and Douglas Hofstadter on analogy."³⁷ He adds that Larson's model "affect[s] our perception of both melody and rhythm, by analogy to our embodied (and cultural) understanding of music."³⁸ By utilizing three main metaphors of motion – gravity, inertia, and magnetism – which he combines with Schenkerian analysis (voice-leading graphs) to depict musical processes, Larson is able to describe tonal motion in a dynamic way. In presenting his model, he quantifies his work with the use of computer models and human cognition experiments in order support his concepts. Moreover, Larson's work is further qualified through notions, formations, and ideas of motion in music (through energetic metaphors) that we, as listeners, already use (for example, fall, descend, leap, etc.). As a result, Larson's model identifies musical processes as motion in music through the use of mapping metaphoric terms associated with the physical world to the realm of music. In doing so, he presents a structure that

³⁴ "Obituary: Larson, Steve," Corvallis Gazette-Times (Corvallis, OR, USA), 02 Aug 2011, Accessed 02 06 2014. <http://www.gazettetimes.com/news/local/obituaries/steve-larson/article_705f1118-bccc-11e0-9a96-001cc4c03286.html>

³⁵ Ibid.

³⁶ Ibid.

³⁷ Robert S Hatten, Foreword to *Musical Forces: Motion, Metaphor, and Meaning in Music*, *Musical Forces: Motion, Metaphor, and Meaning in Music*, by Steve Larson (Bloomington: Indiana University Press, 2012), p. ix. Larson himself wrote an article in 1993 describing the contributions of Rudolf Arnheim's work and how it relates to music theory. See Steve Larson, "On Rudolf Arnheim's Contributions to Music Theory," *Journal of Aesthetic Education* 27, no. 4 (Winter, 1993), pp. 97-104. This work will be summarized in the literature review, as well as explored in the methodology chapter.

³⁸ Hatten, Foreword to *Musical Forces*, p. ix.

accurately describes musical motion that listeners perceive in common-practice musical material. Larson's model, which is more fully explored in the literature review in Chapter 2, culminates with the publication of his book, entitled *Musical Forces: Motion, Metaphor, and Meaning in Music* (2012).³⁹

Larson's model is engaging because tonal music unfolds as a series of events with expectations linked to these events, and the use of metaphors allows us to capture motion more effectively in music. This thesis utilizes concepts and a theoretical framework that is indebted to the work of Larson to further the work of a metaphoric mapping of musical motion.

Repertoire Utilized

I have selected two piano concertos to serve as case studies to show some of the ways in which forces are treated through analysis: Wolfgang Amadeus Mozart's *Piano Concerto No. 20 in D minor, K. 466* (1785) and Robert Schumann's *Piano Concerto, op. 54 in A minor* (1841-5). Mozart's *Piano Concerto* was chosen specifically because it lends itself well to Larson's model with its Classical tonal harmony and formal structures, resulting in few instances where Larson's model must be adapted. With Schumann's *Piano Concerto*, I demonstrate how a shift in musical process occurs in the nineteenth century. By selecting a work from the Classical era and one from the Romantic era, a comparison of how forces overlap and diverge between works of different styles and eras is informative in the understanding of some of the processes and developments in tonal music.

³⁹ "Obituary: Larson, Steve," see also, Robert S Hatten, Foreword to *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. ix.

Thesis Outline

This chapter has situated Larson's research in the historical context of the energeticist school and has highlighted some of the influences that informed his work. Furthermore, I have provided a summary of the main objectives for this thesis. Chapter 2 surveys the pertinent literature in this area of research, beginning with sources directly related to Larson and his musical forces model. Chapter 3 focuses on the methodology and theoretical framework by presenting key concepts and terminology extracted from Larson's model. This methodology outlines how the analytical process works within this model. Furthermore, Chapter 3 expands on some concepts by refining and adding to the metaphors presented in Larson's work, as well as others. Chapter 4 provides an analysis of excerpts from Mozart's *Piano Concerto* and introduces a notational method for representing "musical forces." This chapter also highlights some of the ways in which our understanding of musical forces reflects certain aspects of the Classical style. Chapter 5 provides an analysis of excerpts from Schumann's *Piano Concerto* in a similar fashion to Mozart's work, and examines how the model works within an early-Romantic style. Chapter 6 synthesizes and compares the case studies, explores limitations of the model and potential for future research, and ends with concluding remarks.

Chapter 2 : LITERATURE REVIEW

While literature exists for the study of music and metaphors, musical space, and musical motion - particularly in the field of energetics - few scholars have specifically examined Larson's model. This may be attributed, in part, to how recent his most formative work has been published (2012). This literature review surveys both previous and current theories of musical motion.

I begin with an examination of primary sources that focus specifically on Larson's "musical forces" model.¹ Aside from Larson himself, and before 2012, few sources deal with his model. However, after Larson's death, *Music Theory Online* published a Festschrift in honour of Larson.² This special publication contributes a significant source of dialogue and criticism surrounding his model. The primary source section also includes a review of Larson's *Musical Forces: Motion, Metaphor, and Meaning in Music* (2012), along with writings by Matthew BaileyShea and Robert Hatten.³

After exploring the literature on Larson's model, I turn to secondary sources that examine the more general topic of musical motion. I divide these secondary sources into three distinct categories: (1) the exploration of models that are similar or relate to Larson's musical forces, (2) Schenkerian theory or voice-leading sources, and (3) approaches to style and genre. The first area discusses works by scholars who deal with both theoretical and historical perspectives on motion in music. For these sources, I turn primarily to Ernst Toch, Robert Erickson, and Ernst Kurth. I also refer to David Cohen's

¹ I am referring to Larson's work as the primary source material because his model is the main focus of this thesis.

² "Festschrift for Steve Larson," *Music Theory Online* 18, no. 3 (September 2012).
< <http://www.mtosmt.org/issues/mto.12.18.3/toc.18.3.html>>

article on directed motion in harmonic progressions, Bruno Repp's writing on Alexander Truslit, Lee Rothfarb's study of energeticists, as well as select writings by Mark Johnson, Fred Lerdahl, and Christopher Hasty. The second area relates to Schenkerian texts and is discussed briefly, given that Schenkerian theory is referenced frequently in Larson's writings. Since one of the goals for this thesis is to produce a similar graphic schema for the visual representation of musical forces, a review of the methodologies and writings about Schenkerian theory will prove beneficial. The third area, defined as approaches to style or genre presents a review of scholarly sources that discuss notions of era-specific tendencies and characteristics. These texts inform my comparison of both the Classical and Romantic style, and thus provide a foundation on which to represent my final expansion. Primary authors of this category include William Caplin, Charles Rosen, and Donald Tovey who address the Classical style, as well as Rey Longyear, Friedrich Blume, Kenneth Klaus, and Leonard Ratner who discuss the Romantic style.

Primary Sources

As the primary author surrounding the area of research explored in this thesis, Larson maintains a formative body of work in relation to musical forces. In this literature review, I present several sources as an overview of the work that has been done in the field, and comment on how it relates to my work. I limit the discussion of some sources since these concepts are explored more fully in the methodology chapter.

Larson first acknowledges that he was inspired by Rudolf Arnheim's work in Gestalt psychology within the visual arts.⁴ He believes that this work is transferable to

⁴ Gestalt psychology can allow for the perception and interaction of meaningful relationships between specific elements and a global perspective; it is based on relationships, and defines aspects of a whole. Steve Larson, "Musical Forces and Melodic Patterns," *Theory and Practice* 22/23 (1997-1998), accessed Nov 19, 2013, *Music Theory Society of New York State*, 56.

musical experience and thus he develops his model accordingly. He notes that his model has made a contribution to the study of Schenkerian theory and is supported by various algorithms and computer models.⁵ As early as 1993 and 1994, Larson presented initial concepts surrounding his model of musical motion, which were then published as part of proceedings for two conferences on cognition: *The Fifteenth Annual Conference of the Cognitive Science Society* (1993) in New Jersey, and *the Third International Conference on Music Perception and Cognition* (1994) in Belgium.⁶ He then wrote *Musical Forces and Melodic Patterns* (1997), which brings together his main ideas and initial concepts.⁷ As with his later work, this article focuses on examples of gravity, inertia, and magnetism drawn from the tonal repertoire. He argues that: “experienced listeners hear tonal music as purposeful action within a dynamic field of musical forces [that] links musical meaning with a conceptual metaphor.”⁸ As the title references, the article also presents lists of musical patterns that “give into” the model of musical forces. As a result, Larson maintains that “we hear tonal music as purposeful action within a dynamic field of musical forces [which] suggests a method of generating a well-defined set of patterns.”⁹ He concludes with a discussion of Schenkerian middleground and background structures and how they can also be interpreted as “giving in” to the musical forces. This last section of the article acts as a point of departure for the relationship between Schenkerian theory and musical forces.

⁵ Ibid., p. 56.

⁶ See Steve Larson, “Modeling Melodic Expectation: Using Three ‘Musical Forces’ to Predict Melodic Continuations,” in *Proceedings of the Fifteenth Annual Conference of the Cognitive Science Society* (1993) Hillsdale, NJ: Erlbaum: 629-634; and Steve Larson, “Musical Forces, Step Collections, Tonal Pitch Space, and Melodic Expectation,” in *Proceedings of the Third International Conference on Music Perception and Cognition* (1994), Liège, Belgium, pp. 227-229.

⁷ See Larson, “Musical Forces and Melodic Patterns,” pp. 55-71.

⁸ Ibid., p. 56.

⁹ Ibid., p. 67.

As an expansion of his model, Larson offers *Musical Forces, Melodic Expectation, and Jazz Melody* (2002), proposing musical forces as a tool to analyze musical processes in jazz repertoire.¹⁰ He once again briefly outlines his three main metaphors drawn from physical forces - gravity, magnetism, and inertia - which he then combines with Schenkerian analysis (voice-leading graphs) to describe musical processes. This expansion into the jazz repertoire shows that his model can be used within various genres. Applying the model to another genre resonates with my approach to musical forces to analyze works of Classical and Romantic styles. It also suggests the possibility of expanding the model to explain the shift of musical style through musical processes.

A year later, in 2003, Larson co-authored an article “‘Something in the Way She Moves’ – Metaphors of Musical Motion,” published in *Metaphor and Symbol*, with Mark Johnson.¹¹ In this article, they further discuss the link between conceptual metaphors as it relates to our understanding of musical motion. As the title suggests, they draw their primary example from the Beatles’ “Something.”¹² The conclusion of this article speaks to the potential musical meaning as a result of this metaphoric understanding.

In 2009, to further the quantitative support for his model, Larson co-wrote an article in *Music Perception* with Leigh Vanhandel on “Measuring Musical Forces,” in which they present how they tested hypotheses with experiments and discusses their

¹⁰ Steve Larson, “Musical Forces, Melodic Expectation, and Jazz Melody,” *Music Perception: An Interdisciplinary Journal* 19, no. 3 (Spring 2002), pp. 351-385.

¹¹ Mark Johnson and Steve Larson, “‘Something in the Way She Moves’ – Metaphors of Musical Motion,” *Metaphor and Symbol* 18, no. 2 (2003), pp. 63-84.

¹² George Harrison, “Something,” On *Abbey Road* [CD] (London: Apple).

implications on the model in relation to strength profiles.¹³ They also explore the relationship between Schenker's *Five Graphic Music Analyses* and test subjects' perception of the music, and describe the experimental parameters utilized. Furthermore, they provide a brief summary of the metaphors of gravity, magnetism, inertia, and stability and their historical developments, as well as the relationships between local versus global influences and the concept of a reference and goal alphabet. Since these notions of local versus global elements align with a Schenkerian approach, they will return in subsequent chapters of this thesis in relation to the musical force analyses of Mozart's and Schumann's works. Finally, the authors produce tables of stability, which reflect those of Lerdahl, Krumhansl, and Kessler.¹⁴ Three important conclusions can be drawn from this study. First, this study "provides clear evidence that musical inertia and musical gravity shape listener judgments of the strength of pattern completions."¹⁵ Secondly, "musical magnetism may be a factor in such judgments."¹⁶ And finally, "the absences of chromaticism in these patterns may limit the conclusions that can be drawn from [the] study."¹⁷ This last conclusion impacts directly my expansion of Larson's model in reference to the analysis of Schumann's work. Furthermore, as it relates to this thesis, the scope of the experimental work completed provides a quantitative foundation in which to base further analysis.¹⁸

Larson's pivotal text *Musical Forces: Motion, Metaphor, and Meaning in Music* (2012) synthesizes many of his ideas on musical forces, and includes an explanation of

¹³ Steve Larson and Leigh Vanhandel, "Measuring Musical Forces," *Music Perception: An Interdisciplinary Journal* 23, no. 2 (Dec. 2005), pp. 119-137.

¹⁴ Krumhansl and Kessler specialize in music cognition and perception.

¹⁵ Larson and Vanhandel, "Measuring Musical Forces," p. 133.

¹⁶ Ibid.

¹⁷ Ibid., p. 134.

¹⁸ A full survey of further experimental work would prove beneficial to this thesis; however, this falls beyond the scope of my research.

his model and applications of his model.¹⁹ As with most his other writings, Larson seeks to understand musical processes by transferring terms originally associated with physical motion to musical processes. These metaphors, which are formed from our experience in “actual motion,” are translated to the musical world.²⁰ The mapping of these concepts suggests that in the tonal repertoire, forces predominantly act in a logical or rational manner. Larson further incorporates the use of spatial reasoning to describe musical processes (musical forces).²¹ He asserts that we do not just understand music, but we experience music, and these forces - and possibly others - make it possible for one to communicate and discuss these events. In his text, he “clarif[ies] the roles of analogy, metaphor, grouping, pattern, hierarchy, and emergence in the explanation of musical meaning...” to present his model.²² I discuss the concepts within “musical forces” in more detail in the methodology section.

Reviewing Larson’s 2012 book, Arnie Cox highlights how Larson’s work in the field of motion in music can be associated with Viktor Zuckerkandl and aligns well with Mark Johnson’s writings.²³ Cox also traces Johnson’s influence as a precursor to Larson’s model, which uses paths and container schemas that later become utilized within the

¹⁹ Steve Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*. Bloomington: Indiana University Press, 2012.

²⁰ This is referred to as domain mapping, or using a metaphor through domain transfer. Here, the source domain is physical in terms of motion and the target domain is musical motion.

²¹ Spatial reasoning refers to the ability to internalize a notion of “space” and the relationships and context within that perceived space. It is the ability to rationalize and navigate the placement of objects within space, and visualize orientation; it is used primarily in the fields of computer science and psychology. [See Gardner Howard, *Multiple Intelligences: New Horizons*, (New York: Basic Books, 2006).]

²² “Musical Forces,” Indiana University Press, accessed Nov 13 2013 < http://www.iupress.indiana.edu/product_info.php?products_id=783952 >

²³ Arnie Cox, review of *Musical Forces: Motion, Metaphor, and Meaning in Music*, by Steve Larson, *Music Theory Online* 19, no. 1 (March 2013). Accessed January 8, 2014. < <http://mtosmt.org/issues/mt0.13.19.1/mt0.13.19.1.cox.php> >. Viktor Zuckerkandl (1896-1965) was a musicologist who studied music perception, and Mark Johnson (b. 1949) is a philosopher known for his work with metaphors, embodiment, and cognition.

perception or cognitive experience of music.²⁴ Moreover, this book review serves as a starting point to identify potential improvements to the model in order to facilitate better comprehension and applicability. First, Cox observes that Larson only addresses horizontal motion, and does not mention a “vertical” dimension in relation to his model.²⁵ A secondary critique can be captured through the question of “is musical experience not already embodied in some relevant way prior to metaphoric conceptualization?”²⁶ Thirdly, Larson applies his model to a strictly tonal repertoire.²⁷ Cox also comments on Larson’s main premise that listeners experience music by giving into the forces of gravity, inertia, and magnetism, and that this premise is not supported by the examples presented.²⁸ For the purposes of my study, his perspective on and critique of Larson’s model provides a beneficial starting point for further explorations of musical forces.

The Festschrift includes Larson’s “Schenkerian Analysis: Pattern, Form, and Expressive Meaning,” an unpublished chapter from a textbook whose goal was to aid students in the study of Schenkerian analysis through musical forces.²⁹ The topics planned for the textbook included tonal forms, chromaticism, jazz, and world music.³⁰ Since the book remains unpublished, the first chapter suggests that Larson was still in the process of working on his model to further incorporate musical forces with aspects of

²⁴ Cox, Review of *Musical Forces: Motion, Metaphor, and Meaning in Music*, paragraph 1.

²⁵ Perhaps Cox is referring to the more melodic applications of Larson’s model versus more harmonic treatments.

²⁶ Ibid., paragraph 8.

²⁷ Ibid.

²⁸ Ibid., paragraph 13.

²⁹ Steve Larson, “Expressive Meaning and Musical Structure, Chapter 1 of *Schenkerian Analysis: Pattern, Form, and Expressive Meaning*,” *Music Theory Online* 18, no. 3 (Sept. 2012), accessed February 11, 2014. < <http://mtosmt.org/issues/mto.12.18.3/mto.12.18.3.larson.php> >

³⁰ Henry Martin, Stephen Rodgers, and Keith Waters, Editor’s Note to “Expressive Meaning and Musical Structure.”

Schenkerian theory. A preface note from the editors of the Festschrift also suggests that Larson was seeking to expand his model to other repertoire:

Larson uses analyses of the Beatles' *Michelle* and Schumann's *Wenn ich in deine Augen seh* to explore how expressive meaning in music relies on relations between musical structure and its embellishments, and in the process offers a succinct overview of "strict use" and the idea of musical forces.³¹

Thus, this article provides insights into Larson's future research on musical forces, and how it could potentially be used for the instruction of Schenkerian analysis.

Theorist Matthew BaileyShea explores the "push versus pull" function inherent in Larson's model, in conjunction with the notion of "agency."³² He draws on "energetic" scholars and Robert Hatten's work to analyze Mahler - examples are primarily drawn from *Nun will die Sonn' so hell aufgeh'n* - to expand Larson's model by proposing new categories of movement, such as sentient agents, non-sentient agents, and field forces.³³ Furthermore, he focuses on the interpretation of music through Larson's model and concludes:

What I'm advocating, then, is an analytical process where decisions about agency and musical forces are foregrounded, with an explicit recognition of how those decisions might activate or alter a host of larger issues concerning narrative and musical meaning.³⁴

³¹ Ibid.

³² The concept of agency refers to "agents" (in BaileyShea's case – sentient agents), which move or defy the forces themselves; they act upon the processes altering the "natural" course of events. See Matthew L. BaileyShea, "Musical Forces and Interpretation: Some Thoughts on a Measure in Mahler," *Music Theory Online* 18, no. 3 (Sept. 2012), paragraph's 1, 3, and 4.

³³ For BaileyShea, we hear sentient agents when we experience musical events as the result of a willed effort of some agent acting upon the music (BaileyShea, paragraph 10). Furthermore, non-sentient agents are unpredictable and are interpreted as having no willful intentions (BaileyShea, paragraph 11). Lastly, "field forces" refers to Hatten's term that includes Larson's main concept, but allows for others. For more information on "energetic scholars," see Lee Rothfarb, "Energetics," in *The Cambridge History of Western Music Theory*, ed. Thomas Christensen (Cambridge: Cambridge University Press, 2002), pp. 927-55, and Yonatan Malin, "Metric Analysis and the Metaphor of Energy: A Way into Selected Songs," *Music Theory Spectrum* 30, no. 1 (2008), pp. 61-88.

³⁴ BaileyShea, "Musical Forces and Interpretation," paragraph 8.

BaileyShea is thus concerned with the classification of the agents that move the musical forces. He focuses on primarily the manner in which we combine sentient and non-sentient notions of agency within a push versus pull dynamic to interpret and ascribe a narrative to a given piece. His work informs Larson's model further by offering a new perspective on the simplifications that can be made, mainly that of reducing musical forces to the dichotomy of push and pull. In this regard, we can conclude that BaileyShea uses Larson's ideas of musical forces in a different manner, which produces further insights into narrative possibilities.³⁵

The last primary source examined here features the work of Robert Hatten on the expansion of musical forces through the concept of "agential energies."³⁶ Mainly drawing on the ideas of agents, momentum, friction, and repulsion, he proposes new concepts to refine the musical forces model. In addition, he introduces the concept of initiatory energy.³⁷ Hatten includes examples to show how Larson's musical forces function and concludes with the question: Could the theory be further extended to atonal music? Inquiries such as this may be answered through the incorporation of other theoretical models. Hatten provides a strong foundation for the expansion of Larson's model; however, perhaps this expansion should not be limited to new terminology, but also include how it could be used in conjunction with other theories.

³⁵ Although explored here, BaileyShea's work only contextually informs this thesis. His insightful ideas on push and pull do not contribute to the expansion of Larson's theory of musical forces. I, however, utilize the terms push and pull in a general manner as a means to describe the movement of the forces named by Larson.

³⁶ "Agential energies" refers to operations that cannot be accounted for within the field forces (musical forces) scheme, and is musical gestures or motion that has a source in a presumed agent. Examples of this for Hatten include initiatory energy, where an agent must act to move the music from a state of stasis. See Hatten, "Musical Forces and Agential Energies," paragraphs 5, 6, 9, and 12.

³⁷ According to Hatten, "initiator energy" is the force that needs to exist in order to act on the first pitch for it to overcome stasis (Hatten, "Musical Forces and Agential Energies," paragraph 5).

As discussed through the literature review above, a substantial body of work provides a context for Larson's theory of musical forces. These works comprise primary source material on which to further explore, apply, and expand Larson's model.

Secondary Sources

My survey of secondary sources reviews briefly the historical context associated with Larson's model, as well as other theoretical methods that can contribute to the expansion of Larson's concepts or model. I divide the secondary sources into three distinct categories: (1) the exploration of models that relate to Larson's musical forces, (2) Schenkerian theory or voice-leading sources, and (3) approaches to style and genre.

The sources utilized in the first category are extracted from a variety of disciplines. Mark Johnson and Janna Saslaw's work on metaphors give insight into the concepts of embodiment. Other energeticists such as Toch, Erickson, and Kurth are included for contextualization. Furthermore, Christopher Hasty's writings on meter and rhythm are also discussed since they align well with my research, especially his approach to process, continuity, and projection through music. Additionally, an examination of tonal pitch space and generative theory through the writings of Fred Lerdahl and Ray Jackendoff provides a context within which Larson's forces operate. The work of these latter theorists relates well to musical forces because it includes musical expectation, melodic "rules," and procedures, and to some extent a general understanding of music as an organic (force-driven) experience. These scholars also provide a context through which Larson's work can be expanded and refined.

Second, the theories of Heinrich Schenker are widely referenced within the discussion surrounding musical forces – mainly by Larson himself. Accordingly, a review

of general Schenkerian texts is beneficial in terms of outlining the tools necessary to discuss concepts, such as local versus global events, fundamental lines, and hierarchal structures. Schenkerian theory is also useful in providing a graphic representation for the analyses and serves as a model for the graphic representation of musical forces.

Lastly, an overview of the sources consulted in terms of musical style of both the Classical and Romantic eras is presented. The primary authors dealing with the Classical style include Caplin, Rosen, and Tovey. Longyear, Blume, Klaus, and Ratner are referenced for the Romantic style. Since a portion of my analysis is dedicated to the expansion and application of a metaphoric force model from one era to another, it is crucial that my comparison be contextually rooted to highlight what constitutes these styles and their development.

(1) Exploration of Other Theoretical Models

Historical Context

Historical context is crucial in understanding the foundations on which Larson's model was conceived. Two main sources provide an introduction to the literature surrounding the history of motion in music: Rothfarb and Cohen. Lee Rothfarb's chapter on energetics in *The Cambridge History of Western Music Theory* serves as an excellent source for the history of motion in music.³⁸ Rothfarb orientates the reader as to what constitutes a force within musical thought throughout musical history.

David Cohen's article on harmonic progression, directed motion, and Aristotelian physics explores early theoretical views of motion within music, particularly from the

³⁸ Rothfarb, "Energetics," pp. 927-955.

time of Aristotle circa 384 BCE to Rameau's *Traité de l'harmonie* of 1722.³⁹ He discusses the Aristotelian logic of motion as change and how this relates to the practice of music. Cohen primarily utilizes the concept of motion within a harmonic progression in relation to the resolution of dissonance and consonance. He is also concerned with the concept of goal-orientated motion known as "directed motion" and how the overall musical motion is described and defined in several medieval treatises, in particular the work of Marchetto of Padua's *Lucidarium* of 1317/18.⁴⁰ Cohen also references works by Jacques de Liège, Ugolino of Orvieto, Gioseffo Zarlino, and Jean-Phillipe Rameau.

Musical Meaning, Metaphor, and Embodiment

Sources dealing with musical meaning, metaphor, and embodiment are referenced in Larson's work a number of times, and are foundational texts behind the reasoning, comprehension, and application of mapping real-world forces to musical processes. The work of Victor Zuckerkandl, Mark Johnson, and Janna Saslaw are discussed below in reference to a theory of musical forces.

In 1956, Zuckerkandl presented a study on the representation of sound and symbols in music.⁴¹ In this early book, Zuckerkandl notes a link in the perception of music and a "space," which in turn creates musical meaning. From this source, three main arguments are important for my research: (1) "the exploration of the paradox of tonal motion," which informs my conception of musical motion, (2) the question of "is space audible?" which addresses notions of metaphor and force realization, and (3) "space as place and space as force," which constitutes defining a musical landscape in

³⁹ David E. Cohen, "The Imperfect Seeks Its Perfection: Harmonic Progression, Directed Motion, and Aristotelian Physics," *Music Theory Spectrum* 23, no. 2 (Fall 2001), pp. 139-169.

⁴⁰ Ibid., p.149.

⁴¹ Victor Zuckerkandl, *Sound and Symbol: Music and the External World*, translated by Willard R. Trask (Princeton, NJ: Princeton University Press, 1956).

which forces or processes operate.⁴² These observations have direct implications on the meaning and understanding of musical processes, especially as they relate to my conceptions of musical space, motion, and forces in relation to Larson's model.

Embodiment and metaphor are the primary areas of research for both Mark Johnson and Janna Saslaw. In Johnson's *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (1987), he proposes ideas on incorporating metaphors and cognition as embodiment.⁴³ This text expands on relationships derived from experience. Johnson uses embodied reasoning (like spatial reasoning) to explain our interpretation of events. As highlighted by Johnson, Saslaw elaborates further on these concepts in "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the Conceptualization of Music" (1996).⁴⁴ Saslaw's primary focus is to discuss the role of image schemas and abstract structures within music. She draws mainly on the research and work of Lakhoff and Johnson for metaphor, image structures, and representations. Saslaw is concerned with the image schemas that reflect "orientation in, and relationship to the work, including link, force, path, source-path-goal, and near-far."⁴⁵ She works on the relationships between the internal structures of image schemas and the reasoning behind their structure. Furthermore, Saslaw explores the concepts of domain mapping and the importance of metaphoric mappings based on our experience.⁴⁶ Here, she cites neurobiologist Gerald Edelman who supports Lakoff and Johnson in regards to

⁴² See Zuckerkandl, *Sound and Symbol*, pp. 75-87, 271-281, 336-348.

⁴³ Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: University of Chicago Press, 1987).

⁴⁴ Janna K. Saslaw, "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the Conceptualization of Music," *Journal of Music Theory* 40, no. 2 (1996), pp. 217-243.

⁴⁵ *Ibid.*, p. 218.

⁴⁶ *Ibid.*, pp. 220-221.

embodiment being supported by biological factors.⁴⁷ As a case study for her article, Saslaw utilizes the work of theorist Hugo Riemann's *Systematic Study of Modulation as a Foundation for the Study of Musical Form* (1887) as an example of near-far schemas and source-path-goal conceptual schemas. She concludes that the implications for embodiment throughout music are profound, and many musical structures and models result from a "metaphoric projection from one or more body-derived image schemas."⁴⁸

Other Scholars

Although the musical forces model that is developed through my expansions are mainly influenced by the writings of Larson, Hatten, BaileyShea, and Hasty, other scholars contributed concepts and ideas that shaped my understanding of musical motion, in particular Toch, Erickson, and Kurth. The work of these three authors, all of whom belong to the energetics tradition, are discussed briefly in the following paragraphs.

Ernst Toch

Although an early work, Ernst Toch's *The Shaping Forces in Music: An Inquiry into the Nature of Harmony, Melody, Counterpoint, and Form* (1948) offers insight on fundamental ideas for the process of music.⁴⁹ Toch briefly discusses the role of metaphor as it relates to the musical manifestations of "natural" phenomenon. His text lacks the well-defined parameters and cognitive experiments that are common in the recent work of Larson, but Toch utilizes musical rhetoric to discuss what he perceives to be forces acting within music and produces many examples. His chapter five focuses on what he titles "the wave line," an aspect, and perhaps even a characteristic, of melodies. Toch also

⁴⁷ Ibid., p. 221.

⁴⁸ Ibid., p. 236.

⁴⁹ Ernst Toch, *The Shaping Forces in Music: An inquiry into the Nature of Harmony, Melody, Counterpoint, and Form* (New York: Criterion, 1948).

discusses the notion of “melodic elasticity” and “the wind-up.”⁵⁰ More specifically, he explores his conceptualization of “the wave line” and describes it as “... a combination of ascending and descending scale-segments... frequent shape with it’s [its] ‘ups and downs’ not [only] confined to stepwise motion but showing a variety of intervals.”⁵¹ Toch also identifies another metaphoric concept as melodic elasticity.⁵² Defined as the tendency for small steps in one direction to be followed by a leap in the other direction, and conversely a large leap in one direction to be followed by small steps in the opposite.⁵³ He further presents another “shaping force” as the “wind-up.”⁵⁴ This is formed as a result of a “preparatory figure comparable to the motion we may make when getting ready for a throw” that is followed by a “throw or jump.”⁵⁵ A final useful term used by Toch is that of the “encircling approach.”⁵⁶ This encircling is defined as “...when both low and high neighboring pitches, independent of their order, are used for appoggiaturas and thus form an *encircling approach* to the harmonic main tone before hitting it.”⁵⁷ Thus, it is evident that Toch focuses on the physical perception and embodiment of “shaping forces” within musical processes. His metaphoric approach intersects with Larson’s in many ways through concepts, such as the wave line, melodic

⁵⁰ Ibid. Ernst Toch was an Austrian composer, pianist, and teacher. See Anja Oechsler, “Ernst Toch,” *Grove Music Online, Oxford Music Online*, Oxford University Press <<http://www.oxfordmusiconline.com/article/grove/music/28037>>. Note that wave line and encircling have direct implications on my conception of wave and orbit as non-force metaphors to be incorporated into the model. “Shaping Forces” can be directly related to the concept of “musical forces” proposed by Larson; however, in his investigation, Toch does not deal with forces in a way that we would conceive of them (as the process that produces musical processes). Rather, he describes only the musical processes themselves through metaphors mapped from a physical or observable perspective, but not necessarily in the context of a physical phenomenon or motion.

⁵¹ Toch, p. 78.

⁵² Ibid., p. 86.

⁵³ Ibid.

⁵⁴ Ibid., p. 95.

⁵⁵ Ibid.

⁵⁶ Ibid., p. 118.

⁵⁷ Ibid.

elasticity, wind-up, and encircling. In my methodology, I will revisit his wave line and encircling to expand and define my concepts of wave and orbit.

Robert Erickson

Robert Erickson (1917-1997), another prominent figure in the field of energetics, receives no mention in Larson's work.⁵⁸ This is surprising since Erickson's book, *The Structure of Music: A Listener's Guide* (1955), proposes a concept that is of great importance to Larson: "musical gravity."⁵⁹ Erickson introduces this term, among others, decades before Larson, and discusses the purposeful nature of music and its goals.⁶⁰ In his section on musical gravity, Erickson begins with Newton's law of "everything that goes up has to come down" and relates it back to music.⁶¹ He summarizes well his concept of gravity in the following:

Put musically, movement upward is felt as strain, tension, lifting against a downward pull. Phrases push upward to a high point, then move downward to a lower point of relative relaxation and rest. Remember, a melodic line is analogous to a moving body...We project our feeling for and about physical motion upon the melodic line.⁶²

From the above excerpt, we can identify several aspects that align well with the theory of musical forces as understood by Larson and other contemporaries. First, similarities exist with BaileyShea's push and pull dichotomy. Second, we can hypothesize that the "lower point of relative relaxation" could be re-termed as stability. Third, embodiment plays a central role within Erickson's work, as with Larson and

⁵⁸ Erickson was an American composer and teacher (Charles Shere, "Erickson, Robert," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed January 24, 2015 <<http://www.oxfordmusiconline.com/article/grove/music/A2249475>>).

⁵⁹ Robert Erickson, *The Structure of Music: A Listener's Guide* (Connecticut Greenwood Press, 1955): p. 27.

⁶⁰ Ibid., p. 27.

⁶¹ Ibid., p. 28.

⁶² Ibid.

others. Erickson also discusses additional concepts, such as “taking off points,”⁶³ “wind-up,”⁶⁴ and momentum.⁶⁵ Although I will not directly include Erickson’s work in my study, it is remarkable that the concepts of musical gravity and embodiment find themselves in such an early work (1955).

Ernst Kurth

Ernst Kurth (1886-1946) is recognized as one of the first researchers in the tradition of the “energetics school.”⁶⁶ In his 1988 work on Kurth, Lee Rothfarb discusses many aspects of Kurth’s theoretical conceptions, in particular Kurth’s notion of “energetic harmony.”⁶⁷ As a summary of such ideas, and as it relates to Larson’s later work, Kurth “speaks of an attraction between tones,” which he characterizes as a “gravitational force.”⁶⁸ The result is “cohesion” among energy-laden tones momentarily “caught” in chords, which represents an “equilibrium of forces.”⁶⁹ Furthermore, Kurth incorporates the notion of hierarchal wave structures (dynamic waves), such as “constituent waves” and “developmental waves” into a conceptualization of larger formal process.⁷⁰ “Constituent waves” are the localized events, which contribute to the larger process termed “developmental waves” (for example phrases and larger formal events).⁷¹ As a result, Kurth’s ideas from the early-twentieth century contribute to the conceptualization of forces through the motion of energies and dynamic waves.

⁶³ Ibid., p. 32.

⁶⁴ Ibid., p. 30. This is similar to the concept explored by Toch.

⁶⁵ Ibid.

⁶⁶ Kurt von Fischer, "Kurth, Ernst," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed January 24, 2015, <<http://www.oxfordmusiconline.com/article/grove/music/15696>>

⁶⁷ Lee Rothfarb, *Ernst Kurth as Theorist and Analyst* (Philadelphia: University of Pennsylvania Press, 1988), pp. 167-189.

⁶⁸ Rothfarb, “Energetics,” p. 941.

⁶⁹ Ibid.

⁷⁰ Rothfarb, *Ernst Kurth as Theorist and Analyst*, p. 191.

⁷¹ Ibid.

Christopher Hasty

Christopher Hasty's research aligns with this thesis by presenting a model that can be applied to Larson's work to describe the process of musical forces. In his book *Meter as Rhythm*, Hasty approaches rhythm as an experience and argues that it is through rhythm that we experience meter as a process that can be predicted.⁷² He identifies this process as a projection, which can be mapped through potentials and realizations. He also discusses the role of hierarchal levels and musical experiences as they relate to his projections. For the purposes of this thesis, chapters, such as discontinuity of number and continuity of tonal "motion," preliminary definition for the model, meter as a projection, and challenges interpreting meter as process, are most useful. These topics highlight several ways in which Hasty's model can be adapted to support Larson's musical forces, mostly for the description of the process of these musical events.

To summarize, I draw from the work of Hatten, BaileyShea, and Hasty for the development of my expansions within the model of musical forces. Notions of friction, momentum, repulsion, push versus pull, and projection have all influenced my conception of motion in music. Furthermore, the brief historical survey on Toch, Erickson, and Kurth has provided me with a context for my expansions of the model.

(2) Schenkerian Theory and Voice-Leading Sources

Heinrich Schenker wrote various treatises on harmony, voice leading, and form. Although Schenkerian analysis is not of primary focus for this thesis, I draw on his method of voice-leading analysis and his understandings of hierarchal musical relationships. Introductory texts by Allen Cadwallader and David Gagné, Felix Salzer,

⁷² Christopher Francis Hasty, *Meter as Rhythm* (New York: Oxford University Press, 1997).

and Wallace Berry provide a general understanding of Schenkerian concepts. In particular, fundamental lines, structural functions, and tonal coherence, to name a few, align well with Larson's model. As Larson argues: "Schenkerian backgrounds constitute another well-defined class of patterns. All the Schenkerian backgrounds give into music forces."⁷³ Schenkerian analysis also offers tools to graphically represent and visually communicate a model of musical forces. Thus, the Schenkerian tools will be combined with Larson's concept of "musical forces" to analyze tonal repertoire.

(3) Style and Genre Sources

The third area of this literature review briefly explores the writing of various scholars to identify principal stylistic characteristics of the Classical and Romantic eras. William Caplin's book *Classical Form: A Theory of Formal Functions for the Instrumental Music of Haydn, Mozart, and Beethoven* serves as the primary source for discussing *general* formal functions and harmony within the Classical repertoire.⁷⁴ His insight provides this thesis with definitions of "tight-knit" themes, phrases (sentence or period), and other formal considerations of the Classical style. These ideas are useful when attempting to characterize a musical force as operating within the period style. In addition to Caplin, Charles Rosen's book *The Classical Style: Haydn, Mozart, Beethoven* contributes an overview of the Classical style in terms of harmonic language and genre development.⁷⁵ This text also includes a chapter on the Classical concerto which has great relevance here, given that the case studies are concertos. Lastly, although acknowledging the dated nature of the source, Donald Francis Tovey's chapter on the

⁷³ Larson, "Musical Forces and Melodic Patterns," p. 66.

⁷⁴ William E. Caplin, *Classical Form: A Theory of Formal Functions for the Instrumental Music of Haydn, Mozart, and Beethoven* (New York: Oxford University Press, 2000).

⁷⁵ Charles Rosen, *The Classical Style: Haydn, Mozart, Beethoven* (New York: W.W. Norton & Company, 1972).

Classical concerto includes useful information on the development of the concerto in terms of musical content and form throughout the era and beyond – even including Romantic repertoire, such as Schumann’s *Concerto*.⁷⁶

Many sources discuss characteristics of the Romantic style from a historical perspective, cultural significance, and with biographical information; however, this more musicological approach – although contextually informative – lacks material to define a Romantic style per se. Four main texts describe a musical style of the Romantic era. First, and perhaps most pertinent to this thesis, Rey Longyear’s *Nineteenth-Century Romanticism in Music* (1973) not only discusses style attributes to the era, but also formal considerations, composer influence, and ideology (nationalism, absolute music, romanticism, etc.). I mainly draw content from his second chapter as it pertains to elements of the Romantic style, which provide an overview of musical tendencies of the era.⁷⁷ Friedrich Blume’s book is particularly useful in terms of differentiating between the Classical and Romantic styles, and the evolution therein, and also provides (similarly to Longyear) descriptors of common musical elements found within the Romantic repertoire.⁷⁸ Kenneth Klaus’s work largely discusses the tendencies of composers, whether nationalistic, philosophical, etc., and how a variety of musical genres (keyboard, chamber, vocal, and orchestral) relay these tendencies. Additionally, he also discusses musical features, such as melody, harmony, counterpoint and form, within nineteenth-century music. Lastly, Leonard Ratner’s *Romantic Music: Sound and Syntax* (1992)

⁷⁶ Donald F. Tovey, *Essays in Musical Analysis: Volume 3, Concertos* (London, Oxford University Press, 1935).

⁷⁷ Rey Longyear, *Nineteenth-Century Romanticism in Music*, second edition (New Jersey: Prentice-Hall Inc., 1973), pp. 18-42.

⁷⁸ Friedrich Blume, *Classic and Romantic Music: A Comprehensive Survey* (New York: W.W. Norton & Company Inc., 1970).

describes well the tonal context (be it tone colour, texture, structure, or form) in which Romantic music operates.⁷⁹ This source, although informative, proves to be either very broad in scope, or case specific in its conclusions. Thus, the Romantic style sources offer varying perspectives on the musical content and context of the nineteenth century.

In addition to literature discussing the style of the Classical and Romantic eras, I also draw from three texts that deal with the concerto: Michael Roeder's *A History of the Concerto*, Abraham Venius's *The Concerto*, and David Grayson's *Mozart Piano Concertos Nos. 20 and 21*.⁸⁰ Roeder's book describes form from the Baroque era to the twentieth century, often discussing the genre outside of the Austro-German tradition. He speaks to the emergence of the Classical concerto, as well as specifically its development at the hands of Mozart. Roeder also devotes a portion of this work to the Romantic concerto and prominent composers, such as Schumann. Venius describes the genre in more era-general terms providing several examples. Lastly, David Grayson has also written about the Classical concerto, and more specifically Mozart's *Piano Concertos Nos. 20 and 21*, of which I utilize No. 20 as a case study. This concise book explores each of the movements in detail and provides tables of themes and other supplemental analyses that offer a foundation for my work.

Conclusion

This literature review has examined several key sources relevant for my research. As highlighted above, Larson's work serves as the primary source for my thesis, which includes an application and expansion of his model. However, my research also includes

⁷⁹ Leonard G Ratner, *Romantic Music: Sound and Syntax* (Toronto: Schirmer Books, Macmillan Publishing Company, 1992).

⁸⁰ Michael T. Roeder, *A History of the Concerto* (Portland: Amadeus Press, 1994); Abraham Venius, *The Concerto* (New York: Dover Publications, 1944); David Grayson, *Mozart Concertos Nos. 20 and 21* (Cambridge: Cambridge University Press, 1998).

sources not directly related to Larson's model, such as studies in Schenkerian analysis, metaphor and embodiment, as well as those of theorists, such as Hatten, BaileyShea, Toch, Erickson, Kurth, and Hasty. I also draw from the writings of Caplin, Rosen, Tovey, Longyear, Blume, Klaus, and Ratner for stylistic characteristics of the Classical and Romantic styles.

Chapter 3 : METHODOLOGY

Introduction

As discussed in Chapters 1 and 2, Larson's model on musical forces serves as the primary source for my study. Thus far, I have contextualized Larson's work within the scholarly work in the field of energetics and have drawn on select sources as the inspiration for the expansion of his model. In this chapter, I examine more thoroughly this literature and introduce other metaphors since the latter will be crucial in my comparison of motion in two case studies.

I begin with a discussion of the theoretical framework surrounding the use of the "musical forces" model. Next, I focus on the role of metaphors within music, followed by the importance of musical reference and goal alphabets. Drawing on Larson's writings, I then present his main metaphors for "musical forces." These main metaphors consist of gravity (melodic and rhythmic), magnetism (melodic and rhythmic), and inertia. I then examine the dialogue between Hatten and Larson in the literature,¹ and ideas of projection that Hasty's model can contribute. Next, I propose expansions to the model; here I explore concepts such as repulsion, friction, wave, oscillation, orbit, and momentum. Lastly, I note analytical considerations including layout and labeling conventions to be employed in the score analyses. I conclude with final thoughts and considerations before proceeding to my analysis.

¹ Although I recognize that other areas of inquiry relate to this model, such as cross-domain mapping, metaphors, and cognitive psychology, these topics will not be discussed due to the limited scope of this project. Furthermore, they do not directly contribute to the practical and theoretical implications of this thesis.

Theoretical Framework

Although I was fascinated by Larson's three main metaphors in my preliminary research, I quickly realized that musical force metaphors could not be limited to three concepts if the model was to be applied to complete works and different repertoires.² Thus, the need for expansion was evident. As a result, in keeping with the traditions of musical energetics, as set out in Chapter 1, and continuing the rationale that Larson employed in his work, I set out to describe and attribute specific musical processes and motion through metaphors taken from the physical world.

The musical forces proposed by Larson work well on traditional tonal works with "tight-knit"³ formal organization, such as those of the classical repertoire (for example, Haydn, Clementi, and Mozart). However, how would we utilize this model to accommodate the shift of musical style, for example, from the eighteenth to the nineteenth century? In other words, how would we use this model for works with extended chromaticism and "looser"⁴ formal organizations, concepts that are generally associated with Romanticism? Is there a way to expand the model to accommodate this change? Moreover, is this change a necessity? Furthermore, how would we graphically represent metaphors in the analysis of different works?

Larson's Model

The metaphor of "musical forces" was inspired by Rudolf Arnheim's application of Gestalt psychology to the experience of art; has illuminated aspects of Schenkerian theory; has been quantified in

² Even Larson does not claim that his work is exhaustive. See Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music* (Bloomington: Indiana University Press, 2012), p. 320.

³ Largely grouped as sentence, period, or hybrid forms, tight-knit themes are formal groupings of a musical process that are largely symmetrical and identifiable through smaller subgroupings and elements. See William E. Caplin, *Classical Form: A Theory of Formal Functions for the Instrumental Music of Haydn, Mozart, and Beethoven* (New York: Oxford University Press, 2000), pp. 36-70.

⁴ Ibid.

various algorithms, some of which have been implemented as computer models; has improved the pedagogy of aural skills, counterpoint, and harmony; has been used in the analysis of pieces by Chopin, Brahms, and Varese; and has helped to explain the phenomenon of “swing” in jazz.⁵

For all Larson has contributed to musical thought, one aspect is abundantly clear in his writings: music *is* motion.⁶ The above excerpt supports the notion that his model of “musical forces” has aided in the understanding and comprehension of music as a series of forces that interact with each other in specific quantifiable ways.

Motion and physical metaphors are prevalent in how we discuss and interact with music. There are countless examples in the ways in which we describe music in this manner. The terms *accelerando*, *morendo*, and *peseante*, and theoretical discussions of *leaps*, *passing tones*, and *scalar descents*, all rely on the concept of motion when explained in the classroom. For example, when teaching the process or concept of *accelerando*, we must include in our description a reference to speed and the rate of movement, that is, tempo. When tempo is introduced, we are already interpreting music in terms of motion. Tempo could be considered as the distance travelled within music over time (which correlates with the formula used for calculating speed). Tempo, then, is the progressing motion of the music in terms of its speed, and *accelerando*, as the root implies, is the acceleration of the tempo, or the motion getting faster. Further examples of motion in music can be drawn from voice-leading concepts which also rely on motion, as they are tied to similar, contrary, and oblique *motion*. As such, we can observe that Larson’s model explores the dynamic way in which we are exposed to and experience

⁵ Larson, “Musical Forces and Melodic Patterns,” *Theory and Practice* 22/23 (1997-1998), p. 56.

⁶ *Ibid.*, p. 57.

music, and thus presents us with a vocabulary that reflects these inherent motions within music.

The Role of Metaphors

The following discussion of the term metaphor is pertinent to my study because of its direct implication in the conceptualization of musical “forces,” and how we define them.⁷ In his writings, Larson meticulously describes his use of the term metaphor.⁸ Fundamentally for Larson, when describing metaphor, he

mean[s] that conceptual process described by George Lakoff and Mark Johnson (1980, 1999) in which we understand one kind of thing (from a “target domain”) in terms of some other kind of thing (the “source domain”). Metaphors are thus “cross-domain mappings.”⁹

In conceptualizing metaphors in this way, we can project that in the “musical forces” model, the “target domain” is music itself and the “source domain” is physical action and physical forces that we can apply to the music.¹⁰ Arnie Cox summarizes this definition into a graphic presented below in Figure 3.1. Larson is also concerned with conceptual metaphors instead of the classical metaphor device. These two concepts are important and relevant to him as he maintains that “philosophers, historians, and theorists have written with great insight on the central role of metaphor in music” and that “others have explicitly called the theory of conceptual metaphor to illuminate the theory of

⁷ An excellent and insightful resource on the history of conceptual metaphors can be found in Richard Trim, *Metaphor and the Historical Evolution of Conceptual Mapping* (New York: Palgrave Macmillan, 2011).

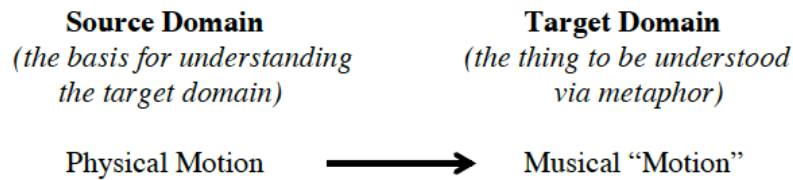
⁸ For further writings on the role of metaphors within music, see Hallgjerd Aksnes, “A Cognitive Approach to Musical Analysis: Metaphorical Projection in Music,” *Proceedings of the Third Triennial ESCOM Conference in Uppsala, Sweden* (Uppsala University, 1997), pp. 551-556; Arnie Cox, “Metaphors in Musical Discourse,” Paper presented at the West Coast Conference on Music Theory and Analysis, Santa Barbara, CA, 1997; Donald Ferguson, *Music as Metaphor: The Elements of Expression* (Minneapolis: University of Minnesota Press, 1960); Marion Guck, “Two Types of Metaphoric Transfer,” in *Metaphor: A Musical Dimension*, edited by Jamie C. Kassler, 1-12 (Sydney: Currency, 1991); Andrew Mead, “Physiological Metaphors and Musical Understanding,” *Journal of Music Theory* 43 no. 1 (1999), pp. 1-19.

⁹ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 20.

¹⁰ Larson, “Musical Forces and Melodic Patterns,” p. 56.

analysis of music.”¹¹ He is concerned with the ways in which we, as musicians and listeners, interact with metaphors as a tool.¹²

Figure 3.1: Source Domain to Target Domain Mapping¹³



Furthermore, Johnson and Larson (2003) present a more detailed version of how they conceive metaphors by exploring and comparing music and physical motion. They conclude that metaphorical logic arises from the way we, as listeners, map musical motion as analogous to our experience within the spatial logic of physical motion.¹⁴

For Larson, “the claim that experienced listeners hear tonal music as purposeful action within a dynamic field of musical forces links musical meaning with conceptual metaphor.”¹⁵ This conceptual metaphor functions by expressing not only a comparison or similar feature, but by communicating an idea itself that is not just a matter of words.

For my research, my conception and use of the term metaphor aligns with Larson’s. As he proposes in “‘*Something in the Way She Moves*’ – *Metaphors of Musical Motion*,” we can associate these musical motion metaphors as operating within constraints of the physical world,¹⁶ and as a result, we can make inferences about “what

¹¹ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 49.

¹² Larson stresses that analogy and metaphors are not the same thing. This is primarily attributed to the fact that he uses analogy as “a mapping that calls attention to similarities between two different things – regardless of whether those things belong to the same or to different domains” (Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 36), whereas metaphors are specific to mapping two different domains.

¹³ Cox, Review of *Musical Forces: Motion, Metaphor, and Meaning in Music* p. 3.

¹⁴ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 68.

¹⁵ Larson, “Musical Forces and Melodic Patterns,” p. 56.

¹⁶ Larson, *Musical Forces*, pp. 68-69.

moves, the way it can move, and where it moves to.”¹⁷ Thus, using the concept of embodied experience of physical motion, we can utilize musical forces as a means, through metaphor, to conceptualize musical motion and processes.¹⁸

The Musical Alphabet

Although metaphors aid in understanding, describing, and comparing two separate objects, in music, we must first provide a context for these metaphors to be used. As such, principles such as “the musical alphabet” allow us to orient our experience of tones and musical events within a musical environment. In his work, Larson draws on the writings of Deutsch and Feroe, as well as Simon and Summer, to describe this musical alphabet and its usage within our conceptualization of musical forces and their processes.¹⁹ He summarizes their work as

[an] advanced model of music cognition that describes musical passages in terms of alphabets (e.g., the chromatic scale, the major scale, and specific chords) and operations (e.g., repetition, or motion to the next higher or lower member) that create motions through those alphabets.²⁰

Furthermore, Larson emphasizes that it is these motions through alphabets to which listeners of tonal music apply certain expectations.²¹ Additionally, it is a space in which musical forces and hierarchies of embellishment (similar to Schenker’s views) operate.²² As a result, we can identify two important concepts when considering the path of tones in

¹⁷ Mark Johnson and Steve Larson, “‘Something in the Way She Moves’ – Metaphors of Musical Motion,” *Metaphor and Symbol* 18, no. 2 (2003), p. 63.

¹⁸ Larson, *Musical Forces*, p. 136.

¹⁹ Larson, “Musical Forces and Melodic Expectations,” p. 466; Diana Deutsch and John Feroe, “The Internal Representation Of Pitch Sequences in Tonal Music,” *Psychological Review* 88 (1981): 503-522; Herbert Simon and Richard Summer, “Pattern in Music,” in *Formal Representation of Human Judgment*, edited by Benjamin Kleinmetz (New York: Longman, 1986), pp. 219-250.

²⁰ Larson, “Musical Forces and Melodic Expectations,” p. 466.

²¹ Larson, “Musical Forces, Melodic Expectation, and Jazz Melody,” p. 352.

²² Ibid.

music: reference and goal alphabets.²³ It is the processes that operate within the “musical alphabet” that give meaning and context to the musical forces studied below.²⁴ For Larson, “the theory of musical forces is that those forces [that is, gravity, magnetism, and inertia] control what are called ‘operations’ on ‘alphabets.’”²⁵ Specifically, the musical forces model utilizes these “operations on alphabets” as a method for describing successions of pitches.²⁶

For the purposes of my study, “operations on alphabets” are used to support the notion of stability by denoting specific chordal structures from reference alphabets.²⁷ For this, Larson uses two specific alphabets to suggest musical motion. The first is a “reference alphabet,” which can be labeled as the scale or tonality of the piece or musical passage.²⁸ For example, *Twinkle, Twinkle Little Star* in *C major* would have the diatonic key of *C major* as the reference alphabet, in which harmony and melody are compared (See Figure 3.2). Secondly, the “goal alphabet” as a subset of the “reference alphabet,” refers to specific pitches of greater harmonic and melodic stability.²⁹ For example, scale degrees $\wedge 1$, $\wedge 3$, and $\wedge 5$ represent the “goal alphabet” of a major scale because of their specific function within the key. Thus, in *Twinkle, Twinkle Little Star*, the goal alphabet is comprised of C, E, and G. This concept will be further explored within the explanation of stability in the terminology section below.

²³ Deutsch and Feroe, “The Internal Representation Of Pitch Sequences in Tonal Music,” pp. 503-522; Simon and Summer, “Pattern in Music,” pp. 219-250.

²⁴ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, pp. 114-118.

²⁵ Larson, “Musical Forces, Melodic Expectation, and Jazz Melody,” p. 354. Larson believes that it is the forces, or the idea of the forces themselves, that control how the alphabet operates, and not the other way around.

²⁶ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 114.

²⁷ As described and defined within stability, this is the denoting of the tonic triad as the goal alphabet.

²⁸ Larson, “Musical Forces, Melodic Expectation, and Jazz Melody,” p. 355

²⁹ Ibid.

Figure 3.2: Reference and Goal Alphabets Example: *Twinkle, Twinkle Little Star*

The figure displays three staves of musical notation for the song "Twinkle, Twinkle Little Star". The top staff, labeled "Original", shows the melody in treble clef with a key signature of one flat (B-flat) and a common time signature (C). The lyrics are: "Twin - kle, Twin - kle, Lit - tle Star How I won - der what you are." The middle staff, labeled "Reference Alphabet", shows the corresponding letter names for the notes: C, D, E, F, G, A, B, C. The bottom staff, labeled "Goal Alphabet", shows the notes in a simplified notation: C, E, G, C, with fingerings indicated by caret symbols: ^1, ^3, ^5, ^1.

One limitation of the musical alphabet is that it can only be applied effectively to diatonic passages. As such, when we move into the nineteenth century and see an increased use of extended chromaticism, the reference and goal alphabets become far more difficult to determine.³⁰ This problematizes certain analytical elements in the Schumann *Piano Concerto*; however, I address some of these elements through the expansion of metaphors. In summary, the notion of conceptual metaphors and musical alphabets contribute to an understanding of a base knowledge that allows one to identify and explain motion metaphors in music and the context in which they operate.

Terminology and Concepts

This section serves to present the main force metaphors for my study, as well as their analytical applications and functions. Before discussing the metaphors of gravity, magnetism, and inertia, I introduce the concept of stability, in relation to melodic and rhythmic events.

³⁰ Larson and Vanhandel, "Measuring Musical Forces," p. 120.

Stability

In order to establish a model for musical forces, one must first define a parameter of stability in which these forces can act upon or within. In essence, this concept of stability functions as a platform within which we can observe musical forces. Stability acts as a primary element in the theory of musical forces because metaphors, such as magnetism and gravity, depend on the awareness of an inherent stability in musical space.³¹ According to Larson, “stability is a comparative quality that we attribute to a note.”³² This stability functions in both a melodic (tonality) and rhythmic capacity.

Melodic stability operates within a spectrum of tonal stability in which certain tones (scale degrees) have more inherent stability than others. Larson asserts that stability is the function of tonic in a tonal framework.³³ Therefore, tonic (and the tonic triad (^1, ^3, ^5)) can be interpreted as a stable reference platform, upon which these forces operate.³⁴ Larson references several models of stability in the literature; however for the scope of my research, Lerdahl’s work in the field will suffice.³⁵ Within the work of Lerdahl, the tonic triad can be observed as a gradient of stability: the tonic note (^1) is strongest; the dominant (^5) is second strongest; and the mediant (^3) is third strongest. To show the relative stability of scale degrees, Lerdahl assigns values for the *C-major*

³¹ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 100.

³² Ibid.

³³ Ibid., p. 101.

³⁴ This idea is similar to that of the “goal alphabet.”

³⁵ Ibid. Additional writing about stability, probe-tone profiles, and pitch-space can be found in Krumhansl, L. Carol, and E.J. Kessler, “Tracing the Dynamic Changes in Perceived Tonal Organization in Spatial Representation of Musical Keys,” *Psychology Review* 89 (1892), pp. 334-368; Elizabeth Margulis, and W.H. Levine, “Melodic Expectation: A Priming Study,” *Proceedings of the Eighth International Conference on Music Perception and Cognition* (2004), pp. 364-366.

scale (Table 3.1).³⁶ In Table 3.1, Lerdahl's values are assigned with 5 being the most stable pitch and 1 being the least stable.

Table 3.1: Probe-Tone Profile, Lerdahl 1988, Major Key Context, *C-major*³⁷

Scale Degree (<i>C-Major</i>)	Lerdahl's Stability Values
C	5
C# / D $\flat$	1
D	2
D# / E $\flat$	1
E	3
F	2
F# / G $\flat$	1
G	4
G# / A $\flat$	1
A	2
A# / B $\flat$	1
B	2

From above, one can observe the stability profile that, according to Lerdahl, assumes inherent stability within the function of a triad, which in itself has a spectrum of stability. While Lerdahl's concept of stability is of great importance in relation to melodic musical forces, such as magnetism, it does not address rhythm.

In a general sense, Larson maintains that rhythmic stability can be heard through the relationship between strong and weak accents in a given time signature (i.e., metrical accents). Rhythmic stability mainly concerns the relationship of points of reference and the articulation of these points of reference at regular intervals of time.³⁸ Larson asserts that this relationship is comparative, and that no moment in musical time can possess

³⁶ Larson, *Musical Forces: Mootion, Metaphor, and Meaning in Music*, p. 101. Material originally presented in Fred Lerdahl, "Tonal Pitch Space," *Music Perception* 5, no. 3 (1988), pp. 315-349. For further study on pitch space and stability see Fred Lerdahl, "Calculating Tonal Tension," *Music Perception* 13, no. 3 (1996), pp. 319-363 and Fred Lerdahl, *Tonal Pitch Space* (New York: Oxford University Press, 2001), pp. 41-80 and 142-188.

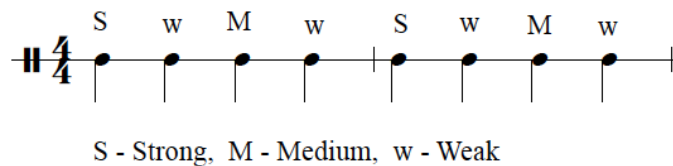
³⁷ In Lerdahl's 1996 and 2001 publications, he suppresses the dominant to operate, at least in terms of melodically, on the same level as the mediant. This however tends to overlook the more functional element of the dominant as both the more prominent melodic and harmonic device in common-practice tonal music.

³⁸ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 147.

absolute metrical stability.³⁹ Accordingly, he argues that “we experience one moment as more or less metrically stable than another – that is, we hear rhythmic moments in terms of other rhythmic moments.”⁴⁰ Furthermore, he conceptualizes (similarly to tonal stability) the ability of metric stability to be conceived as hierarchal levels with deeper levels of meter.⁴¹ Although I am not directly concerned with rhythmic hierarchy, the relationship of strong-weak beats, as a projection of stability, has implications with the forces that concern rhythm (for example, metric magnetism, rhythmic gravity, etc.). Thus, I only examine rhythmic stability as it relates to musical forces.

A common-time signature (4/4) serves as a good example to describe metrical stability through its arrangement of strong versus weak beats. The first beat is metrically strongest followed by the third beat, and beats two and four are the weakest (see Figure 3.3).

Figure 3.3: Common-Time Stability Points



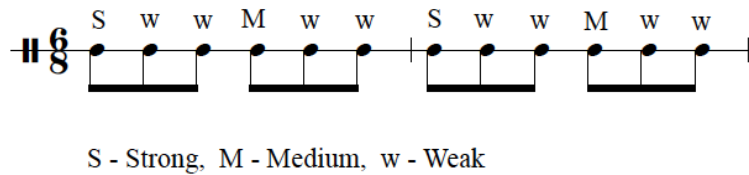
Compound-time stability operates as a series of pulses within two groupings. Two dotted-quarter note values divide and produce a strong-weak-weak, and medium-weak-weak effect (see Figure 3.4). The weaker points of stability are the result of the subdivision of the second and third pulses of the subdivision of the dotted-quarter note.

³⁹ Ibid., p. 148.

⁴⁰ Ibid.

⁴¹ Ibid.

Figure 3.4: Compound-time Stability Points



As mentioned above, stability profiles for meter are integral to the way we perceive and experience meter. Like tonal stability, “metric stability gives a note or moment the quality of a goal.”⁴² Thus, I use these stability points as reference points in the mapping and labeling of strength profiles of rhythmic musical forces.⁴³

In summary, both melodic stability in the form of a tonic triad and metric stability in the form of metrical accents have implications in the analysis of musical forces. They provide listeners with a reference point through which musical forces can act and be perceived. They also function as a platform with which gravity, inertia, and magnetism can interact. The musical processes operating from moments of stability, to instability, back to stability thus create the dynamic musical processes that we perceive in our aural experience.⁴⁴

Gravity

“The soprano’s *high* notes rang *above*... the *rising* melodic line *climbed* higher.”⁴⁵ These descriptions relate well to the terminology and perception of music as a process that is “bound” by a sense of direction. Musicians continually refer to “up” or “down” in terms of pitch space, frequencies, upbeats, downbeats, etc. However, in the use of this

⁴² Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 148.

⁴³ In particular, this concept of rhythmic stability will have implications when analyzing the relationship of expectations conforming or deviating from Hasty’s projections. See Christopher Hasty, *Meter as Rhythm* (New York: Oxford University Press, 1997).

⁴⁴ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 145.

⁴⁵ Larson, “Musical Forces and Melodic Patterns,” p. 58.

language, few consider the implications for our musical processes as being something inherently bound by directed motion.

As the traditional idiom resonates, “what goes up must come down.” In the physical world, this is apparent through bodies and objects being bound to earth through the force of gravity. In the musical world, as Larson and many other scholars assert, the same holds true.⁴⁶ For, “[gravity] is reflected in rules of composition (for example, fourth-species counterpoint requires the downward resolution of suspensions)...”⁴⁷ Furthermore, Larson argues that “...if listeners make sense of musical motions by mapping them onto their own experience of physical motion, then musical gravity will play a role in the way they interpret melodic ascent and descent.”⁴⁸

As a result, the ways in which we map gravity onto musical processes through metaphors can be observed and experienced in two distinct ways. First, and of primary importance in Larson’s scheme, is the domain of pitch relations with the designation of “down” for frequencies that are “lower” in relationship to others.⁴⁹ Secondly, Larson associates and projects gravity to the domain of meter, where “down” is associated with “moments of greater metric stability.”⁵⁰ He does note that gravity in relation to pitch (melodic) and meter (metric) need not complement each other or align with each other.⁵¹

⁴⁶ Larson cites theorists, such as Hindemith, Roth, Schachter, and Toch, as examples of the concept of gravity in the literature. See Larson and Vanhandel, “Measuring Musical Forces,” p. 122.

⁴⁷ Ibid.

⁴⁸ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 85.

⁴⁹ Ibid., p. 149.

⁵⁰ Ibid.

⁵¹ Ibid.

Melodic Gravity

In general terms, melodic gravity can be described as “the tendency of a note (heard as ‘above a stable position’) to descend.”⁵² Larson often interchanges the idea of stable position with a reference platform in his discussion.⁵³ Gravity mainly operates above the stable platform of the tonic note. However, gravity as a motion (force) maintains the potential to land on any note, the main concept associated with the process of descent.

For example, in *C-major*, a scalar descent to the tonic of C is not the only possible outcome of a descent; the scalar descent could theoretically stop on eleven other pitches within the octave, while still maintaining its process of descent. However, not all pitches are stable enough to function as an arrival point. When Larson specifies that the descent must end “above a stable position,” he does not necessarily mean that the descent must end on the tonic (the main source of stability), but rather that a stable platform produces pitches that *fall* or descend to a lower pitch, which possesses a perception of stability. It can be as simple as $\wedge 6$ descending to $\wedge 5$.

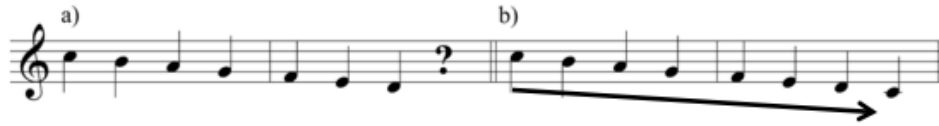
To give a further example, gravity comes into play when a listener perceives the feeling of incompleteness through a descending scalar motion from $\wedge 8$ to $\wedge 1$ stopping on scale $\wedge 2$. The falling motion has the tendency and expectation to continue to the final note of the scalar descent $\wedge 1$ because of its tonal stability (see Figure 3.5). When the descent stops at $\wedge 2$, our expectations are thwarted. Gravity has still occurred because of the descent; however, the stable tonal platform on which listeners expect the gesture to

⁵² Ibid., pp. 83-84.

⁵³ Essentially, a differentiating characteristic between these terms seems to be a stable position would refer to the goal alphabet (tonic triad), whereas a reference platform would refer to any pitch or harmony that is structurally significant, such as by harmonic prolongation. See Larson *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 22.

complete is not sounded. Figure 3.5a presents the scalar descent that stops at $\wedge 2$ (D) and 3.5b shows the gravity continuing to the most stable $\wedge 1$.

Figure 3.5: Gravity Within a Descending C-major Scale



Additionally, as mentioned above, gravitational processes are not limited to scalar descents. Any descending motion above a stable platform can be identified as “gravity;” as a result, we must also recognize leaps, among other descent processes, as yielding a force of gravity.

Larson also proposes that one perceives gravity within global (entire piece) and local (melodic event) contexts.⁵⁴ Since we tend to be unaware of the experience of gravity itself and feel its influence less directly, “we are more likely to observe its influence on the global, rather than the local, trajectories of our bodies and other objects.”⁵⁵ However, I acknowledge the presence gravity regardless of the hierarchal structural levels, for, listeners are aware of the gravity even in terms of semitone movements.⁵⁶

Furthermore, Hatten proposes in his notion of hierarchal conceptions: “listener[s] will shift among relevant gravitational platforms as the relevant harmonic context affects interpretations of melodic pitches.”⁵⁷ This conceptualization produces implications when identifying the “stable platforms” above which the gravity descends. For example, if the descent occurs in the key of *C-major* from an F, and the harmony which supports the F’s

⁵⁴ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 88.

⁵⁵ Ibid.

⁵⁶ For the purposes of this project, this difference will not be explored in depth in-so-far as the hierarchal structure of gravity. Primarily, my analyses are confined to melodic and rhythmic events of gravity, and the global context for gravity is beyond the scope of this thesis.

⁵⁷ Robert Hatten, “Musical Forces and Agential Energies: An Expansion of Steve Larson’s Model,” *Music Theory Online* 18, no. 3 (Sept. 2012), paragraph 4.

descent is IV (*F-major*), then the stability platform will have shifted to its local area of *F-major* with F (temporarily ^1) as the goal. This phenomenon can be described as a shift of stability platform from a global to a localized context. However, from the example drawn, it is clear that this happens on a localized level and for generally short time spans.⁵⁸

Rhythmic Gravity

Although Larson applies the metaphor of gravity primarily to melodic events, he also discusses gravity in relation to meter and events “gravitating” to downbeats. He proposes that

...we might define “rhythmic gravity” as that quality we attribute to a rhythm (when we map its flow onto a physical gesture) that reflects the impact physical gravity has on the physical gesture onto which we map that rhythm. Thus, if we hear a musical gesture as a “falling in to a downbeat,” then we experience rhythmic gravity as a force which pulls that musical gesture “down.”⁵⁹

An example with predictable strong and weak beats, such as a waltz, serves as a good tool to explain this force. It is obvious that in a traditional waltz meter (3/4), there is a stress on the first beat of the measure creating - in metaphoric terms - a strong-weak-weak (1²³1²³) pattern. Because of our exposure to waltzes, we can, as listeners and performers, perceive a push towards the first beat of every measure. This initiates expectations realized on every “downbeat.” As Larson suggests, with these metrical

⁵⁸ An example of an extended time-span would be produced through the use of a harmonic pedal-point.

⁵⁹ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 149.

accents, the force of gravity is applied because of the second and third beats, which are directionally significant by proceeding to the first beat of every measure.⁶⁰

In summary, gravity as a musical force can be perceived through the motion of melodic descent, as well as through rhythmic patterns that gravitate to downbeats. Due to the established relationships present in tonal music, such as the melodic tendencies to return to an original sounding pitch and the rhythmic emphasis given to certain beats of a measure, gravity exists as a conceptual metaphor that functions to highlight the “up” versus “down” in tonal music.

Magnetism

“The music is *drawn to* this stable note... the *leading tone* is *pulled* to the tonic.”⁶¹ Magnetism, another primary force that perpetuates Larson’s theory of musical forces, describes how certain notes are attracted to others with the strength of the attraction contextually determined through stability. A general understanding of magnetism is apparent in the musical discourse through discussions on the resolution of tones in voice leading, as suggested by the above quotation. For example, consider the infamous “shark theme” from Steven Spielberg’s 1975 *Jaws*, with music by John Williams.⁶² The semitone motion between the first note and its more stable second note acts a magnetic attraction to the more stable tone, creating a tension-release effect. This tension and release, which permeates tonal music, can often be explained in terms of resolutions, which arise from the magnetic attraction from one note to the next. As with gravity, there are two types of magnetism: melodic and metric.

⁶⁰ Larson also reflects this mapping by discussing the conducting motions associated with “downbeats” and downward motions. See Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p.148.

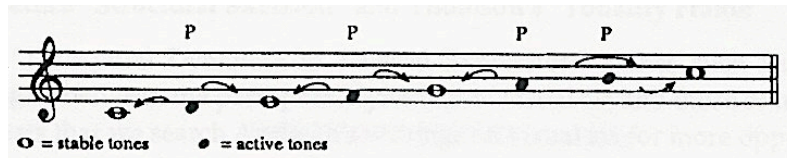
⁶¹ Larson, “Musical Forces and Melodic Patterns,” p. 58.

⁶² This example includes additional opportunities for metaphoric labeling.

Melodic Magnetism

Just as gravity acts on notes to produce descending motion, magnetism acts to “attract” certain unstable notes to ones with more inherent stability.⁶³ As Larson explains: “melodic magnetism is the tendency of an unstable note to move to the closest stable pitch, a tendency that grows stronger as we get closer to that goal.”⁶⁴ Figure 3.6 provides a good example of the interaction of magnetism with stable tones through the *C-major* scale. Although the arrows in Aldwell and Schachter’s text show the tendencies of “active” tones attracted to “stable tones,” there are additional considerations with how melodic magnetism operates and the force itself.⁶⁵ For example, as discussed further below, there is a certain degree of magnetism between any two notes, but the strength of the magnetism changes with the size of intervals and the proximity of the two pitches.

Figure 3.6: Stability in *C-Major*⁶⁶



Melodic magnetism operates within the rules of tonal composition in relation to resolutions.⁶⁷ For example, we consider sevenths as dissonances and thus unstable in a tonal context. As a result, sevenths must resolve to a pitch of stability. The tendency to resolve to a stable pitch, or magnetism, explains the “pull” we perceive in these resolutions. It is this sense of tension and release - motion of an unstable note to a stable

⁶³ This idea is also described as a “push versus pull” phenomenon in BaileyShea’s work.

⁶⁴ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 88.

⁶⁵ Edward Adwell, and Carl Schachter, *Harmony and Voice Leading* (Toronto: Harcourt Brace Jovanovich Inc., 1989).

⁶⁶ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 90.

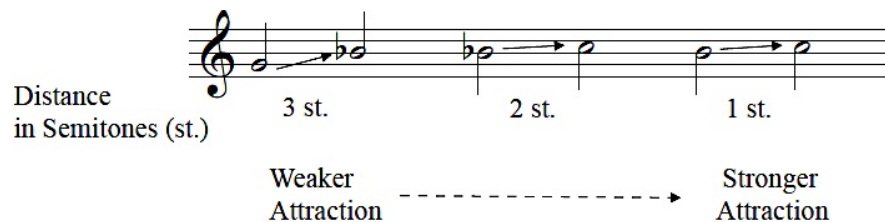
⁶⁷ Larson, “On Rudolf Arnheim’s Contributions to Music Theory,” p. 100.

⁶⁷ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 90.

note - that results in the identification of a musical process as magnetism. Composers often play with these expectations of resolutions to add interest to their works.

Furthermore, the strength of magnetic attraction depends on the size of the interval between the notes. The closer the proximity of the note to the closest stable pitch, the stronger the “pull” and the stronger the magnetism. One can assert that unstable chromatic tones or leading tones exert a high degree of magnetic strength in the form of attraction to their respective stability tones. Figure 3.7 provides a representation of the strength of magnetism in relation to distance. Here, the semitone motion from B $\natural$ to C has the highest degree or strength of magnetism because of its distance (one semitone); B $\flat$ to C comes in second in the strength of attraction because of its major-second distance (two semitones); and lastly, G to B $\flat$ is third in strength of attraction based on its distance of a minor third (three semitones).

Figure 3.7: Magnetic Attraction as Dependent on Distance⁶⁸



Hatten contributes to this concept by identifying attraction as “not only attributable to closeness – [but] also is attributable to the degree of stability of one of the two pitches.”⁶⁹ Thus, in *C-major*, a chromatic F $\sharp$ is pulled magnetically to G, not F-natural, even though scale degrees 4 $\wedge$ and 5 $\wedge$ are equidistant to the chromatic pitch $\wedge\sharp 4$.⁷⁰

⁶⁸ I have adapted this figure from Larson’s *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 89.

⁶⁹ Hatten, “Musical Forces and Agential Energies,” paragraph 13.

⁷⁰ Ibid.

Furthermore, the span of notes covering more than one octave can also have an implication for magnetism. If two notes are separated by three octaves, a listener will struggle to connect the notes, and as a result, the force of magnetism will be rendered weaker than notes separated by the interval of a fourth.

Magnetism also possesses a different relationship when comparing the chords of major and minor tonalities, especially with cadential gestures. A perfect authentic cadential gesture in the minor mode exerts a stronger magnetic force than in the major mode because of semitone relationships. In Figure 3.8 the first progression in *a-minor*, V (E-G#-B) – I (A-C-E), maintains one common tone (E), while the other tones are both a semitone apart, creating a strong movement. In *A-major*, V (E-G#-B) – I (A-C#-E), the common tone E remains the same; however, only one semitone relationship exists (G#-A), while the other is a whole-tone (B – C#). This subtle difference affects the degree of strength exerted by magnetism in these progressions.

Figure 3.8: Cadential Magnetism, Major vs. Minor Modes



Metric Magnetism

As mentioned above, similarly to tonal stability, our understanding of metric stability allows us as listeners to perceive the strength (either strong, medium, or weak) of the meter. Moreover, it is the drive to these more stable moments in the meter that

creates metric magnetism.⁷¹ Larson includes little discussion on this topic, and seems to focus almost entirely on the melodic approach to magnetism in his writings. This metric magnetism, similarly to melodic magnetism, grows stronger as we approach points of metric stability.⁷² One can differentiate between rhythmic gravity and metric magnetism in that all rhythmic gravity figures are metric magnetisms, but not all metric magnetisms are rhythmic gravity. In other words, rhythmic gravity can only exist on the “downbeat” or beat 1 of the measure, whereas metric magnetism operates from one pulse of weaker stability to one of greater stability. Furthermore, rhythmic gravity also operates in the same manner in terms of rhythmic figures. For instance, the lesser durational value of a note, the weaker its stability, and as a result, it is attracted to durations of longer length.

Thus, through both rhythmic and melodic tendencies of attraction, we can come to realize magnetism as a musical force that is consistent with our observations of attraction within the physical world. As a result, we are able to map our concepts of attraction of tones and rhythmic processes to music through the use of a conceptual metaphor. This attraction metaphor allows us to discuss musical events in terms of magnetism.

Inertia

Defined as “the tendency of a pattern of motion to continue in the same fashion,” inertia utilizes musical memory in order to make predictions as formulated expectations, such as repeated patterns.⁷³ Larson clarifies that the meaning of “same” reflects how the pattern is represented in previous musical memory.⁷⁴ He primarily associates inertia with rhythm through the use of simple ostinato patterns in the musical examples he analyses.

⁷¹ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 148.

⁷² Ibid.

⁷³ Ibid., p. 96.

⁷⁴ Ibid. I further understand this “sameness” in terms of the ability to recognize a pattern, motive, process, model, or other musical gesture or trope from one point in time to another.

However, in addition to rhythm, Larson proposes that musical inertia can operate within patterns of pitches.⁷⁵ As a result, musical inertia can, on a fundamental basis, be described as a repetition of musical material or the continuation of material in the same manner. Melodic (directional), rhythmic (model and repetition), and harmonic (chord structures and progressions) motion all qualify to operate through inertia.

According to Larson, musical inertia is not a new concept, and several other scholars have explored this concept using other terms. For example, Meyer (1956, 1973) identifies inertia through “good continuation,” Narmour (1992) through “process,” and von Hippel (2002) through “step-inertia.”⁷⁶

As a result, we (as listeners) can understand the forward progression of musical processes through time and musical space as analogous to that of the path of an object in the physical world. Take for example, an object, such as a ball, which has been pushed forward and continues to roll. The expectations regarding the motion of the ball are inferred through our understanding of inertia. We can logically determine that the ball will continue in the same manner until another force acts upon the ball to slow it down (such as friction). In a similar way, we can understand the process of musical inertia operating in a manner that continues its motion as a repetition of the “same.”

Below, in Figures 3.9 and 3.10, in a similar manner to Larson’s example, I have set out some preliminary examples and representation of how the concept of inertia functions within a musical experience. In Figure 3.9a, the force of inertia acts on the ascending motion and inertia continues the ascent in the “same” manner in Figure 3.9b.

⁷⁵ Ibid., p. 96 and p. 143.

⁷⁶ Ibid., pp. 98-99. Paul von Hippel’s work references whole or half steps’ tendency to continue in the same direction. See Paul von Hippel, “Melodic Expectation Rules as Learned Heuristics,” in *Proceedings of the Seventh International Conference on Music Perception and Cognition* (Adelaide: Causal Productions, 2002).

Figure 3.9: Directional Inertia Realization

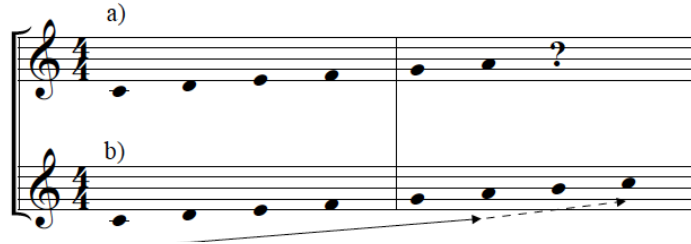


Figure 3.10 illustrates a case of rhythmic inertia. An eighth-note triplet is followed by a quarter note for a pattern that repeats to establish inertia. The listener can expect that this pattern will continue into the second measure (Figure 3.10b). Larson argues that “musical inertia is central to musical rhythm,”⁷⁷ and as a result, we experience musical rhythms as aligning or thwarting our sense of musical expectations.⁷⁸ These two concepts of inertia (directional and rhythmic) can also work in tandem.

Figure 3.10: Rhythmic Inertia Realization



In summary, Larson describes melodic and rhythmic inertia as functioning independently of each other, and our inertial expectations as limited to the patterns that we perceive as internally represented within the music.⁷⁹ Furthermore, both sequences and ostinato-like patterns function as some of the strongest examples of inertia. Thus, inertia suggests that our conceptualization of musical motion is combined with our experience of motion to continue in the same manner unless acted upon by another force.

⁷⁷ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 142.

⁷⁸ This concept of aligning or thwarting will be further expanded later with the inclusion of Hasty’s work.

⁷⁹ Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 144.

Although Larson's explanation of inertia is clear, he does not present a way in which to identify the process of inertia as "becoming." When do we label a musical process or passage as giving into inertia? I posit that inertia is a process which has three states: (1) a model, whereby the event which will be continued occurs, (2) a period of momentum, in which the model is repeated (promoting a sense of expectation), and (3) the initialization of inertia through the continuation of the process, which was stated in the model, repeated in the momentum phase, and now can be labeled as inertia.

Larson's Metaphors Combined

Although I have presented each of the main metaphors of Larson's musical forces model independently, in a musical context the forces interact and are often juxtaposed. Since the musical space in which these forces operate is similar to the dynamic nature of our physical world, we are able to conceptualize multiple forces at once. For example, a scalar descent can be heard as gravity (descent), inertia (continued movement "down"), and magnetism (weaker pitches attracted to more stable pitches, ultimately ^{^1}). Larson does not address which forces, when acting together, dictate the movement of the process. In my analysis of Mozart and Schumann's works, I discuss several of these combined forces and the way in which they operate with each other.

Other Models

In my survey of literature surrounding Larson's work and possible expansions of his model, the writings of two primary theorists - Hatten, and Hasty - are most useful. These scholars offer a critique of the theory, possible expansions, and other considerations when dealing with motion in music and the concept of musical forces as metaphors. In the following paragraphs, I focus on the writings of these scholars,

followed by a brief discussion of others, such as Toch, Erickson, and Kurth, who also inform my conception of motion in music.

Hatten

Larson asserts that Hatten's theory of gesture draws on the theory of musical forces.⁸⁰ Hatten is primarily concerned with ideas of musical gesture and expression, which result in the production of a musical meaning.⁸¹ When discussing metaphors of force, he mainly focuses on the shaping of sound through energies through time.⁸²

In his article "Musical Forces and Agential Energies: An Expansion of Steve Larson's Model," Hatten discusses energy, agency, momentum, friction, and repulsion.⁸³ First, Hatten examines how the patterning of pitch collections, through motivic or rhythmic structures, can yield alternate endings based on the grouping of these collections.⁸⁴ Hatten also introduces the term friction.⁸⁵ Friction can be described as the effect that slows down inertial motion through the effects produced by contextual forces.⁸⁶ After his discussion of friction, Hatten proposes the opposite of attraction in magnetism, which is repulsion.⁸⁷ Since in nature repulsion consists of the repelling of one magnetic object with another, we likewise require two musical objects to perceive

⁸⁰ Ibid., p. 145.

⁸¹ Robert Hatten, *Interpreting Musical Gestures, Topics, and Tropes: Mozart, Beethoven, Schubert* (Bloomington: Indiana University Press, 2004).

⁸² Ibid., pp. 93-132.

⁸³ See Hatten, "Musical Forces and Agential Energies."

⁸⁴ Hatten, "Musical Forces and Agential Energies," paragraph 4.

⁸⁵ Ibid., paragraph 11. Larson mentions the term "musical friction" in acknowledgement of other potential musical forces towards the end of his book. See Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music*, p. 320.

⁸⁶ Hatten, "Musical Forces and Agential Energies," paragraph 11. As an example, in the physical realm, one way to describe, the "environmental forces" is through ideas of "drag" created through water-flow or air-flow. For Hatten, environmental forces are always acting upon the predominant force, requiring a further investment from a source of energy. Environmental forces can be understood in a musical capacity as the potential for musical forces to operate, and friction is produced by those environmental forces that act in contrary to the predominant driving force of a moment in musical time.

⁸⁷ Ibid., paragraph 15.

repulsion as a musical metaphor.⁸⁸ This is usually achieved through the repulsion of two separate voices within a harmonic or melodic line. Lastly, Hatten proposes the idea of a pliable platform (of stability).⁸⁹ He explores concepts of malleable and hard platforms and their impact on the forces (mainly gravity). These different types of rigidity platforms yield varying musical results with repercussions on the perceptions of stability.⁹⁰ Hatten discusses the outcomes of impacts on three platforms of varying rigidity (rigid, flexible, and permeable). This concept does not have a direct impact on forces themselves, but more so on the outcomes of the forces. Hatten's work thus provides a new perspective on Larson's main metaphors; by integrating new conceptualizations and understandings, Hatten furthers the inquiry of the musical force model.

Hasty

For the purposes of this project, Christopher Hasty's ideas concerning meter and rhythm are useful in the identification, labeling, and experiencing of forces that arise from metrical processes. More specifically, his book *Meter as Rhythm*, offers insights into describing and denoting meter as a process.⁹¹ I borrow Hasty's "projection" to support the processes or forces of inertia, metric magnetism, rhythmic gravity, and friction.⁹² Hasty argues that music operates by completing or thwarting a series of projections within time and space. He proposes that musical events, such as rhythm and meter, are interconnected; by extension, the mapping of projections provides tools with which to describe force realizations and non-force realizations.

⁸⁸ Ibid.

⁸⁹ Ibid., paragraph 18.

⁹⁰ Ibid.

⁹¹ Hasty, *Meter as Rhythm*.

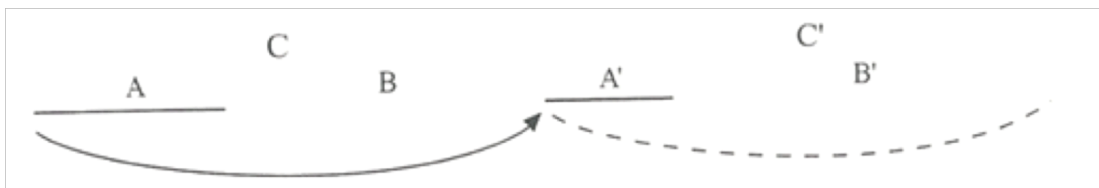
⁹² Ibid., pp. 84-95.

When introducing the idea of “projection,” Hasty references several related concepts: potential and denial, along with realized and unrealized. Figure 3.11 reproduces the process of projection, which he describes in the following:

I will say that a potential duration for the second event (C') is *projected*, and I will represent the projected duration by a dotted line to indicate that this duration is potential rather than actual. When there is an actual duration C' that emerges as a reproduction of the first event's duration, I will say that the projected potential has been realized.⁹³

We can project a process based on an event, here known as C , and establish a potential outcome that results with a repetition of the process heard in C with the reproduction being C' . Thus, “projective potential is the potential for a present event's duration to be reproduced for a successor.”⁹⁴ This projective potential is realized when a restatement of the first process is sounded. However, Hasty notes that projective potential is not the potential (or likelihood) of the event sounding again, but rather, “the potential of a past and completed durational quantity being taken as especially relevant for the becoming of a present event.”⁹⁵ As clarification, projective is the potential duration of the second event as measured by the first, and projection is the entire process.⁹⁶

Figure 3.11: Hasty's "Projection" Configuration⁹⁷



Furthermore, when these projective elements are thwarted, by means of not being realized, Hasty suggests a labeling of denied or unrealized.⁹⁸ He differentiates the two

⁹³ Ibid., p. 84.

⁹⁴ Ibid.

⁹⁵ Ibid.

⁹⁶ Ibid.

⁹⁷ Ibid.

terms in the following manner: denied is the thwarting of an “expected new event,” whereas unrealized is the thwarting of the projective element “if we are not expecting a new event.”⁹⁹

With Hasty’s ideas on projection, potential, and realizations (thwarted or otherwise), we are equipped with a specialized vocabulary to describe inertial and metric processes within musical forces.¹⁰⁰ This vocabulary allows me to incorporate ideas of non-realizations, and furthermore, to predict, through a process of projection, what our expectations as listeners would have been if realized. By using projections, I more easily label and define musical processes that result from the process of inertia, as well as other forces that have a metric or rhythmic quality.

Expansions

(Force and Non-Force Metaphor Expansions)

Preserving Larson’s conception of musical metaphors, I offer examples of additional musical forces to expand his model. Although some of the musical forces that I propose exist in the literature on energetics, my conception of these forces differs from other scholars and aligns with Larson’s writings. I acknowledge that these are not the only additional metaphors that could be added to Larson’s model; the energetics literature is filled with many other metaphors and terms. However, I believe that these are the most pertinent first additions to the model.

⁹⁸ Ibid., p. 86.

⁹⁹ Ibid.

¹⁰⁰ For additional information on metric and rhythmic structures in music, see Grosvenor W. Cooper and Leonard B. Meyer, *The Rhythmic Structure of Music* (Chicago: The University of Chicago Press, 1960).

Classification of Metaphors

For clarity, I distinguish between force expansions and non-force expansions (see Figure 3.12). Force expansions are metaphors that are independent of the outcome of another force. For example, friction, although categorized within inertia, is an independent force that can be applied to music resulting in outcomes specific to its process. Non-Force expansions arise from the outcomes of forces already in place. For example, acceleration is not a force itself, but merely the speed at which the force of inertia operates. From this classification scheme I attribute the following:

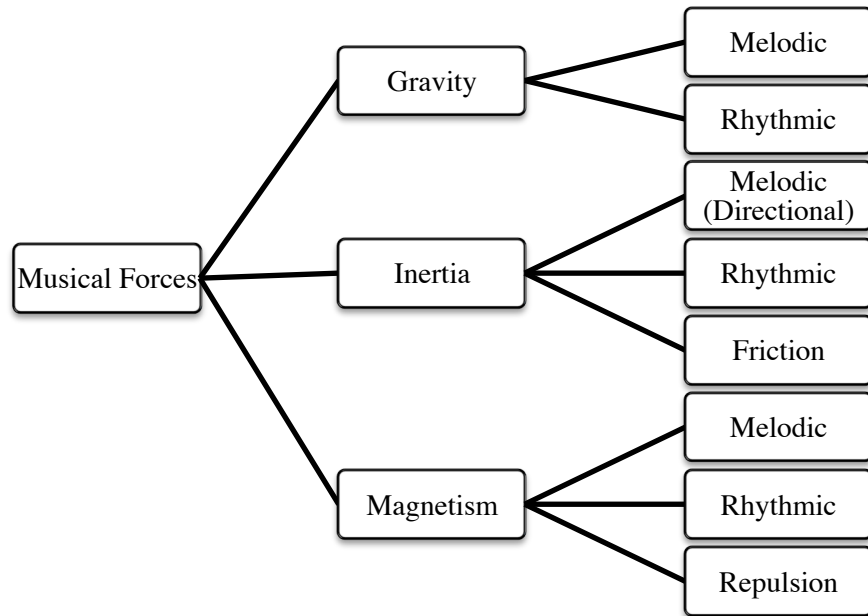
Gravity: Encompasses motion metaphors with ascending or descending motion
(for example, ascent, descent, and trajectory).

Inertia: Encompasses motion metaphors associated with a moving forward in
time (for example, acceleration, friction, deceleration, and momentum).

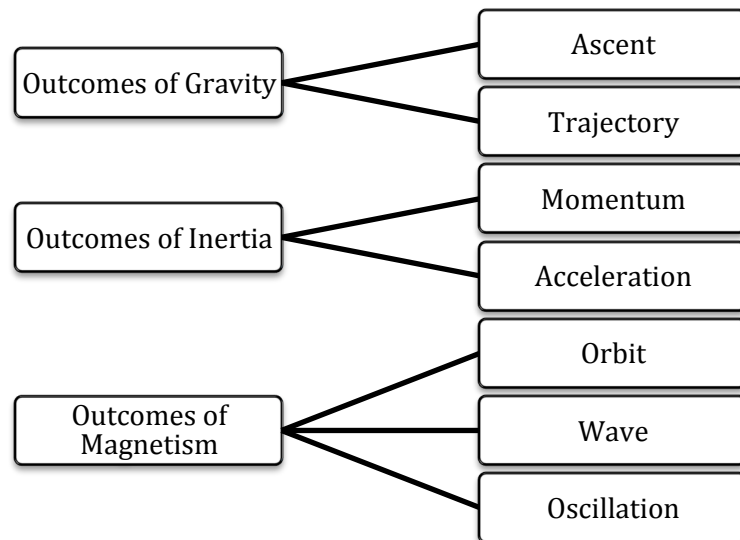
Magnetism: Encompasses motion metaphors associated with a push or pull
function (for example, orbit, oscillation, wave, and repulsion).

Figure 3.12: Classification of Metaphors¹⁰¹

Force Metaphors:



Non-Force Metaphors:



¹⁰¹ Since the stability metaphor is not considered a force, just the platform on which these forces operate, it is not included in this classification scheme.

Force Metaphor Expansions

I add only two metaphors to Larson's force metaphors. These metaphors - friction and repulsion - are not primary forces, but rather a subcategory of main forces themselves.

Repulsion

Hatten describes repulsion as "the opposite of attraction;" consequently, I conclude that, in a musical context, repulsion can be identified as attraction that occurs as a result of a non-chord tone sounding against a consonance; which gets repelled (pushed into submission), thus being attracted to a more stable note. The metaphor of repulsion functions within magnetism as one note disassociating itself from a harmony moving to another point in musical time.

Repulsion, then, can occur in two cases. First, it can arise when a note of stability is departed or passed-on for another tone of importance. This can occur in terms of the voice-leading or melodic structure, for example, the departure of the stable $\wedge 5$ to $\wedge 6$ as a prolongation. This involves the tone moving away from (being repelled) the point of stability. Secondly, repulsion results from a suspension (a non-chord tone accented or sounded above a harmony that does not support it). These tones are repelled (through harmonic support) and thus attracted to the stability of chord tones. This extension of magnetism is not just a simple attraction that leads to the resolution of these tones, but it is repulsion because of the clear emphasis on the dissonant pitches that ultimately proceeds to a resolution.¹⁰² One may note that the first occurrence of repulsion acts

¹⁰² The metaphor of repulsion works through the "collision" of a non-chord tone with those of a consonant harmony, with a resulting magnetic attraction to a stable tone.

through melodic motion (voice leading), and the second through harmonic implication (movement away from a stable pitch of the harmony to a harmonic dissonance).

Friction

Hatten first hypothesizes that, since friction “is the effect of an environmental medium that acts as drag and slows down inertial motion...,” we may be able to infer a “virtual musical effect akin to friction [within] Larson’s musical forces.”¹⁰³ Following this idea, I aim to develop friction as a force which acts upon another force, resulting in the slowing down or impediment of the completion or continuation of the latter force’s process. As such, friction in a rhythmic manner involves longer durations or lessening of rhythmic processes. It affects the continuation of musical motion (inertia) because the musical material does not occur as in recent memory; rather it is hindering that very process by elongating (drawing out) the procedures.

As observed above, both metaphors of repulsion and friction present opportunities within the model to accommodate certain melodic and voice-leading processes that would otherwise be unaccounted for or addressed. Although these two metaphors allow a further expansion in terms of force metaphors, several other concepts and processes may also contribute to the model. However, these arise through motions already contained within the three primary forces of gravity, inertia, and magnetism. As a result, my non-force expansions further refine the forces themselves.

Non-Force Metaphor Expansions

In addition to expansions of forces, I further expand and contribute to this model by including metaphors that arise from the forces themselves. Below I highlight

¹⁰³ Hatten, “Musical Forces and Agential Energies: An Expansion of Steve Larson’s Model,” paragraph 11.

metaphors that arise from magnetism (wave, oscillation, and orbit), from inertia, (momentum), and finally from gravity (trajectory and ascent).

1. Arising from Magnetism

I group wave, oscillation, and orbit as three non-force expansions arising from the process or force of magnetism. These three terms overlap in many ways, but subtleties, explored below, exist between these concepts. It is important to understand these expansions as arising from the force of magnetism since magnetism is the mechanism that makes these metaphors operate.

(a) Wave

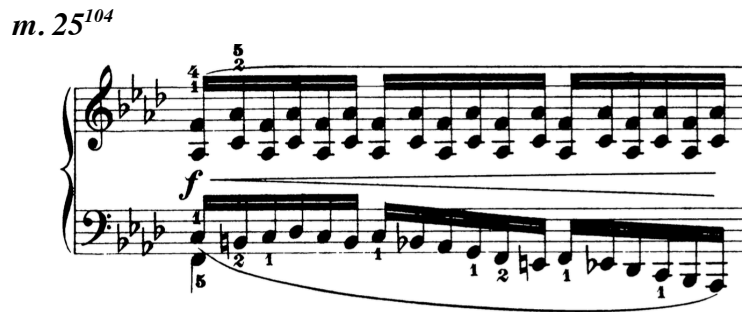
For the context of my research, I propose that a wave consists of ascending and descending melodic motion that is centered around an established focal pitch or pitches. The metaphor of the “wave” is applied to melodic events that are constructed from four elements: (1) start on a pitch (focal or not), (2) movement away from the starting pitch (up or down), (3) a return to the starting pitch, and (4) movement away from the starting pitch in the opposite direction as (2). Furthermore, the notion of multiple pitches allows for the interpretation of a passage that is able to move from one focal pitch to another focal pitch in a wave-like manner (continuous ascending and descending motion). This also supports the idea of superimposed waves - more than one wave operating simultaneously with different pitches, as well as ascents and descents through arpeggiations. Waves result primarily from magnetism, but also continue as a process through inertia. Additionally, the movement involved in the ascending or descending process need not be stepwise.

(b) Oscillation

Oscillation can be defined as the movement between two equally important pitches. This can happen at the melodic level between two tones or at the harmonic level between inversions of chords. It differs from a wave because a wave utilizes up and down motion *around* one or more focal pitches; oscillation operates either up and down *between* pitches. This concept resonates with the notion of upper and lower neighbours; however, the back and forth (up and down) motion needs to occur more than once. The simplest example may be a trill.

Below in Example 3.1, the right hand of Chopin's *Nocturne Op. 15, no. 1* functions as an oscillation between the inversions of the *f*-minor harmony. The first articulation is sounded with an A $\flat$ and F, which proceed to a simultaneous C and A $\flat$ (operating above the initial pitches) and then returns to the original A $\flat$ and F pitches.

Figure 3.13: Oscillation of Chord Inversions, Chopin: *Nocturne Op. 15, No. 1*,



Additionally, similarly to a wave, oscillation can also be produced as a result of the establishment of a focal pitch, which is then abandoned and returned to in a focal pitch/non-focal pitch/ focal pitch manner. In other words, the departure away from, and the return to, creates a motion congruent with the notion of moving between two points in

¹⁰⁴ Frederic Chopin, "Nocturne Op. 15, No. 1," *Complete Preludes, Nocturnes and Waltzes: For Piano*, edited by Rafael Joseffy (New York: G. Schirmer, Inc., 2006), p. 78.

an alternating fashion.¹⁰⁵ As observed from the discussion above, oscillation facilitates the inclusion of a metaphor that recognizes the repeated motion between two particular tones.

(c) *Orbit*

Orbit differs from that of wave or oscillation structures because it deals with harmonic motion, not melodic.¹⁰⁶ My methodology for orbit is similar to Toch's "encircling approach" and the use of neighbouring pitches that "encircle the harmonic main tone before hitting it."¹⁰⁷ The harmony from which the orbit is based (referenced) can be established following the orbital process, or the orbital pitches can be presented before the stability goal is referenced.¹⁰⁸

An example from the physical domain, from which I map of this metaphoric construct, aids in a conceptualization of a musical orbit. Figures 3.13 to 3.15 represent the domain mapping conceptualization that has produced this metaphor. In these figures, objects encircle a "larger mass"¹⁰⁹ through the force of gravity (inherent magnetism to larger objects). The larger mass exerts a force of attraction, which results in the smaller mass objects establishing a curved path around the larger mass object. In music, the "object of mass" (i.e., larger mass) asserting the "pull" is the prevailing harmony. Thus, the pitches that encircle the stable harmony can be interpreted as orbital pitches. The attraction from the orbital pitches to the stable harmony does not require a certain direction; however, it usually arises from stepwise motion. For example, the harmony D,

¹⁰⁵ In a similar manner, we may further this conceptualization of oscillation to also apply to Alberti-bass figures.

¹⁰⁶ I recognize that harmonic motion produces certain voice-leading tendencies in common-practice music that may or may not be melodic in function.

¹⁰⁷ Ernst Toch, *The Shaping Forces in Music: An Inquiry Into the Nature of Harmony, Melody, Counterpoint, and Form*, (New York: Criterion, 1948), p. 118.

¹⁰⁸ This differs from Toch's approach in that the orbit must come before the sounding of the harmonically predominant pitches.

¹⁰⁹ The size of the mass in these examples is contextual.

F, A could orbit C, E, G with the orbital pitch of D of the first harmony going either to C or E.

Figure 3.14: Conceptualization of Orbit

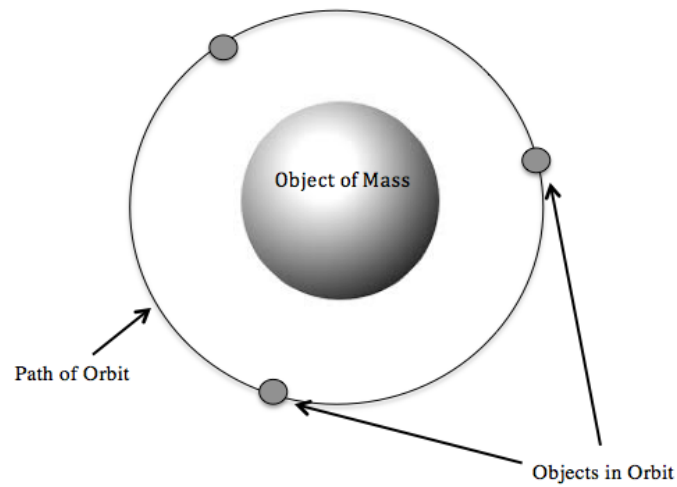


Figure 3.15: Mapping Orbit from Physical to Musical Domain

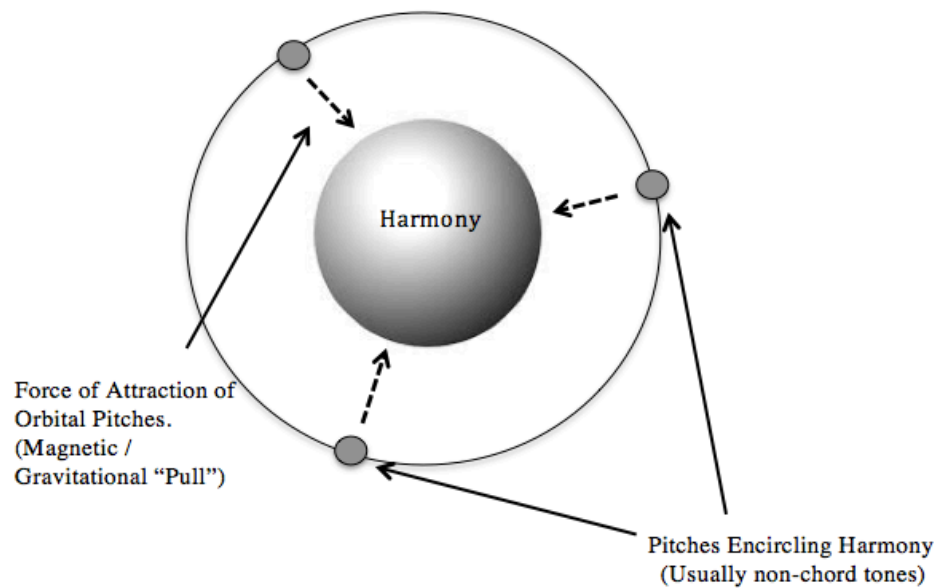


Figure 3.16: Example of a Pitch Construct for Orbit¹¹⁰

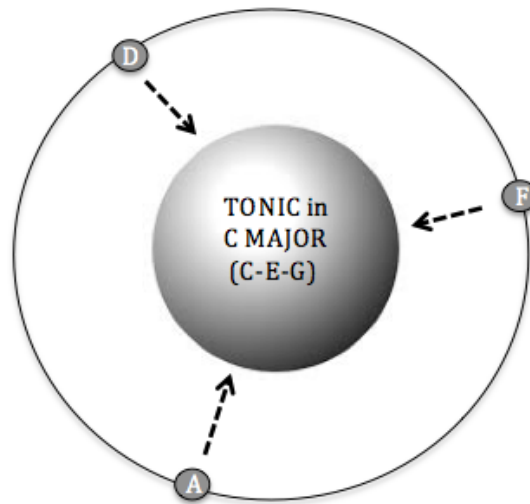
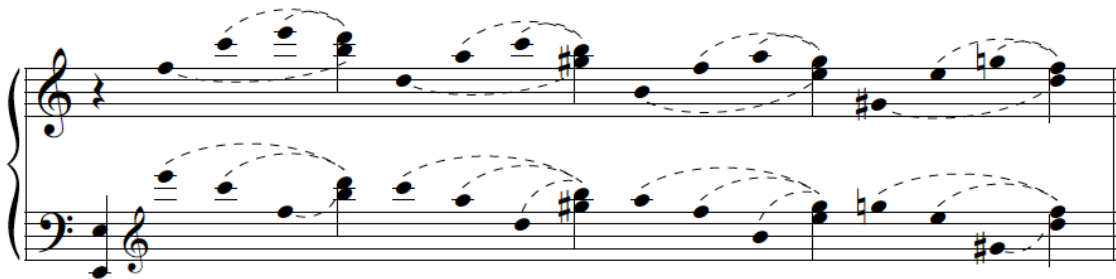


Figure 3.16 presents a visual schema for the identification of the orbit metaphor. For notational purposes, the dotted lines mark the orbital pitches (unstemmed), as they relate to the primary pitches (stemmed), through a metaphor of orbit.

Figure 3.17: Analysis Example (Notational Representation) of Orbit



I also adopt the premise that all waves are orbits, but not all orbits are waves (as can be noted in Figure 3.17). This arises out of simplicity since we can perceive a “wave” as more of a melodic (voice leading) event, whereas the concept of “orbit” is produced from a harmonic process. Perhaps in the simplest terms, orbit may be conceptually understood similarly to the double-neighbour figure. With the inclusion of the orbit

¹¹⁰ Not all possible encircling tones are included in this figure.

metaphor, I maintain that we may further account for a musical conceptualization that would be unrecognized within Larson's model.

As a summary of the above presentation on expansion metaphors that are outcomes of magnetism, I have selected an example that combines the metaphors into one passage or one measure (see Figure 3.17). Figure 3.17 includes examples of the wave and oscillation figures. Additionally, we may apply the third metaphor to describe the motion of the bass voice. Orbit occurs as the articulation of I (C-E-G)-V (G-B-D)-I (C-E-G) with the tonic harmony being the mass which the pitches of the V harmony orbit. As a result, we, as listeners, can interpret musical processes in this excerpt as multiple metaphors.

Figure 3.18: Wave, Oscillation, and Orbit Combined, Mozart: *Sonata in F major*, K. 332/III, mm. 65-66.¹¹¹

The figure displays two musical staves for measures 65 and 66 of Mozart's Sonata in F major, K. 332/III. The top staff, labeled 'Piano', shows the original notation with annotations: 'Wave: G Focal' above the first measure, 'Oscil.: F-G' above the second measure, and 'Orbit: G+ to C+' below the second measure. The bottom staff, labeled 'Analysis', shows the same measures with annotations: 'Wave' above the first measure, 'Oscil.' above the second measure, and 'Orb.' below the second measure. Dashed lines in the Analysis staff illustrate the harmonic movement and the 'Orbit' concept.

¹¹¹ W.A. Mozart, *Nineteen Sonatas for the piano, Book I*, edited by Richard Epstein (New York: G. Schirmer, Inc., 1918), p. 13.

As presented above, metaphors that develop as outcomes of the force of magnetism are perceivable within the tonal music repertoire. My expansions aim to refine the metaphors to highlight the subtleties of certain musical processes. Through conceptualizations of wave, oscillation, and orbit, we are able to map physically perceivable events in music.

2. Arising from Inertia

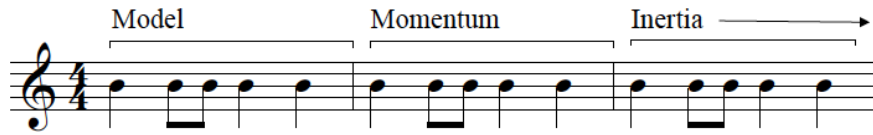
In conceptualizing the force of inertia, one main factor seems apparent; we understand inertia simply as a continuation of “the same.” Few scholars have discussed the actual process of inertia itself. It seems evident that there must be a musical operation between the original statement and the realization of inertia. Namely, inertia does not “just happen;” it is a process.¹¹² As a result, I propose an additional metaphor that operates not as a force itself, but acts in support of a force. Momentum describes the process through which inertia is conceptually realized as a process.

(a) Momentum

Rhythmic inertia is the main force concept that utilizes the metaphor of momentum. The idea of momentum is conceived through the inclusion of ideas from Hasty’s model of projection. In order for a rhythmic event to have inertia, I propose that the music must: (1) establish the model; (2) repeat itself so we can conceive of the continuation of “the same” (momentum); and (3) continue, and as a result, commence inertia. Here, the momentum is the realization of a projection (the initial model), which establishes the continuation. Figure 3.18 shows the manner in which momentum is utilized.

¹¹² The process of “becoming” was highly influential in Romantic thought, and furthermore many scholars dealing with rhythm and meter attribute the articulation of groupings through a series of processes.

Figure 3.19: Momentum as Process



Thus, momentum is a concept that can be understood as the middle segment of the process of inertia. A model is established, gains momentum through repetition, and is continued through inertia.

3. Arising from Gravity

Final expansions arise out of a lack of supplementary terms within the notion of gravity. These seek to account for ideas of both trajectory of tones through musical space and issues of the ascent. Trajectory can be summarized as the path of an object (tones) through space and time, while ascent can be understood as a motion contrary to the gravitational process in which tones are directed “up” rather than “down.” Although these additional metaphors are recognized as important in terms of an expansion of this model, their respective features are beyond the scope of this thesis and cannot be fully addressed.

Analytical Considerations

In this largely metaphoric study, it seems that we often *talk* about metaphoric forces rather than *produce* sketches or analyses that are consistent with the theory. However, I am attempting to change this approach, as I see a great value in putting these metaphoric processes to work on the manuscript page. As a result, I propose a way to visually represent musical motion as metaphors.

Notation

As mentioned in the introductory chapter, one of the primary goals of this study is to expand on the tools used in the representation of analytical observations through musical examples. For the purposes of this study, I have adopted a layout with three stages for the musical analyses:

- (1) The original excerpt
- (2) A voice-leading graph of a foreground, and occasionally middleground,¹¹³ levels
- (3) A musical-forces foreground and background sketch

I have chosen to include voice-leading (quasi-Schenkerian) analysis because Larson argues convincingly that this tool is useful to show processes in musical excerpts. In addition, the repertoire analyzed in my study is tonal, the repertoire most suitable for Schenkerian analysis. Moreover, Schenkerian analysis integrates the concept of organicism as one of its primary elements and organicism involves motion in music. The three stages outlined above are useful to show how hierarchical tonal structures and processes overlap with musical forces. The hierarchies included in the voice-leading sketches largely correspond and relate to the musical forces themselves.

The score analyses, as presented in the appendices, are formatted as layers with musical forces labeled as required. In this layout, the original passage appears on the lower staff (if just orchestra) or staves (if orchestra and piano). Systems 4 and 5, labeled as Voice-Leading (Middleground) and Voice-Leading (Foreground), respectively, provide a voice-leading sketch of the musical material. Moreover, in the upper three systems, I present the score with labels and graphics to represent various musical forces

¹¹³ My conception of a “middleground event” in this model, would best be compared to a reduced foreground sketch in the traditional Schenkerian approach, however, due to the perceptual level, I do believe that more local events, in terms of structural hearing, operate on a level that is congruent with Schenker’s notions of a middleground.

at play. As with the voice-leading sketches, the forces operate at both the foreground and middleground level, which are separated by a staff depicting rhythmic processes.

Labeling Conventions, Notation Legend, and Layout Schema

Table 3.2 provides a summary of the symbols used in my analyses: the concept or force in the first column, the notational symbol in the second column, and a descriptor of the symbol in the third column. Table 3.3 lists the abbreviation used in the analytical chapters.

Table 3.2: Legend for Notation

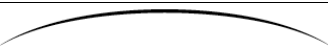
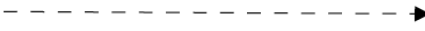
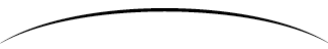
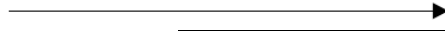
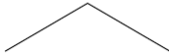
Concept / Force	Symbol/ Notation	Descriptor
Gravity		Solid Line with Arrow showing direction
Rhythmic Gravity		Vertical “V” (Up-bow) which designates the “landing” of the process
Magnetism		Solid Curved Phrase Line
Inertia (Rhythmic)		Square Solid Bracket with Label (Model, Momentum, Inertia)
Inertia (Melodic)		Dotted Line with Arrow
Orbit		Dotted Curved Phrase Line
Friction	Fric. 	Trill Figure with Label (Fric.)
Repulsion	 R	Solid Curved Line with Label (R)
Acceleration	Accel. 	Solid Line with Label (Accel.)
Oscillation		Triangular Bracket

Table 3.3: Analysis Abbreviations

Symbol / Sign / Abbreviation	Meaning
O	Original
V.L. (MG)	Voice Leading (Middleground)
V.L. (Local)	Voice Leading (Local)
Orch.	Orchestra
FP	Force Profile
32.1 [x.y]	In reference to measure number (x) and beat number (y). For labeling location of processes within the score.

Concluding Remarks

In this chapter, I have outlined the model that I apply to the case studies in Chapters 4 and 5. By describing the role of metaphor, specifically conceptual metaphors, I have shown the way in which we are able to map and describe physical forces to the realm of music. Through this application, we are able to describe musical forces in a dynamic and energy-laden manner, which fundamentally reflects the way in which we perceive and conceptualize motion in music. I further explored concepts surrounding Larson's model, which mainly concerned his metaphors of stability, gravity, inertia, and magnetism. I also discussed expansions of Larson's model as two distinct categories: force and non-force expansions. I proposed expansions through terms, such as repulsion, friction, wave, oscillation, orbit, momentum, trajectory, and ascent. Lastly, I reviewed tools to graphically represent musical motion as metaphors.

Chapter 4 : ANALYSIS: Mozart *Piano Concerto in D minor, K. 466*

In this chapter, I analyze selected excerpts from Mozart's *Piano Concerto No. 20 in D minor, K. 466*, composed in 1785, to show the realization of musical forces within the Classical style. I divide this chapter into five subsections. I begin with a brief overview of general characteristics of the classical style, followed by a short summary and contextualization of Mozart's *Piano Concerto* to highlight the date of composition, formal design, and several scholars' comments in relation to the work. I then analyze and discuss select excerpts to show the application of the model. Finally, I end the chapter with concluding remarks.

4.1: The Classical Style

Specific stylistic characteristics common to the Classical era, often described as the period of time between ca. 1750 and 1820, have been discussed extensively by scholars such as Charles Rosen, Donald Francis Tovey, and William Caplin.¹ I focus on two main principal characteristics of the Classical era with respect to these scholars' work: phrase structure and harmonic language. This overview provides a summary of the type of musical material that can be expected within the analysis of Mozart's *Piano Concerto*, as well as a framework for recurring patterns in the Classical era.

Phrase structure in the works of Haydn, Mozart, and Beethoven serves as one of the primary characteristic of the Classical style. The Classical phrase structure is, for the most part, symmetrical and utilizes mainly diatonic harmony with very little

¹ Charles Rosen, *The Classical Style: Haydn, Mozart, Beethoven* (New York: W.W. Norton & Company, 1972); Donald Francis Tovey, *Essays in Musical Analysis: Volume 3, Concertos* (London, Oxford University Press, 1935); William E. Caplin, *Classical Form: A Theory of Formal Functions for the Instrumental Music of Haydn, Mozart, and Beethoven* (New York: Oxford University Press, 2000).

chromaticism, if any. Rosen supports this notion by arguing that “late eighteenth-century phrasing is emphatically periodic, and comes in clearly defined groups of three, four, or five measures, generally four.”² He adds, “musical ideas, rather than being persistently spun out, [are] articulated through distinct phrases.”³ This clear defining of measures, which is based on musical ideas of the same length, provides a linear conceptualization of organization that allows the work to be perceived as a continuous sounding of segments (phrases) that combine to complete a whole.⁴ This is supported in the use of what Caplin identifies as “tight-knit themes,” such as the sentence and period form.⁵

In addition to phrase structures, Classical era composers also explored and exploited the dynamic polarity of tonic and dominant sonorities.⁶ Rosen concludes that, in the Classical era, the hierarchal arrangements of triads are utilized to create stable contrasting harmonic areas.⁷ This results in minimal departures from the tonal regions of tonic or dominant key areas within smaller formal structures (e.g., phrases). With this adherence to established tonal hierarchies, recurring patterns in voice leading and harmonic progressions arise in this repertoire. We can expect to find a Classical progression beginning with a tonic function chord, followed by a pre-dominant function, additional prolongations (which can include applied chords), and then closing with an authentic or half cadence. With few exceptions to this harmonic language, the use of

² Rosen, *The Classical Style*, p. 29.

³ Ibid.

⁴ Ibid.

⁵ I do not survey Caplin’s theory of formal organization within the Classical era in detail; rather, I only borrow his understanding of phrase structures as “tight” and logically structured. For Caplin, areas of “looser formal organization” are characterized by additional repetitions (Caplin, *Classical Form*, p. 99) and cadential expansions (Caplin, *Classical Form*, p. 109).

⁶ Rosen, *The Classical Style*, p. 26.

⁷ Ibid., p. 27.

tonal harmonic functions and tones prevails, which creates logical and identifiable voice-leading patterns and structure.

The phrase structures and harmonic patterns described above account for much of the musical organization in Mozart's works. As a result, I focus on these characteristics as they relate to my analysis of his *Piano Concerto*. Furthermore, these conceptions offer a basis on which to frame my metaphoric analysis.

4.2: Mozart's *Piano Concerto No. 20 in D minor, K. 466*

Mozart composed many concertos for the piano, most of which are staples of the concert pianist's repertoire. In January of 1785, he began work on what would be one of his most famous concertos: *Piano Concerto No. 20 in D minor, K. 466*.⁸ He completed the *Concerto* on 10 February 1785, the day before it premiered.⁹ For the Classical concerto style, Mozart's music epitomizes the evolution of the form. Veinus notes that "each of the three piano concertos composed in 1785 are among the greatest masterpieces of the form."¹⁰ The first movement, for example, makes use of the concerto-sonata procedure.¹¹ This form can be summarized as a soloist articulating a structure similar to a sonata (i.e., exposition, development, and recapitulation) with orchestral interruptions (ritornellos) between solo sections. Furthermore, referring to the *Piano Concertos* of 1784-86, Roeder argues that "the relationship between the soloist and the orchestra is finally fully integrated... the two become an organic whole."¹² This observation highlights the role of the orchestra moving from an accompaniment figure to one of more

⁸ David Grayson, *Mozart Piano Concertos No. 20 and 21*, (Cambridge: Cambridge University Press), p. 3.

⁹ Ibid.

¹⁰ Abraham Veinus, *The Concerto* (New York: Dover Publications, Inc., 1944), p. 118.

¹¹ Michael Thomas Roeder, *A History of the Concerto* (Portland: Amadeus Press, 1994), p. 128. See Caplin, *Classical Form*, Chapter 17 on "Concerto Form" for more information on the Classical Concerto Form.

¹² Roeder, *A History of the Concerto*, p. 154.

prominence, primarily through thematic material. Veinus also maintains that the work can be identified as contemporaneous of the spirit of the time, a comment that reflects the classical nature of the work (i.e., its musical content keeps with the established compositional style).¹³

The formal organization of this *Concerto* plays a primary role in selecting excerpts for the analysis of metaphoric forces. I borrow Grayson's formal layout and organization scheme as a starting point for my analysis. Figure 4.1 reproduces this formal outline with thematic areas clearly identified. Grayson also provides a summary for the identification of the thematic areas. I focus on many of these thematic areas for my application of musical forces. This summary also highlights the continued use of thematic material (Themes 1, 2, 3, 4, 5, and 6) from the first ritornello (R1) to successive statements. Most of the thematic content of this *Concerto* is therefore be derived from the first ritornello statement.

¹³ Veinus, *The Concerto*, p. 119. For this reason, among others, this serves as an excellent case study for the Classical style.

Figure 4.1: Formal Layout of Mozart's *Piano Concerto No. 20 in D minor, K. 466*¹⁴

RITORNELLO													
<i>R1</i> (76 bars)													
bar	1	16	28	33						44	71		
theme	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>						<i>5</i>	<i>6</i>		
key	d												
EXPOSITION													
<i>S1</i> (97 bars)										<i>R2</i> (18 bars)			
bar	77	91		108	115	127	143	153	174			186	
theme	<i>N</i>	<i>1</i>		<i>3</i>	<i>4</i>	<i>D</i>	<i>E</i>	<i>5'</i>	<i>2</i>			<i>6</i>	
key	d					F			F				
DEVELOPMENT													
<i>S2</i> (62 bars)													
bar	192	202	206	216	220	232	236	240	250				
theme	<i>N</i>	<i>1</i>	<i>N</i>	<i>1</i>	<i>N</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>2'</i>				
key	F		g			E♭ → f → g → V/d							
RECAPITULATION													
<i>R3 S3</i> (7 bars + 95 bars)										<i>R4</i> (10+32 = 42 bars)			
bar	254	261	269	281	288	302	318	330	356	365	366	384	390 - 394
theme	<i>1</i>		<i>2</i>	<i>3</i>	<i>4</i>	<i>D</i>	<i>E</i>	<i>5'</i>	<i>2A</i>	cadenza	<i>5</i>	<i>6</i>	<i>1' & 2'</i>
key	d												

Although several scholars have studied this work, the piece has not been approached using a distinctly energetic model. My analysis, as a result, offers an approach that focuses on interpreting the work through metaphoric forces.

4.3: Analysis

For the analysis, I select five excerpts to show how this *Concerto* can be interpreted through metaphoric forces (see Table 4.1).¹⁵ Table 4.1 includes the labels that

¹⁴ Grayson, *Mozart Piano Concertos*, p. 34.

¹⁵ Although I acknowledge the presence of musical forces within all three movements of this concerto, I focus on solely thematic musical material from the first movement.

I use in my analysis, the measure numbers, and general comments on metaphors and special features for each excerpt. These are discussed in greater detail in the following paragraphs. As mentioned before, these excerpts focus primarily on thematic material.

Table 4.1: Select Excerpts from Mozart *Piano Concerto No. 20 in D minor, K. 466*

Title	Measures	General Comments (Theme, Key, Forces, etc.)
Score Analysis 4.1	1-16	Ritornello 1, Theme 1, Main Features and Metaphors: • Local gravity through voice-exchange • Gravity punctuating cadence/phrase endings • Rhythmic inertia of syncopated harmonic accompaniment • Melodic inertia and magnetism articulating ascent figures • Double-neighbour orbits • Friction
Score Analysis 4.2	16-32	Ritornello 1, Theme 2 and 3 Main Features and Metaphors: • Thwarted gravity and gravity punctuating local stability • Melodic inertia versus sequencing • Rhythmic inertia • Friction • Magnetism through wave, orbit, and oscillation metaphors
Score Analysis 4.3	33-44	Ritornello 1, Theme 4 Main Features and Metaphors: • Gravity • Melodic inertia through Linear Intervallic Pattern's (LIP's) • Magnetism through passing motion
Score Analysis 4.4	44-58	Ritornello 1, Theme 5 entrance Main Features and Metaphors: • Gravity from register shifts • Rhythmic inertia at phrase endings • Rhythmic gravity displacement • Orbit
Score Analysis 4.5	77-91	Piano Solo Entrance Main Features and Metaphors: • Gravity and melodic inertia linked • Acceleration

In my discussion of metaphoric forces in the *Concerto*, I describe metaphors in groups that share common features.¹⁶ For each excerpt, I focus on particular occurrences of forces, instead of undertaking a detailed complete chronology of the piece through specific passage(s). In doing so, I provide an organization of musical force events to simplify how they work within the excerpts and in general. This allows us to eventually compare metaphoric forces in two select case studies. Although I focus on specific forces within a few excerpts, the full analyses of these excerpts are reproduced in the appendices.

4.3.1: Analysis 4.1: Mozart, *Piano Concerto*, mm. 1-16

One of only two minor concertos written by Mozart, Roeder argues that “the opening of the *D-minor Concerto* establishes a quiet but tense and highly energized mood.”¹⁷ This type of description satiates the literature surrounding this concerto.¹⁸ It is evident that analysts use terms such as “energized” that function as metaphors to describe the musical processes in this work. Further examples of this language can be observed in Grayson when he explains the opening of the first movement as: “...the menacing rising ‘slide’ figure in the cellos and basses is more an ominous pulsation than a conventional melody.”¹⁹ Many performers and analysts agree with Grayson and *hear* a “rising slide”

¹⁶ As noted earlier, although I focus on select forces within a few excerpts, the full analyses of these excerpts are produced in the appendices for reference; I extract the most relevant examples from these and insert them in-text for ease of reference.

¹⁷ Roeder, *A History of the Concerto*, p. 160.

¹⁸ See for example Roeder, *A History of the Concerto*, p. 160-164; Grayson, *Mozart Piano Concertos*, pp. 31-56; and Veinus, *The Concerto*, pp. 118-120.

¹⁹ See mm. 1-16 in Appendix A for a more complete analysis of this excerpt. [Grayson, *Mozart Piano Concertos*, p. 31.]

motion in this movement through a musical figure that suggests ascending motion through a “slide.”²⁰

In this section, I examine some of the processes that result from one musical force metaphor on both local (foreground) and more global (middleground) levels. This discussion consists of general observations throughout mm. 1-16, starting with interpretations of gravity, inertia, magnetism, and orbit.

Applying the theory of musical forces to this passage provides the tools to describe how motion, such as gravity comes into play in the cadential descent and at other local events. Further observations include inertia, created through the presence of repeated rhythmic figures. Additionally, the use of continued directional lines,²¹ interpreted as melodic inertia, as well as melodic magnetism and orbit, associated with the voice leading of the changing harmony. All of these musical forces occur over the stable reference platform of tonic in d minor with $\wedge 1$ (D), $\wedge 3$ (F), and $\wedge 5$ (A).²²

4.4.1: GRAVITY

Gravity operates on two levels in mm. 1-16 - local (foreground) and global (middleground) - and arises in both melodic and rhythmic forms. Here, I focus on two main occurrences of gravity. The first, at the local level, involves the repetition of a voice exchange that results in the melodic descent from less stable tones to tones that belong to the stable platform (m. 3 and m. 7), as can be seen in Figure 4.2. In these two examples, through a voice exchange of treble and bass voices, the treble voice descends to a pitch of stability. In m. 3 (Figure 4.2a) F moves to D ($\wedge 3$ - $\wedge 1$), while in m. 7 (Figure

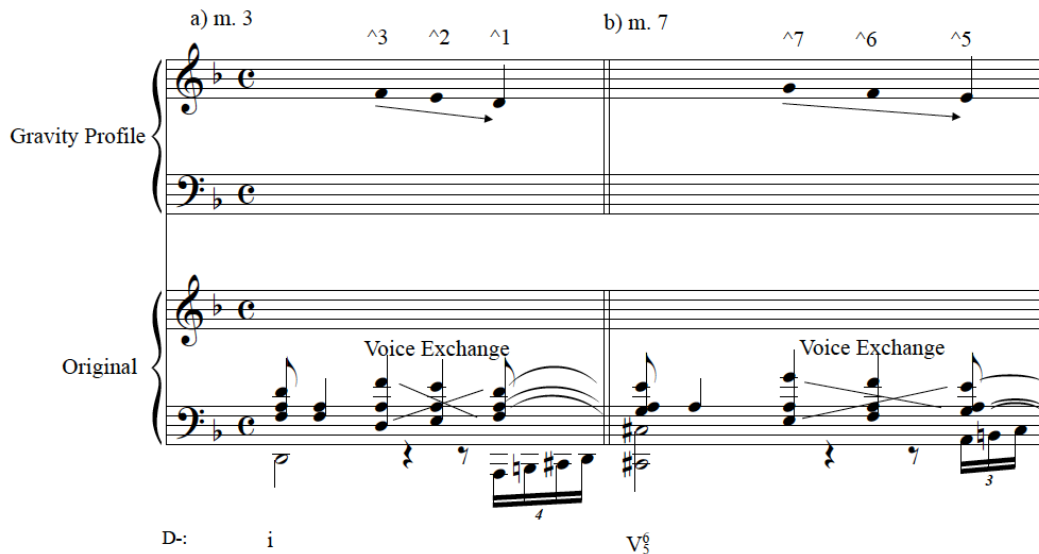
²⁰ It is not my intention to define the metaphor of slide here, but rather to acknowledge the language used when describing this piece while focusing on the other musical forces present in this excerpt.

²¹ By “continued directional lines,” I mean the continuation of either an ascending or descending motion in the same direction.

²² Refer to Analysis 4.1 of Appendix A for the full analysis of musical forces for mm. 1-16.

4.2b) the same pattern results in a descent from G to E ($\wedge 7$ - $\wedge 5$). The force of gravity in m. 7 further continues and extends to $1^\wedge$ in *d-minor* on the downbeat of m. 8 (see Appendix A 4.1).

Figure 4.2: Mozart, Local Gravity, m. 3 and m. 7



Gravity also plays a central role during the cadential process in mm. 14-16 (see Figure 4.3). However, to arrive at this descent, the melody must rise from its original octave D's (D_2 , D_3 , and D_4). This ascent spans mm. 8-14 with its culmination in the sounding of E_5 in its upper-most voice (m.14), which falls to D_5 ($\wedge 1$) in m. 14.1 and then continues to descend to its original voicing of D_2 , D_3 , and D_4 . This descent punctuates the cadence and represents a return to the original pitch, creating a sense of completion in terms of melodic motion.

Figure 4.3: Mozart, Middleground Gravity, mm. 1-16



Through the processes described above, we can conclude that gravity as a musical force operates at both local and middleground levels in mm. 1-16. Gravity accounts for the descending melodic motions within the example and also punctuates the perfect authentic cadence (PAC) of mm. 14-16. Although gravity is a prominent force metaphor in which we are able to perceive an ascending (up) versus descending (down) motion, inertia is the force that represents the tendency for continuation of musical motion in similar patterns.

4.4.2: INERTIA

Inertia serves two primary functions in mm. 1-16: (1) to continue the rhythmic processes established in the treble and bass voices, and (2) to continue the ascent of the melodic lines. Rhythmic inertia occurs through the continuation of the upper strings (violins and viola) syncopated rhythm (see Figure 4.4).

Figure 4.4: Mozart, *Piano Concerto No. 20*, K. 466, mm. 1-4²³

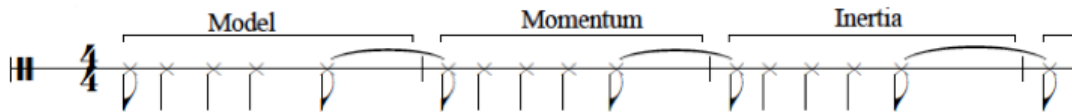
The image displays a musical score for the first four measures of Mozart's Piano Concerto No. 20, K. 466. The score is written for four parts: Violino I, Violino II, Viola, and Violoncello e Basso. The key signature is one flat (B-flat major or D minor) and the time signature is common time (C). The first measure shows a syncopated rhythmic pattern where the upper strings (Violino I, Violino II, and Viola) play a quarter note on the offbeat, followed by a quarter rest, and then a quarter note on the downbeat. This pattern is repeated in the subsequent measures. The Violoncello e Basso part has a more active bass line, featuring a syncopated rhythm with a quarter note on the offbeat, a quarter rest, and a quarter note on the downbeat, followed by a triplet of eighth notes.

The first syncopated rhythmic figure (m. 1) sets up a projection that is realized through subsequent repetitions of the figure. This rhythm remains active for the full sixteen measures. The regularity of quarter-note values sounding on the offbeat produces the model, and the repetition creates a metric stability because it shifts the expectations of

²³ W.A. Mozart, *Wolfgang Amadeus Mozarts Werke, Serie XVI: Concerte für das Pianoforte, Band 3, No. 20* (Leipzig: Breitkopf & Härtel, 1878), p. 181.

the listener to align with the offbeats. This inertia is structured under groupings of four quarter notes sounding on offbeats (see Figure 4.4). In Figure 4.4, the model is followed by a repetition creating momentum, which is then followed by a third repetition that sets the conceptualization of inertia in motion.

Figure 4.5: Mozart, Rhythmic Inertia, mm. 1-4.1



The second way in which inertia operates on a rhythmic level is through the repetition of a sixteenth-note triplet to quarter-note/half-note figure (see the cello and bass staves in mm. 1-3 of Example 4.1). The concept of “same” in this instance describes an ascent from a lower pitch through a sixteenth-note figure (often using a triplet, either triplet or quadruplet) to a note of longer duration, usually a half or quarter note.

Furthermore, melodic inertia (coupled with magnetism) describes the ascent of mm. 9-14.1 by continuing the process of upward motion through groups of three pitches (see Figure 4.5). In Figure 4.5, one can perceive how the ascent through inertia in three-note groupings is carried through the entirety of mm. 9-14.²⁴

Figure 4.6: Mozart, Melodic Inertia, mm. 9-14



²⁴ I recognize that the F# in m. 11 is lower (descends) than the previous measure; however, the three-note grouping ascends with its starting pitch simply shifted.

4.4.3: MAGNETISM

In mm. 1-16, the force of magnetism becomes apparent through the voice leading, more specifically through the prominence of the semitone motion created through resolutions to the nearest local stable pitches. This occurs primarily in mm. 9-10, 11-12, and 14-15 (see the Musical Forces middleground graph of Score Analysis 4.1). In these measures, we can observe the following: the F $\sharp$ in m. 9 is attracted to the G in m. 10 and functions as a passing tone between the E to G motion, as is the case for the G $\sharp$ in m. 11 to A in m. 12, as well as C $\sharp$ in m. 13 to D in m. 14.

Furthermore, melodic magnetism is a recognizable force within the prominent sixteenth-note triplet figures in the bass and cello voices in this excerpt. In relation to melodic magnetism, this figure is often attracted to $\wedge 1$ (D), and in other instances $\wedge 1$, $\wedge 3$, or $\wedge 5$ of the local harmony. For example, in m. 3 the A in the bass ($\wedge 5$ of the *d-minor* harmony) moves to E, which is $\wedge 5$ of the *A-major* harmony sounded in m. 4; thus, the attraction is not based in *d-minor*, but rather the temporary harmony of *A-major*. The last pitch of the sixteenth-note (grouped-triplet) figure exerts the highest amount of magnetic attraction because it is the closest to the stable pitch by either a semitone or a whole tone. However, the motion of the other tones of the sixteenth-note figure can also be interpreted as magnetism since they are connected or grouped with the last sixteenth note. In other words, they sound as part of the process that is moving closer to the stable tone. As we will recall from our definition, a melodic-magnetism attraction grows stronger as we approach the goal (tone of stability); therefore, the strength of magnetism over the course of the gesture increases. In the case of mm. 1-2, the A is the furthest tone and

exerts the weakest force of attraction²⁵ to the D, followed by B $\natural$, then finally C $\sharp$ to D which yields the strongest force of attraction as the raised seventh (leading tone) of the key. Thus, with the sixteenth notes being connected metrically, we interpret the figure as one magnetic movement to the D that grows stronger as we approach it.²⁶

Metric magnetism also exists within this passage, perhaps most overtly within the cello and bass parts through the use of the sixteenth-note/tuplet figure. Here, the duration of beat 4 of m. 1 and m. 2 is attracted to the downbeat (more stable beat) of the next measure (m. 2 and m. 3). This results from the quicker duration of the triplet rhythm that moves to a half note, which creates a durational accent. The downbeat, as a longer duration, thus acts as a resting point for the motive, until the process begins again.²⁷ In other words, the triplet figure occurs on a very unstable beat (the second half of beat 4), which leads to the beat with the most stability, beat 1.²⁸ This rhythmic figure continues in much the same manner for the duration of mm. 1-16.

4.4.4: ORBIT

The non-force metaphor of orbit results from an appoggiatura-like (or double-neighbour motion) figure, and is present in mm. 9-13. In this case, both pitches (upper and lower) orbit a main harmonically functional pitch, which is supported by metrical stability arising from a durational accent. As a result, two orbital pitches encircle the last pitch of the grouping. Scale degrees 5 and 7 above the bass voice encircle $\hat{6}$. In Figure

²⁵ Although the Dominant-Tonic magnetism that is inherent in the tonal language could be included in the discussion, by choosing a B $\natural$ instead of a B $\flat$, Mozart has already set up a V-I-like system of *A-major* moving to *d-minor*.

²⁶ This is also aided by the tempo of the piece, which suggests that listeners would not hear the individual tones of the sixteenth-note gesture, but rather the movement or attraction between the tones and their relationship to the downbeat of the next measure.

²⁷ This could also be identified as rhythmic gravity.

²⁸ Furthermore, in the Classical repertoire, this beat 4-1 (weak-strong beats) often serves as an anacrusis (pick-up), creating an inherent motion of magnetism within this gesture.

4.6, the dotted curved lines support this by showing that the first two pitches “encircle” the third pitch (stemmed). The stable pitch is then repeated to become the first pitch orbiting a new stable pitch. This process reoccurs as a 6-6-6 linear intervallic pattern (LIP) with the bass, which creates expectations, and through inertia continues for mm. 9-14.

Figure 4.7: Mozart *Piano Concerto in D minor*, K. 466, mm. 9-14 Orbit Example

The figure shows a musical score for measures 9-14 of Mozart's Piano Concerto in D minor, K. 466. The score is written in treble clef with a key signature of one flat (B-flat). The measures are numbered 9 through 14. Dotted curved lines connect notes across measures, illustrating an orbiting harmonic pattern. The notes are as follows: Measure 9: G4, A4, Bb4, C5, D5, E5. Measure 10: F5, G5, A5, Bb5, C6, D6. Measure 11: E6, F6, G6, A6, Bb6, C7. Measure 12: D7, E7, F7, G7, A7, Bb7. Measure 13: C8, D8, E8, F8, G8, A8. Measure 14: Bb8, C9, D9, E9, F9, G9. Chord symbols are provided below the notes: ii₃⁶, V₃⁴/iv, iv⁶, iii⁶/₅, V₅⁶/V, V₅⁶, i, V₃⁴, and i⁶.

4.4.5: FRICTION AND ACCELERATION

Friction also occurs within this passage through a cadential process and a slower harmonic rhythm in mm. 14-16 (see Score Analysis 4.1). In these measures, quarter notes replace the sixteenth-note motive in the bass voice, which gives the perception of motion slowing down. It is no longer a quick ascending figure, but rather longer durations that punctuate the arrival to the pitches of harmonic importance.

Furthermore, we can perceive an acceleration in harmonic rhythm with the increased occurrences of this figure in mm. 8.4-14.1. As a result, mm. 9, 11, and 13 reproduce the figure at twice the rate as compared with the opening measures (mm. 1-4). Thus, this acceleration of harmonic rhythm produces an acceleration of the rhythmic forces in the celli and basses, which is fundamentally a result of metric magnetism.

As discussed above in Score Analysis 4.1 (mm. 1-16), these metaphors of musical motion are readily identifiable within a given musical context. The construct of these metaphors clearly operates at both local and middleground levels, and can often work in conjunction with one another. The main metaphors explored above highlight the manner in which a musical reading is able to utilize concepts, such as rhythmic gravity, metric magnetism, friction, orbit, and inertia to explain musical processes in Mozart's *Piano Concerto*.

4.3.2: Analysis 4.2: Mozart, *Piano Concerto*, mm. 16-32

As shown in Score Analysis 4.1, many instances of musical material can be interpreted as a network of musical forces. I now turn to mm. 16-32, the second theme, to discuss gravity, melodic inertia, rhythmic processes, and magnetism within these measures.

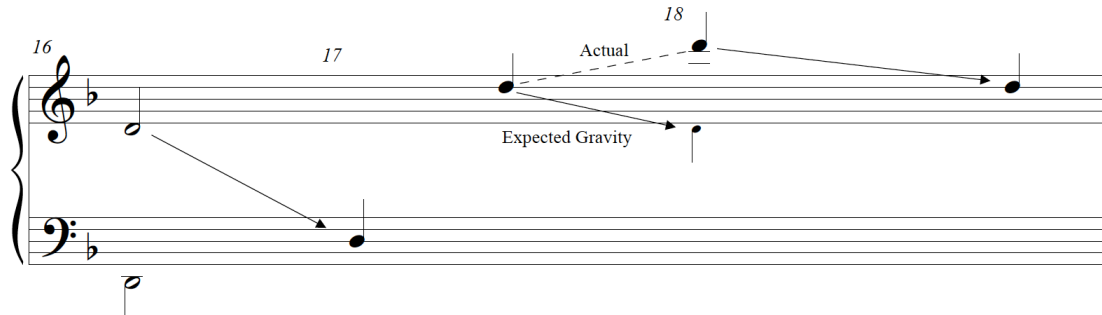
4.5.1: GRAVITY

Throughout mm. 16-32, we can perceive instances of musical motion as the force of gravity on both the local and middleground levels. In my complete sketch (Score Analysis 4.2 in Appendix A), one can notice the prevalence of gravity as motion, especially in mm. 18-20.4 and mm. 25-32.

Although most instances of gravity as musical motion are straightforward in the second theme, in mm. 16-18.1, gravity is thwarted due to a register transfer (see Figure 4.7). The prevailing tuplet-quarter-note gesture sounds in multiple registers in this passage, and with its repetition, we, as listeners, establish a set of expectations. For example, as shown in m. 16 of Figure 4.7, we hear the articulation of D_4 on beat 3, followed by D_3 on beat 1 of m. 17. This descent from D_4 - D_3 on beats 3 and 1,

respectively, creates an expectation when we hear the D_5 on beat 3 of m. 17. With this sounding, we expect to hear another D on beat 1 of m. 18, which is an octave lower (D_4), as established previously in mm. 16-17. However, instead of the realization of D_4 on beat 1 of m. 18, the gesture ascends an octave to D_6 and gravity is thwarted.

Figure 4.8: Mozart, Thwarting of Gravity, mm. 16-18.1



Furthermore, in many instances, the force of inertia aids gravity in continuing the descent of tones past their primary points of stability to “land” on a tone belonging to the subsequent harmony. As inertia continues the process through the first stability point, our context of stability then changes with the harmony, which we hear as a platform shift (see mm. 18-21.1 in Figure 4.8). In Figure 4.8, the descent through chordal skips within each bar occurs over a local harmonic stability platform (one harmony per measure). However, when we move from the individual measure level to the higher level, we can hear inertia continuing the descent past its point of stability (beat 4 of each measure) to the downbeat of the next measure. This makes the process of gravity continuous through the four measures above as the platform repeatedly shifts. In this example, we can also observe gravity not only in the individual measures, but also in the descent of the voice leading from measure to measure. Here, a descent from D to A occurs through stepwise motion on the downbeat of each measure: D in m. 18, $C\sharp$ in m. 19, $B\flat$ in m. 20, and A in m. 21. Furthermore, the importance of the force of rhythmic gravity to the shift in

platform, which aids in the continuation, results through the forces that are drawn to the downbeat. Moreover, if we remove the registral shifts, the descent at the middleground level supports this interpretation through D - C $\sharp$ - B $\flat$ - A. This process produces the shift from a tonic prolongation in mm. 16-20 to a dominant prolongation of *A-major* in mm. 21-32 (ending with a half cadence).

Figure 4.9: Mozart, Gravity and Local Stability Platforms, mm. 18-21.1

D-:	i	vii ^{o6} ₅	VI ⁶	V ⁶ ₅
Stability	A	G	F	G
Platform	F	E	D	E
	D	C $\sharp$	B $\flat$	C $\sharp$
				A

4.5.2: MELODIC INERTIA

As with the first theme, we hear the continuation of a triplet sixteenth-to-quarter note gesture in the second theme through inertia. More specifically, this occurs through melodic inertia created by the triplet pattern as a repeating motion of filling in the interval of an ascending fourth. This triplet figure, which begins as triplets (mm. 16-17.4), changes to quadruplets in m. 18.4. This change, in addition to the different ending pitch (E instead of D), thwarts our expectation of the continuation of the force as we have perceived it thus far. The quadruplet gesture, after its repetition in m. 19.4, then fails to proceed in the same manner; instead, in m. 20.4, where we project an expectation of continuation, Mozart includes a descending triplet gesture, which can be identified as an

inversion to its anticipated ascending motion. Furthermore, in mm. 28-31.1, melodic inertia, through the denial of projections, is unrealized (as seen in Figure 4.9). In Figure 4.9b, we would expect a continuation of the descending-fifths sequence. However, Mozart thwarts this expectation by including ascending motion back to the starting pitch of A. This results in a non-realized force in terms of melodic inertia, but the larger process (gesture) remains confined to a standard two-measure sub-phrase, which is characteristic of the era. As a result, although the continuation of the voice leading is unrealized, the gesture conforms in relation to the expected phrase structure of the Classical era.

Figure 4.10: Mozart, Melodic Inertia mm. 28-31.1

a) Original b) Continuance via Inertia

a) D-: V i

b) Model Sequence

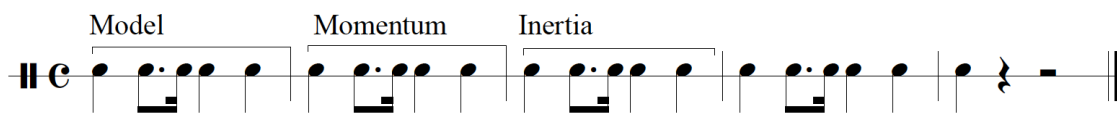
iv?

4.5.3: RHYTHMIC PROCESSES (Metric Magnetism, Rhythmic Gravity, Inertia):

Similar to the repeated offbeat quarter-note rhythmic pattern of mm. 1-16, Mozart includes continuous sixteenth notes in the bass voices of mm. 16-21, which only cease at the arrival at the half cadence in m. 21; this cadence is followed by a linking motive in mm. 23-24. In mm. 25-32, eighth notes replace the sixteenth notes. These two instances (1-16, and 16-21) of rhythmic motion, which continue for an extended period, can be described as the continuation of rhythmic inertia. The process of equal-note durations

continues until a musical process stops or acts upon it. In this case, a cadential figure interrupts the continuity of the motive. Supplementary examples of rhythmic inertia occur in the melodic voices of mm. 28-32.1 through the use of a one-measure motive (see Figure 4.10). The model is repeated once to create momentum, which in turn produces expectations for its continuation or projection; this is followed by inertia, which continues the repetition of the motive. This motive is highlighted through the articulation of pitches in higher registers and the steady eighth-note bass motion as support.

Figure 4.11: Mozart, Rhythmic Inertia, mm. 28-32.1



Metric magnetism also plays a role in mm. 28-32.1. The force of metric magnetism occurs with a shorter duration, perceived as unstable, being attracted to a longer duration, functioning as a resting stability point. In the first measure of Figure 4.10, the rhythmic event of a dotted-eighth note, which moves to a sixteenth note and then to a quarter note, can be interpreted as metric magnetism since the unstable sixteenth note is drawn towards the stability of the quarter note.

4.5.4: FRICTION

Friction, a non-force metaphor, results from a deceleration in the rate of musical processes (or forces) imposed by a musical environment (or changes such as *ritardando*, *rallentando*, slower harmonic rhythm, etc.). It is apparent in mm. 18-20 because the triplet-quarter event slows from a rate of two-to-one per measure. With the quarter-note descent against the sustained sixteenth-note rhythm, listeners are now required to slow down their metrical perception from that of quick sixteenth notes to the now prominent

quarter note. Since the quarter note moves more slowly than the sixteenth notes, the perception is that motion slows down and this process can thus be identified as friction.

4.5.5: MAGNETISM

Two of the more prominent examples of magnetism within mm. 16-32 can be found in mm. 21-23.1 and mm. 28-32.1. In these two excerpts, the metaphors of orbit, oscillation, and wave can be used as tools to discuss musical motion since the tones move from points of instability to points of relative stability.

In m. 21, for example, given the local stability platform (goal and reference alphabets) of *A-major*²⁹ (the dominant), the departure from the tones A, C#, and E (^1, ^3, ^5) to Bb, D, and F (^2, ^4, ^6) are significant. However, immediately following this change, the tones are then attracted back to their original pitches by semitone, a very strong attraction. In this two-measure gesture, we can further identify three different types of magnetism as outlined in the expansion section of the methodology. Figure 4.11 shows the non-force metaphors of orbit, oscillation, and wave in one gesture.³⁰ Figure 4.11 demonstrates three ways in which we can account for the continued process of magnetism in mm. 21-23.1 of Mozart's *Piano Concerto*. The first system represents the voice-leading graph for the passage with a prolongation of the dominant harmony (V = *A-major*).

²⁹ The *A-major* reference alphabet includes A, B, C#, D, E, F#, G#, A, while the goal alphabet consists of A, C#, E.

³⁰ I preface this explanation by acknowledging that listeners may hear one of these metaphors more prominently; however, through analysis we can conclude that all are present in some form.

Figure 4.12: Mozart, Magnetism's Non-Force Metaphors: Orbit, Oscillation, and Wave in mm. 21-23.1

The figure displays three musical interpretations of a passage from Mozart's Magnetism, measures 21-23.1, for the V.L. (M.G.) part. The key signature has one flat (B-flat).

- a) Wave:** The treble staff shows a melodic line starting on A4, moving up to B-flat4 and G-sharp4, then down to F4 and E4, with a wavy line indicating the undulation. The bass staff shows a harmonic accompaniment of chords: D4-F4-A4, D4-F4-A4, D4-F4-A4, D4-F4-A4, D4-F4-A4, and D4-F4-A4. A label 'D-: V⁹' is present below the first measure.
- b) Orbit:** The treble staff shows a melodic line starting on A4, moving up to B-flat4 and G-sharp4, then down to F4 and E4, with a dashed line indicating the orbit. The bass staff shows a harmonic accompaniment of chords: D4-F4-A4, D4-F4-A4, D4-F4-A4, D4-F4-A4, D4-F4-A4, and D4-F4-A4. A label 'i.e.' is present above the last measure.
- c) Oscillation:** The treble staff shows a melodic line starting on A4, moving up to B-flat4 and G-sharp4, then down to F4 and E4, with a wavy line indicating the oscillation. The bass staff shows a harmonic accompaniment of chords: D4-F4-A4, D4-F4-A4, D4-F4-A4, D4-F4-A4, D4-F4-A4, and D4-F4-A4.

In Figure 4.11a, I have sketched how this passage can be interpreted as a wave metaphor for the first five pitches. Here, the A in the treble voice serves as the focal pitch, to which the non-chord tones of B $\flat$ and G $\sharp$ operate melodically above and below, each time returning to the primary tone of A. This ascending and descending undulation creates a sense of a wave. However, the sixth tone of this melodic group repeats G $\sharp$ when, according to the wave schema, it should produce a B $\flat$. This results in an interruption of the wave process, causing a reinterpretation of the return to G $\sharp$ as an oscillation rather than a continuation of a wave. The ability of listeners to hear this process on a larger scale (more than the five initial notes) is affected; however, at least

the first five pitches of the melodic process around the focal pitch A can be interpreted as a wave metaphor. Figure 4.11b presents the passage as an orbit figure, which highlights the harmonic prolongation. In doing so, as listeners we are more likely to hear the succession of pitches as vertical sonorities moving from one to another, instead of individual melodic (horizontal) voice-leading lines. This results in the tones B $\flat$ and G $\sharp$ operating as orbiting the A, rather than the ascending and descending melodic motion which passes through the A as in the wave metaphor. Lastly, Figure 4.11c outlines the metaphor of oscillation in both the bass and treble voices. This metaphor is the only one of the three (orbit, oscillation, and wave) that can account for the bass-voice motion. This results from the absence of a focal pitch with which pitches operate both above and below, as in a wave process; in addition, the voice leading is straightforward in that the D and F do not orbit the E, but rather are drawn through departures and returns through magnetism to their original pitches. Musical motion in mm. 21-23.1 can thus be explained through several non-force metaphors. Each of these metaphors is motivated through the inherent attractions set forth by magnetism, which ultimately accounts for how the listener interprets motion (harmonically or melodically). I suspect a more harmonically conscious listener would label the process as orbit (vertical sonorities [harmony] that encircle a main harmony or pitch), while a more melodically conscious listener would identify the process as a wave-oscillation metaphor.

Orbit also plays a prominent role in describing musical motion in the inner voices of mm. 28-32. Orbital pitches on beats 1 and 2 of m. 29 encircle beat 1 of m. 30. This is

shown in Figure 4.13, where the F and D of m. 29 orbit the E of m. 30.³¹ The orbit shifts in m. 30 so that E and C# now orbit the D of m. 31, followed by a return to the original orbit of F and D around E; these orbits create a harmonic prolongation. Furthermore, in addition to the orbit figure in the inner voices, the highest voice of Figure 4.12 can be interpreted as an oscillation because there is no central or focal pitch. For this to be interpreted as a metaphor of a wave or an orbit, a B $\flat$ would have to be included below the C#.

Figure 4.13: Mozart, Treble Orbit mm. 28-32

In summary, musical motion can be described through metaphors of magnetism in mm. 16-32. Although some processes result directly from the musical force of magnetism, others are discussed through the non-force metaphors of friction, orbit, wave, and oscillation. These metaphors allow the analyst to describe more vividly how pitches are attracted to one focal pitch or harmony.

4.3.3: Analysis 4.3: Mozart, *Piano Concerto*, mm. 33-44

Some commonalities begin to emerge in the analyses presented thus far. The most apparent may be the benefits of being able to interpret musical motion as numerous musical forces within the span of a few measures. Our perception of musical motion is

³¹ I recognize that from a voice-leading perspective a metaphor of oscillation may prove beneficial; however, I doubt that the melodic voice leading of this passage would be heard more prominently than the harmonic sonorities themselves.

not limited to isolated musical events; rather, our experience of music is infused with different motions, and metaphors give us the means to describe these events more dynamically. Measures 33-44 present us once again with an abundance of musical material on which to draw. As before, I begin with a discussion of the forces of gravity, melodic inertia, and rhythmic processes, and conclude with magnetism.

4.6.1: GRAVITY

In Score Analysis 4.3, gravity operates on both foreground and middleground levels. At the local level, in mm. 33-44, gravity can describe the descent of a chordal skip, which is frequently filled in with passing motion. In mm. 33-38, the sequence of two-measure segments transposed up by a major-second creates expectations linked to gravity. For example, in mm. 34, 36, and 38, the upper (melodic) voice first ascends an octave, and then falls a sixth to the third of the passing harmony. At the measure level, this third is reinterpreted as the seventh of the prolonged harmony, which is sounded at the beginning of the measures (see Figure 4.13a). The boxes in Figure 4.13a show the fall of the seventh, as well as the ascent to a new harmony (the downbeat of the next measure). As a result, these measures produce expectations of an octave ascent followed by a descent of a major sixth that will then ascend by semitone to the third of the prolonged harmony.

Figure 4.14: Mozart, Local Gravity mm. 33-38

a) Local Level

33

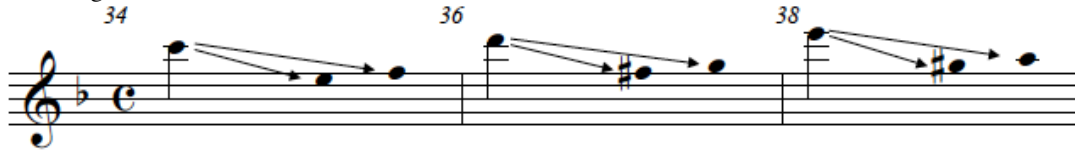
35

37

F: I vii°6 I⁶ V₄ I⁶ g: i vii°6 i⁶ V₄ i⁶ a: i vii°6 i⁶ V₄ i⁶

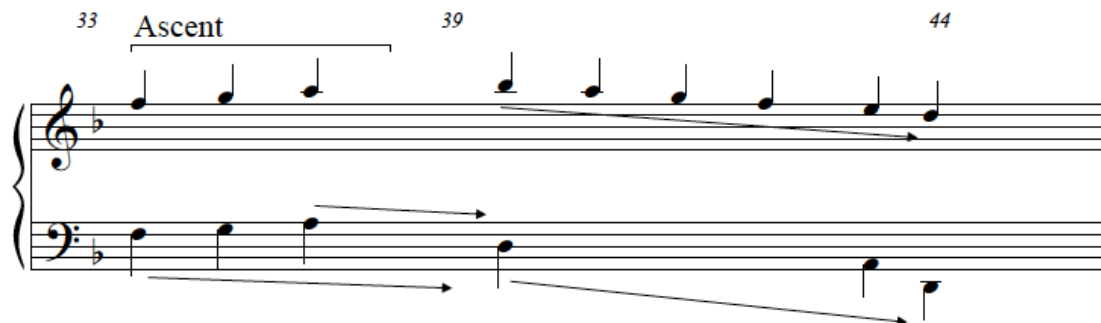
Figure 4.13: Continued

b) Middleground Level



Measures 33-44 can be interpreted as a period structure with the antecedent phrase spanning the first six measures (mm. 33-38) and the consequent the latter six measures (mm. 39-44). At the middleground level, the antecedent includes a rising melodic line through a sequence, which begins with F₅ (paired with C₅) in its highest voices and ends with B₅ in m. 39 (which can be paired with E₆ of m. 38). As one would expect with the Classical style, the phrase begins its descent in the consequent phrase (m. 39), which in this case continues until m. 44. This process of descending motion is highlighted by another sequence (both melodically and harmonically), where the melodic voice leading moves in descending stepwise motion, with an inner voice articulating an identical descent separated by an interval of a third. The stable platform from which this descent operates consists of the *d-minor* sonority. The descending motion spans a major-sixth interval in the treble voices and an octave in the lower voices (see Figure 4.14 below). Furthermore, the stepwise descent of the middleground in this section (mm. 39-44) overlaps with, at a local level, a sub-phrase also with descending motion. This alignment of both local and middleground events strengthens the perception of the descending line and thus the force of gravity.

Figure 4.15: Mozart, Middleground Gravity Sketch, mm. 33-44



As a result, we can understand the force of gravity operating at both the local (foreground) and middleground levels in mm. 33-44. As demonstrated above, the force of gravity plays a primary role in returning melodic motion to its original stability platform, which in turn provides a sense of closure for musical processes, such as form and harmony.

4.6.2: MELODIC INERTIA

In mm. 33-44, the repetition of linear intervallic patterns (LIPs) creates motion that can be described as inertia. Furthermore, due to the number of sequences in this excerpt, many instances of melodic inertia go beyond directional continuation. To be more precise, melodic inertia generally requires that the melody continue in the “same manner” as in recent memory, which usually implies a tendency to continue the direction of the melody. However, in addition to this type of inertia, the voice leading of the sequences in mm. 33-38 and mm. 39-44 also produces melodic inertia, as discussed below.

At the local level melodic inertia can be used to explain the continuation of rising thirds in mm. 33-38 as the bass (m. 33), the inner voice (m. 34), the bass (m. 35), etc. In this instance, inertia is combined with magnetism, which moves the progression from a stable harmony, through a passing chord, up to an inversion of the stable harmony.

The musical motion experienced in mm. 39-44 can be interpreted as the continuation of a gravitational descent, as discussed above. However, within the outer voices, the continuation of a repeated linear intervallic pattern (LIP) of <6-10-10-10>, which recurs twice before cadential processes interrupt the continuation, reproduces the same melodic structure as remembered in recent memory; this is done, despite any shifts in harmony, to create expectations in relation to upcoming musical material. Thus, by examining the LIPs independently of other musical parameters, we are able to clearly identify what is the “same” about the process and discuss how this motion can be interpreted as inertia.

4.6.3: RHYTHMIC PROCESSES (Rhythmic Inertia, Metric Magnetism, Rhythmic Gravity)

Musical motion in mm. 33-44 can also be interpreted from the perspective of rhythmic processes through rhythmic inertia, metric magnetism, and rhythmic gravity. Score Analysis 4.3 is marked by two rhythmic patterns (see Figures 4.15a and 4.15b). The articulation of the first rhythmic pattern (Figure 4.15a) consists of one measure of longer note values (half-note durations) followed by one measure of quicker note values (quarter- and eighth-note durations). In Figure 4.15b, the second rhythmic pattern that is presented is not “new” since it is a fragment of (a). These two rhythmic patterns permeate mm. 33-44.

Figure 4.16: Mozart, Rhythmic Patterns, mm. 33-44



From mm. 33-38, Mozart repeats rhythm 4.15(a) twice by first presenting the model, which gains momentum and then is realized as continuation by inertia. This process is thwarted in m. 39, not because of the articulation of an entirely new rhythmic event, but rather through the continuation of the second half of (a), which is identified as (b) in Figure 4.15. Both rhythmic patterns occur for six measures each and parallel the periodic structure. As such, when the change occurs at m. 39, it is not so much an ending or discontinuation of inertia, but rather the continuation of a fragment of the rhythm as heard in recent memory. Thus, since a fragment of the inertia motion from mm. 33-38 continues, albeit in a varied form in mm. 39-44, we may conclude that rhythmic inertia persists throughout this excerpt, with a minor thwarting of process in m. 39.

Metric magnetism efficiently describes the material in mm. 33-37. To remind the reader, metric magnetism is the tendency for quicker note values to be attracted to notes of longer durations. This phenomenon occurs across the barlines in mm. 34-35 and 36-37. In both cases, metric magnetism metaphorically describes the attraction of the eighth notes that move to the half notes. Furthermore, metric magnetism attracts the eighth notes to a downbeat (the most stable beat). As a result, the continuous eighth-note values in mm. 34 and 36 are ultimately attracted to the downbeat of mm. 35 and 36.

In these measures, one last example of a perceptible rhythmic force occurs in the form of a slight thwarting of rhythmic gravity. Rhythmic gravity, the force that accounts for metric patterns and rhythmic events landing on the downbeat of the measure, is left only partially realized in mm. 33-38 due to the entrance of a prominent melody on the second half of beat 1. As stated above in Figure 4.13 [Mozart, Local Gravity mm. 33-38], the entrance of the flute line (eighth notes which are stemmed up) emphasizes the

second half of beat 1, which subverts our strong notions of rhythmic gravity because it does not begin on the downbeat. Although notes are articulated on the downbeat of the measures (mm. 34, 36, and 38), the prominent entrance of a new voice on the offbeat does catch the listener's attention, and as a result, emphasizes a perceived metrical shift of the downbeat.

Rhythmic processes, as explored above, offer many insights into the musical motion that occurs in mm. 33-44 of Mozart's *Piano Concerto*. Highlighted examples include the forces of rhythmic inertia, metric magnetism, and rhythmic gravity.

4.6.4: MAGNETISM

Magnetism also contributes to our perception of musical motion in theme 4. Measures 33-44 may be interpreted as melodic magnetism, and, when coupled with the force of inertia, completes an ascending melodic motion, moving melodic tones from unstable pitches to tones with more stability. In Score Analysis 4.3, I identify melodic magnetism as a force that can be observed within two voice-leading paradigms. First, it operates through the attraction of passing tones to pitches that belong to the local tonal stability (i.e., within the harmonic context of the measure or beat). Secondly, melodic magnetism attracts lower neighbours (in this case $\wedge 7$) back to $\wedge 1$. Figure 4.16 illustrates a passing motion functioning as magnetism. In this excerpt, every measure includes examples of magnetism attracting passing tones to points of more melodic stability. This magnetism primarily occurs at the local level, and is represented by the slurs in Score Analysis 4.3. Figure 4.16 shows this prominent passing motion in the bass voices.

Figure 4.17: Mozart, Magnetism in mm. 33-34.1

The figure displays two musical staves for measures 33 and 34. The top staff, labeled 'Magnetism', shows a treble clef with a single note (F) in measure 33, followed by a whole note (F) in measure 34. The bottom staff, labeled 'Original', shows a bass clef with a whole note (F) in measure 33, followed by a whole note (F) in measure 34. Below the staves, the harmonic progression is indicated: F: I (T) in measure 33, vii° in measure 34, and I° in measure 35. A line labeled 'Stability: F+ (F, A, C)' spans the measures, indicating the stable tones in F major.

Here, the bass begins with an *F-major* chord, utilizing $\wedge 1$ and $\wedge 3$, which then proceeds to a passing chord (diminished-seventh chord), before returning to an iteration of *F-major* tonic triad, this time utilizing $\wedge 3$ and $\wedge 5$. In *F-major*, $\wedge 1$ (F), $\wedge 3$ (A), and $\wedge 5$ (C) function as the most stable tones; therefore, all other notes are attracted to F, A, and C. In this case, B $\flat$ is attracted to C and G is attracted to A. This figure of passing thirds resolving up through magnetism, supported by inertia, is a frequent motion in this excerpt and can be identified primarily as melodic magnetism. A secondary example of melodic magnetism occurs in mm. 33-34 through the use of a lower-neighbor figure. Mozart presents this figure in the treble (see Figure 4.16). Here, in *F-major*, $\wedge 1$ descends to $\wedge 7$, then returns to $\wedge 1$. This resolution of the seventh moving up can be interpreted as magnetism since $\wedge 1$ (F) functions as the closest stable pitch to $\wedge 7$ (E) through a semitone motion.

In conclusion, as with theme 2, metaphors are useful to interpret musical motion in theme 4. Gravity, inertia, rhythmic processes, and magnetism once more play a prominent role in describing this motion.

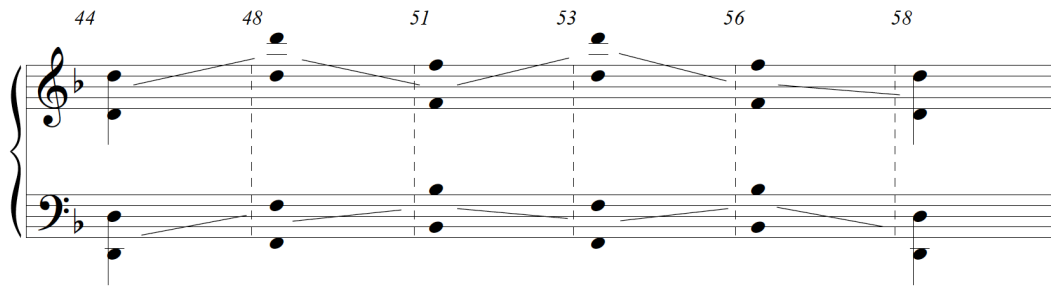
4.3.4: Analysis 4.4: Mozart, *Piano Concerto*, mm. 44-58

Measures 44-58 present the first occurrence of a new theme divided into two phrases. The first (mm. 44-48) phrase consists of a continuous sixteenth-note quasi-melodic sequencing that accents an ascent to the second phrase that is comprised of segmented descents and a cadential process (mm. 48- 52). The length of the two phrases varies in that the first is four measures, while the second spans five measures plus one beat. The musical motion in this theme can be interpreted through several metaphors operating at both the local and middleground level. Apart from the now standard three metaphors of gravity, magnetism, and inertia, I add friction, orbit, and, for the first time, repulsion.

4.7.1: GRAVITY

Similar to the previous examples, gravity can be used to explain musical motion at the middleground level in mm. 44-58. In these measures, a reoccurring pattern begins the phrase in one register and then ascends an octave higher (typically near the middle or three quarters through the phrase); it then descends back to the original register through a cadential process (see Figure 4.17). Measures 48-52.4 repeat the pattern in mm. 53.1-57.4 through an elided phrase and cadence in mm. 52-53. In other words, musical motion is created by the repetition of a pattern that begins in a certain register; this register is transferred up an octave and then returns through gravity to its original register.

Figure 4.18: Mozart, Registral Shifts, mm. 44-58



Local gravitational gestures are still prevalent in this example, most prominently through the chordal descent in mm. 48-49 which is repeated in mm. 53-54, and also through melodic descents from mm. 49.3-53.1 (see Score Analysis 4.4).

4.7.2: MELODIC INERTIA

Identifying melodic inertia at the local level in mm. 44-58 can be difficult for a number of reasons. Principally, the harmonic support is weak and the melodic direction is ambiguous. The excerpt begins with the magnetically charged motion of the sixteenth-note passage in mm. 44.2-48, which operates over the weak harmonic progression of $i-v^6_5 - III - v^6_5 - iv^6$; this progression is not conventional, nor is it easy for one to predict where the notes are moving. I therefore propose that, at the local level, besides supporting the continuation of gravity in mm. 48-53.1 and 53.1-58, inertia is constantly thwarted, usually as a result of the unpredictable melodic lines and the unconventional harmonic progression. For example, in mm. 44-47 the melodic motion changes frequently in direction with no visible pattern emerging in terms of melodic intervallic motion from one note to the next. The only apparent consistency, apart from the continuation of the sixteenth notes, appears to be the LIP of <6-6-6> between the bass and treble voices.

One instance of musical motion in this theme can be explained through melodic inertia due to the repetition of a phrase. The repetition of mm. 48-53 in mm. 53-58 allows

the listener to identify the beginning and ending of the phrase through the “sameness” of the original statement. Within this phrase, the continuation of the melodic line in the treble voices involves the alternation of two intervals for each statement³² (see brackets in Figure 4.18). This figure creates the expectation that the melody will continue in the same manner in m. 53, but it is thwarted due to the elided cadence and phrase.

At a higher level (middleground), a trend emerges in relation to the way in which the directional motion progresses. In mm. 48-53 and its repetition, a continued descent occurs in the voice leading, which moves from D₆ down an octave to D₅. This unfolds over a dominant prolongation (m. 50-52.4), which emphasizes the descent from A to D and highlights the dominant to tonic relationship (see Figure 4.18).

Figure 4.19: Mozart, Local Melodic Inertia, mm. 50-53.1



As a result, we can interpret the material of mm. 44-58 as melodic inertia through the middleground voice leading that continues a descent to a cadence. The local level melodic inertia is difficult to predict due to the rapid changes in melodic direction and the ambiguous chord progression.

4.7.3: RHYTHMIC PROCESSES

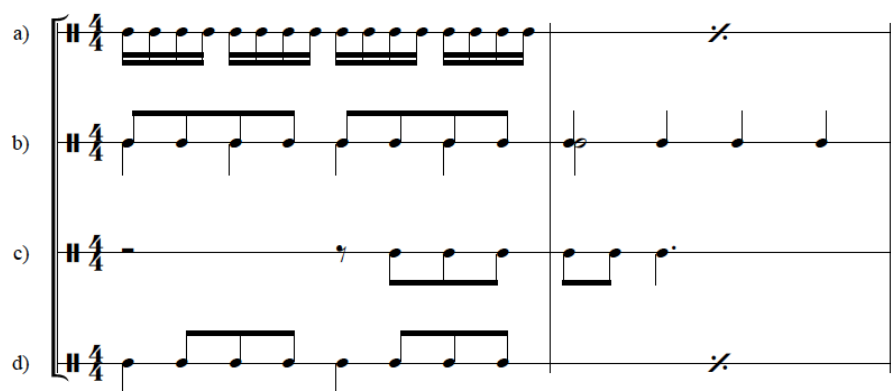
As with the other themes, some of the material in theme 5 can be examined as rhythmic processes. Mozart includes multiple independent rhythmic segments in mm. 44-

³² This bracketed figure can also be interpreted as an example of oscillation due to its departure from and return to an interval. In this case, the pattern of oscillation is what acts as the “same” in this inertia process.

58, four of which are shown in Figures 4.19a-d. Rhythmic segment (a) occurs in mm. 44-46 (continuous sixteenth notes), while rhythmic segment (b) (continuous eighth notes punctuated with quarter notes) is stated in the bass and treble voices of mm. 48-49 and again in mm. 53-54. The violin melody of mm. 49-50 presents rhythmic segment (c) (five eighth notes starting on a syncopation followed by a dotted-quarter note). Lastly, rhythmic segment (d) can be identified as the bass quarter notes that are coupled with the treble eighth notes in mm. 51.3-52.4.

In this excerpt (mm. 44-58), most of the rhythmic segments occur within two-measure groups and are independent of each other. As a result of the rhythmic content of this section being varied and segmented into small units, rhythmic inertia as defined in the methodology chapter does not apply well to the middleground level since expectations are not strongly established on the larger scale. However, at the local level, note-to-note patterns emerge. For example, a group of four sixteenth notes is repeated several times in rhythmic segment (a), allowing us to perceive it as a continuation of the “same.”

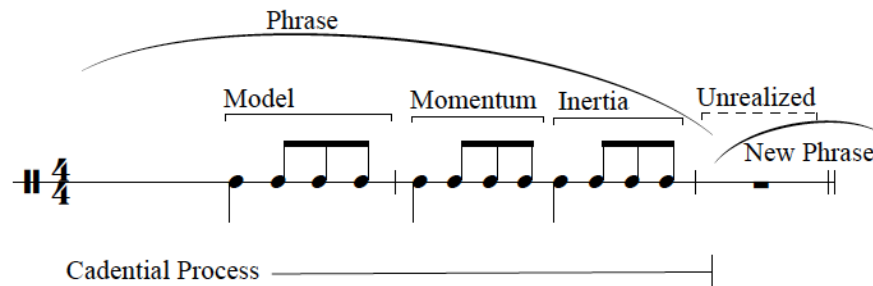
Figure 4.20: Mozart, Main Rhythmic Motives, mm. 44-58



Before describing segments (b) and (c), I briefly discuss the role of (d). Rhythmic segment (d) is repeated three times, resulting in a model, momentum, and inertia

realization (mm. 51.3-53 and 56.3-58). However, following the onset of inertia, the process is interrupted by the beginning of a new phrase (see Figure 4.20).

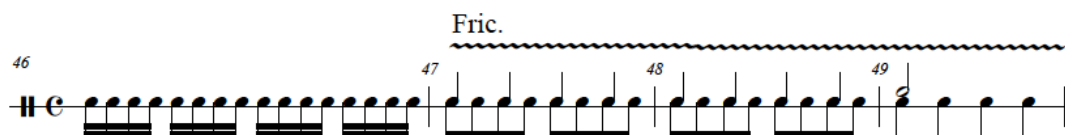
Figure 4.21: Mozart, Rhythmic Inertia, mm. 51.3-53 and 56.3-58



As discussed above, inertia is limited when examining theme 5 because of the relatively short length of two measures for each instance of inertia. However, rhythmic inertia is just one rhythmic process and two others play a significant role in this excerpt: friction and rhythmic gravity.

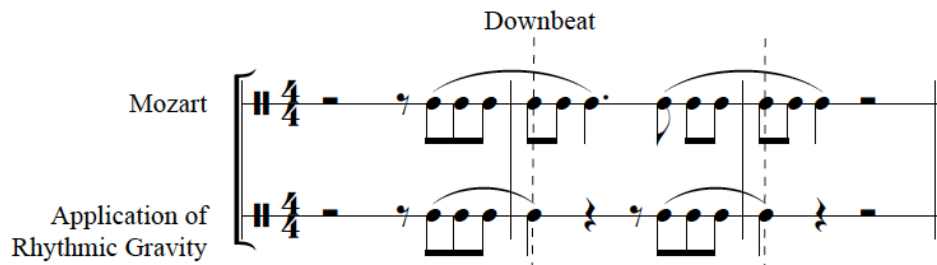
If we combine rhythmic segments (a) and (b) (as Mozart has done), the musical motion of mm. 46-49.2 can be explained as friction through the gradual lessening (deceleration) of rhythmic attacks. In m. 46, the most prominent duration consists of the sixteenth notes, which shift to eighth notes and quarter notes in mm. 47-48, and ultimately to quarter notes and a half note in m. 49 (see Figure 4.21). This increase in the length of durational values creates a perceived deceleration in our sense of forward momentum (inertia) from the repeated sixteenth notes of mm. 44-46 to the half note (m. 49); this can be explained metaphorically as musical friction.

Figure 4.22: Mozart, Friction mm. 46-49



Lastly, rhythmic segment (c) presents a case in which the rhythm carries through its expected resting point of the downbeat to a weaker position within the measure. In this case, rhythmic gravity is weakened due to the continuation of eighth notes through the downbeat, followed by a point of rest with the longer duration on beat 2 (see Figure 4.22). This is coupled with a repulsion figure, examined below, and can also be understood as emphasizing the dominant prolongation leading to the cadential “completion” in m. 53.³³ Normally for metrically strong cadences, we would expect a quarter-note duration (on beat 4) or half-note duration (on beat 3) that follows on the downbeat to emphasize the metrical accents. However, this is not the case as we are only presented this longer duration on the weaker beat 2. As a result, we can now interpret rhythmic gravity as displaced to sound on beat 2 instead of the downbeat.

Figure 4.23: Mozart, Rhythmic Gravity Displacement, mm. 49-51



In summary, musical motion can be interpreted through two main rhythmic metaphors in theme 5: friction and weakened rhythmic gravity. Rhythmic inertia only plays a small role in our perception of this theme since the rhythmic segments (a), (b), (c), and (d) function within two-measure units, which precludes them from being interpreted at the middleground (or deeper) level. A metaphor that does function on these levels is that of magnetism.

³³ This does not unfold as a typical authentic cadence since the cadential process is not completed through a pre-dominant-dominant (in root position)-tonic (in root position) progression on weak-weak-strong metrical positions; the cadence is elided in this case.

4.7.4: MAGNETISM

The most prominent example of musical motion interpreted as melodic magnetism in theme 5 (mm. 44-58) occurs in mm. 44.2-48. As shown in Score Analysis 4.4, this results primarily from the upper-neighbour (UN) and passing (P) motions, which function over local harmonic platforms; in other words, the half-note duration of the harmony acts as stability over which we can interpret musical motion as magnetism at the local level. With these shifting goal and reference alphabets, magnetism acts on and attracts tones that are otherwise perceived as stable in the main key of *d-minor*.³⁴

The musical motion of the cadential figure in mm. 51-53.1 produces another example of a magnetic metaphor, this time as an orbit. In Figure 4.23, the orbit motion is labeled through the use of dotted slurs, where the dotted slurs connect the orbital pitches to the primary tones. These orbit tones encircle and eventually resolve to primary harmonic tones due to the force of magnetism, which usually attracts these unstable orbiting notes to more stable notes through semitone or stepwise motion. The orbit figure discussed here is primarily the result of a tonic prolongation with the pitches D, F, and A encircled by both the iv and V harmonies. In m. 51 beat 1, the VI chord functions as tonic and preserves two common tones in relation to the I chord (i.e., D and F); this is followed by the ii⁶₅ chord (E, G, B $\flat$, and D) on beat 3 of m. 51. Already from this progression, we can identify the beginning of the orbiting process because both B $\flat$ and G encircle the pitch of A. Furthermore, the E in m. 51 (tenor voice) orbits above the D on the downbeat of m. 52, while the C $\sharp$ that follows orbits below on beat 3 of m. 52, thereby

³⁴ A reference alphabet refers to the diatonic scale of the key or harmony, whereas the goal alphabet refers to the tonic chord as a point of stability to which the other tones of the reference alphabet are attracted.

encircling the D. In the upper voices, we can interpret the cadential six-four harmony of m. 52 moving to a dominant and then tonic harmony (V^6_4 to V^5_3 to i) as orbiting the D since the C $\sharp$ and E of m. 52.3 encircle the resolution to the D on the downbeat of m. 53.

Figure 4.24: Mozart, mm. 51-53.1 Orbit³⁵

The figure shows a musical score for measures 51, 52, and 53.1. The score is written for piano in C major, 4/4 time. Measures 51 and 52 are marked with measure numbers above the staff. Measure 53.1 is also marked. The score shows the progression of chords and voice leading. Below the staff, the harmonic progression is labeled: D-: VI, ii⁶, V⁶₄, - V⁵₃, i⁶. Dashed lines connect notes between measures, indicating voice leading and harmonic relationships. The notes are: m. 51 (F#4, C#5, F#4, C#5), m. 52 (F#4, C#5, F#4, C#5), m. 53.1 (F#4, C#5, F#4, C#5).

In mm. 50 and 51, I introduce the new metaphor of repulsion as a means to discuss motion that does not conform to conventional magnetism. In these measures, repulsion is produced through the accented suspension tones (see Figure 4.24). The B $\flat$ is repulsed by the *A-major* sonority, which comprises the main harmony of m. 50. Since B $\flat$ does not belong to the *A-major* triad (A, C $\sharp$, and E), its appearance on the downbeat of m. 50 creates a dissonance. This dissonance results in the B $\flat$ being repelled into submission, where it has to resolve through a realized magnetism (its resolution to the A). This is termed metaphorically as repulsion because the B $\flat$ cannot move elsewhere, other than an A (semitone) and it cannot stay as a dissonance in the conventions of the Classical style, as a result, it is forced into a position in which it must resolve to an immediate chord tone. A similar occurrence appears in the next measure as the tones C $\sharp$,

³⁵ In this figure, smaller noteheads represent implied notes through harmony.

E, and G are repulsed by the VI harmony (B $\flat$, D, F), which results in immediate resolution.

Figure 4.25: Mozart, Repulsion mm. 50-51

The musical score for measures 49-51 of Mozart's Piano Concerto is shown. The key signature is B-flat major (two flats). The time signature is 4/4. Measure 49 begins with a D minor chord (D-: $\flat\text{II}^6$). Measure 50 features a V chord (D major) with a circled 'R' above it, indicating a repulsion. Measure 51 features a VI chord (F major) with a circled 'R' above it, indicating a repulsion. The bass line consists of a steady eighth-note accompaniment. The treble line shows various chords and melodic fragments.

As shown through Analysis 4.4 and with Score Analysis 4.4, several musical forces and force expansions come into play in the interpretation of mm. 44-58. I discussed the projection of rhythmic inertia through small units at the local level, as well as the resulting in a denial of inertia at the middleground level in one excerpt. Additionally, I examined one example of friction by analyzing the increasing values of rhythmic durations from one measure to the next. Furthermore, I proposed that repulsion results from the dissonant suspension of a pitch from one harmony to the next and its consonant resolution through magnetism. I also highlighted musical motion as melodic magnetism at the local level in mm. 44-48. Finally, operating over a shifting stability platform through changing harmonies, I discussed the resolution tendencies of unstable non-goal alphabet tones to more stable pitches.

4.3.5: Analysis 4.5: Mozart, *Piano Concerto*, mm. 77-91

After a seventy-seven measure ritornello introducing the main themes that return in both the piano and orchestra throughout the first movement, the piano soloist enters in m. 77. This arrival is not a main theme per se, but rather can be identified as a musical

statement in which the piano asserts the key of *d-minor*.³⁶ The piano begins with a fourteen-measure phrase with orchestral accompaniment in m. 88. This phrase can be divided into two subphrases: the first from mm. 77-85.1 and the second from mm. 85-91.1. Within these fourteen measures, three musical forces become especially useful in discussing musical motion: (1) rhythmic inertia, (2) melodic inertia, and (3) gravity. I also include other metaphors, such as orbit (mm. 77-78), wave (m. 85), and magnetism (mm. 88-89), in Score Analysis 4.5, but do not discuss these in the main text due to the limitations of space.

4.8.1: GRAVITY

Both at the local and middleground levels, I use gravity to explain some of the musical processes throughout mm. 77-91. In many instances, gravity accurately describes the movement of voices in a chordal inversion to the initial register of a root-position chord, such as in mm. 78-79, 80-81, and 84-85. Furthermore, melodically, both at the local and middleground level, gravity depicts well lines that begin in a higher register on pitches that belong to either a tonic (T) or dominant (D) harmony, and then descend to pitches belonging to the other harmonic function. For example, D_6 (T) in m. 79 descends to A_4 (D) in m. 83, and F_6 (T) in m. 85 descends to $C\sharp_5$ (D) in m. 88 (see Score Analysis 4.5). Thus, gravitational motion articulates and describes the process of descending chordal inversions and highlights the harmonic stability platform of the middleground regions.

³⁶ I chose this excerpt because it is the first solo statement by the piano, and as a result holds a prominent place in both the listener's ear and the structure of the work.

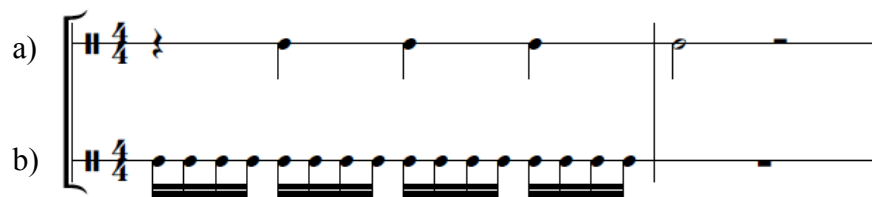
4.8.2: MELODIC INERTIA

While the force of gravity can be understood as an independent force, in mm. 77-91³⁷, melodic inertia can be used to explain the descending pitches. At the local and middleground levels, the descending lines often move past the points of harmonic stability (even when they are as strong as $\wedge^1$) to end on another harmony (usually dominant), in a similar manner to Figure 4.8.

4.8.3: RHYTHMIC PROCESSES

In mm. 77-91, I apply two main rhythmic processes that recur and project a sense of continuation through inertia to explain musical motion. The first of two rhythmic segments, which occurs in the bass of the piano part (mm. 78-87), comprises a quarter-note rest followed by three quarter notes and finally a half note (see Figure 4.25a). The second prominent rhythmic segment (mm. 88-91.1) includes a repeated sixteenth-note figure (see Figure 4.26b).

Figure 4.26: Mozart, Rhythmic Motives, mm. 78-87 and 88-91

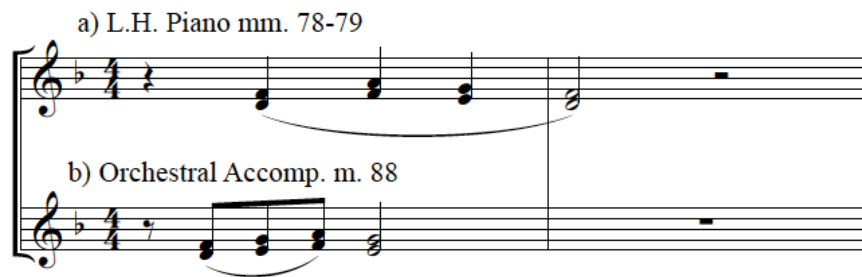


These two principal rhythmic segments comprise the main material to explain how rhythmic inertia functions in this excerpt. Mozart repeats rhythmic segment (a) four times allowing rhythmic inertia to continue for seven measures (see Score Analysis 4.5). We may also interpret the material in the orchestral reduction of mm. 88-89 as a

³⁷ It operates and describes well the motion of the musical process without requiring the aid of additional metaphors.

diminution of rhythmic segment (a) since the alto voice includes an eighth-note rest followed by three eighth notes and finally a half note. This figure preserves the short-long ratio of rhythmic segment (a), albeit with shorter (faster) durations (see Figure 4.26). With this interpretation, one could argue that the rhythmic process of the lowest line in the piano part is not unrealized in m. 88, but rather transferred to the orchestral accompaniment and accelerated.

Figure 4.27: Mozart, Accelerated Rhythmic Process, mm. 78-79 and 88



Mozart includes rhythmic segment (b) in mm. 88-91.1, which is left unrealized in m. 91 due to the end of a musical phrase marked by a cadence. Through rhythmic inertia, the listener anticipates the continuation of the sixteenth notes in the treble voice of the piano. For example, after m. 89, we continuously project the continuation of sixteenth notes and any duration other than sixteenth notes would deny our sense of completion and rhythmic inertia.

In summary, as shown in Analysis 4.5, many metaphors can be used to explain musical motion in mm. 77-91. Although I discussed several metaphors in Analysis 4.5, my analysis focused primarily on the ones that we hear most readily, in particular gravity and inertia (both melodic and rhythmic). In addition, my analysis included an example of rhythmic diminution, resulting from the acceleration of durations of rhythmic segment

(a). Throughout my analyses, I have shown that motion metaphors capture well musical processes in Mozart's work.

4.5: Conclusion

The unsurpassed stability of Mozart's handling of tonal relations paradoxically contributes to his greatness as a dramatic composer. It enabled him to treat a tonality as a mass, a large area of energy which can encompass and resolve the most contradictory opposing forces.³⁸

The above quotation from Rosen exemplifies the manner in which we discuss energy within tonal music. We strive to explain and label forces through their interaction with one another in the context of tonal stability. In the introductory remarks of this chapter, I discussed two main characteristics of the Classical style: adherence to phrase structures and the use of mainly diatonic harmonic language. Within our energetic-inspired analysis, we are able to show how musical forces align with these stylistic features. In terms of phrase structures, musical forces align with the punctuation of phrases. This can be readily observed in the use of gravity to articulate phrase endings (see mm. 14-16, for example). This notion hinges on the use of mainly arch-shaped melodies that are so common in the tonal repertoire. After an ascent, the tones naturally fall (through gravity) to their original register to articulate the end of a process. As a result, this fall largely occurs in cadential gestures that end phrases. In addition to gravity, a connection also exists between phrase endings and the interruption of melodic and rhythmic inertia. Our conceptions of musical time (an element of the musical context in which these forces interact) becomes linked with the periodicity of phrase structures. Additionally, this more "tight-knit" formal scheme produces more predictable musical material in terms of the force model. In other words, we are largely able to determine the

³⁸ Rosen, *The Classical Style*, p. 186.

duration of a phrase and of some of the musical processes (rhythmic inertia, for example) through metaphors.

The use of tonal language within the Classical style also reaffirms our conceptualization and experience of musical forces within Mozart's *Concerto*. As Rosen asserts, "the tonal stability provided a frame of reference which allowed a much wider range of dramatic possibilities."³⁹ In this statement, Rosen clearly identifies the possibilities of musical forces interacting within a stable, Classical, context.

From this analysis, I have been able to draw preliminary conclusions on the Classical style through the application of the musical force model, which will be used in a comparison of musical processes in Mozart's and Schumann's works in the concluding chapter.

³⁹ Ibid.

Chapter 5 : ANALYSIS: Schumann *Piano Concerto in A minor, op. 54*

In this chapter, I analyze select excerpts from Schumann's *Piano Concerto in A minor, op. 54* to show the realization of musical forces within a more early-Romantic style. In the preceding chapter, I demonstrated how Mozart's *Concerto*, a work representative of the Classical style, could be understood in terms of musical forces. In the current chapter, I focus on how these musical forces operate within a early-Romantic context. I explore the manner in which we can apply this model to a work representative of the early-Romantic era to highlight stylistic developments from the Classical to the early-Romantic eras, which will be discussed more extensively in Chapter 6. I begin with a brief overview of musical characteristics in the Romantic style, followed by a contextualization of Schumann's *Piano Concerto*. I then analyze select excerpts to show the application of the metaphoric model. Finally, I end the chapter with concluding remarks.

5.1: The Romantic Style

Music of the Romantic style can, in its narrowest, represent repertoire between 1828-1880, and in its broadest from 1789 – 1914.¹ Schumann's *Concerto*, completed in 1845, represents a style that we may identify as Romantic² based on several musical characteristics. The literature on this topic is extensive and, as surveyed in the literature review, I focus on four sources to outline the main stylistic features of the Romantic era:

¹ Rey M. Longyear, *Nineteenth-Century Romanticism in Music* (New Jersey: Prentice-Hall Inc., 1973), p. 1. These dates are tied to stylistic tendencies, but the delineation of musical composition in terms of year-to-year, for the purposes of this thesis, holds no bearing. Rather, it is the more general development from one period or style to another that concerns us here.

² The term "Romantic," hereafter acknowledges that a work from 1845 presents a style appropriate to the first-half of the nineteenth century, or early-Romanticism.

Longyear's *Nineteenth-Century Romanticism in Music*, Blume's *Classic and Romantic Music*, Klaus's *The Romantic Period in Music*, and Ratner's *Romantic Music: Sound and Syntax*.³

Below I outline selected primary musical characteristics to provide a context for analyzing Schumann's work.⁴ These characteristics, which include melody, rhythm, and harmony (non-chord tones, modes, and progressions), highlight differences between the Romantic and the Classical eras.⁵ Several of these stylistic traits have implications on the musical forces model, since we must reinterpret or extend certain processes, as well as realize the limitations of the model itself on certain repertoires and styles.

As discussed in Chapter 4, certain phrase archetypes occur in the music of the Classical era, including the period form. In addition to these melodic constructs, during the Romantic era, composers often wrote longer, more extensive melodic lines.⁶ Furthermore, in contrast to the tendency to include more stepwise or conjunct motion in Classical melodic lines, Romantic composers often sought melodic lines with larger leaps for expressive purposes and more disjunct motion to highlight dissonant sonorities.⁷ Rhythmic freedom and flexibility also became prominent for Romantic composers.⁸ The use of cross-rhythms became increasingly popular, as well as the release from what

³ Longyear, *Nineteenth-Century Romanticism in Music*; Friedrich Blume, *Classic and Romantic Music: A Comprehensive Survey* (New York: W.W. Norton & Company Inc., 1970); Kenneth B. Klaus, *The Romantic Period in Music* (Boston: Allyn and Bacon, Inc., 1970); Leonard G. Ratner, *Romantic Music: Sound and Syntax* (Toronto: Schirmer Books, Macmillan Publishing Company, 1992).

⁴ Longyear, in Chapter 2: "Romantic Musical Style," discusses eighteen defining and differentiating characteristics. See Longyear, *Nineteenth-Century Romanticism in Music*, pp. 18-42.

⁵ As Longyear argues: "there is no sharp dividing line between Classic and Romantic styles, for most Romantic style-traits are based on the transformation and intensification of ideas present before 1800." See Longyear, *Nineteenth-Century Romanticism in Music*, p. 18.

⁶ *Ibid.*, p. 20.

⁷ *Ibid.*, p. 22.

⁸ *Ibid.*, p. 25.

Beethoven labeled “the tyranny of the bar-line.”⁹ This allowed more experiments into rhythmic devices and meters. Longyear also argues that “lesser” Romantic composers failed to take advantage of this new freedom by relying on one rhythmic pattern, which can be interpreted as a regression of the rhythmic variety within many Classical works.¹⁰ The last stylistic change that I discuss here pertains to the use of harmony within the Romantic period. According to Kenneth Klaus, “...composers used more dissonance, more complex chords, more altered chords, more chromatic modulation ...”¹¹ As a result of these more frequent harmonic dissonances, the musical language, at least in terms of harmonic context, significantly changed from that of the Classical period. Whereas Classical composers “used dissonant chords relatively infrequently and then in a functional manner... Romantic composers frequently used the same chords in a colouristic sense and progressively elevated the milder dissonant chords, usually dominant or diminished sevenths, to the level of consonances.”¹²

Through these stylistic changes, we, as musicians and listeners, are able to differentiate between music of the Romantic era to that of its predecessor, the Classical era. Composers, such as Schumann, Berlioz, Liszt, Chopin, Dvorak, and Brahms, to name a few, developed their own individual style. When dealing with Schumann in particular, Roeder affirms that: “the emotional content of Schumann’s music is quintessentially Romantic...”¹³ Thus, Schumann’s work provides an excellent foundation for the application of the model to a Romantic repertoire and style.

⁹ Ibid.

¹⁰ Ibid., p. 27.

¹¹ Klaus, *The Romantic Period*, p. 174.

¹² Longyear, *Nineteenth-Century Romanticism in Music*, p. 27.

¹³ Michael Thomas Roeder, *A History of the Concerto* (Portland: Amadeus Press, 1994), p. 251.

5.2: Schumann's *Piano Concerto in A minor, op. 54*

Robert Schumann (1810-1856) was an enigmatic figure of the nineteenth-century musical scene. Having contemporaries such as Berlioz, Mendelssohn, Chopin, and Liszt, Schumann's works (piano pieces, orchestral works, as well as vocal music) hold a prominent place in the Western European art music cannon. He attempted to write a concerto for piano and orchestra on four occasions before he succeeded in 1845.¹⁴ In May of 1841, he completed what would become the first movement of the *Piano Concerto in A minor, op. 54* as a *Fantasie in A minor for Piano and Orchestra*.¹⁵ However, Schumann had no success in publishing this initial composition.¹⁶ Four years later in May of 1845, while living in Dresden, he began the Intermezzo and Finale movements of the eventual *Piano Concerto*.¹⁷ His wife Clara (née Weick) reports on 31 July 1845 that he had finished his *Concerto* and was to give it to the copyists.¹⁸ From this, Roeder notes:

Clara Schumann, the greatest female pianist of the century, gave the first public performance of the complete Piano Concerto in Leipzig on New Year's Day 1846, and continued to play it throughout the balance of her career. The concerto was one of her husband's happiest and most successful large works.¹⁹

As in Chapter 4, the formal organization of the concerto, a sonata-allegro form,²⁰ plays a primary role in selecting excerpts for the proceeding analyses. In Table 5.1, I present Erickson's formal layout of the work. From this overview, I draw examples from

¹⁴ John Daverio and Eric Sams, "Schumann, Robert," *Grove Music Online*, *Oxford Music Online* Oxford University Press, n.p; information is extracted from a table of Orchestral works. Schumann started work on three early concertos (that remained unfinished), 1827, 1828, and 1830-31; he further completed a first movement of another concerto (*d minor*) in 1839.

¹⁵ Roeder, *A History of the Concerto*, p. 251.

¹⁶ Erickson, "A Formal Analysis of Four Selected Piano Concertos," p. 50.

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ Roeder, *A History of the Concerto*, p. 255.

²⁰ Ibid., p. 253

many of the thematic sections. In contrast to Mozart's *Piano Concerto*, this concerto does not make use of an orchestral ritornello; rather, the orchestra is integrated with the piano to provide accompaniment for the soloist and present thematic statements.²¹

Table 5.1: Form of Schumann's *Piano Concerto in A minor, op. 54, First Movement*²²

Large Scale	Subsection/ Thematic Content	Measures
Introduction	Introduction	1-4
Exposition	Theme 1	4-19
	Bridge	19-66
	Theme B	67-112
	Closing Theme	112-134
	Transition	134-155
Development	Development Section 1	155-185
	Development Section 2	185-204
	Development Section 3	205-259
Recapitulation	Recapitulation	259-393
	Orchestral Closing	393-410
Cadenza	Cadenza	410-467
Coda	Coda	467-553

5.3: Analysis

For the analysis, I select five excerpts to show how this concerto can be interpreted through metaphoric forces (see Table 5.2).²³ Table 5.2 includes the label that I use in my analysis, the measure numbers, and general comments on metaphors and special features for each excerpt. These are discussed in greater detail in the following paragraphs. As mentioned earlier, these excerpts focus primarily on thematic material.

Table 5.2: Select Excerpts from Schumann's *Piano Concerto in A minor, op. 54*

Title	Measures	General Comments (Theme, Key, Forces, etc.)
Score Analysis 5.1	1-18	<i>Introduction and Theme 1</i> Main Features and Metaphors: • Gravity through registers shifts and descending third motive • Thwarted rhythmic inertia • Metric magnetism

²¹ This contrast does not affect the choice of excerpts. Stylistically, it allows for less thematic repetition and a denser musical texture.

²² Table 5.1 extracts information from an analysis in Erickson's "A Formal Analysis of Four Selected Piano Concertos," p. 51.

²³ Although I acknowledge the presence of musical forces within all three movements of this concerto, I focus solely on musical material from the first movement.

		• Denial of rhythmic gravity • Orbit via applied chords
Score Analysis 5.2	19-47	<i>Bridge</i> Main Features and Metaphors: • Gravity at M.G. via voice-exchange • Gravity arpeggiating key stability (local reference platforms) • Rhythmic inertia of triplet rhythms • Magnetism through passing motion • Orbit via applied chords and double-neighbour harmonies
Score Analysis 5.3	48-59	<i>Bridge (cont.)</i> Main Features and Metaphors: • Gravity and melodic inertia linked • Rhythmic inertia and metric magnetism • Middleground orbit
Score Analysis 5.4	67-76	<i>Theme B (First section)</i> Main Features and Metaphors: • Gravity and rhythmic inertia of triplets
Score Analysis 5.5	103-112	<i>Theme B (Ending Section)</i> Main Features and Metaphors: • Melodic Magnetism • Orbit via Tonic Prolongation

5.3.1: Analysis 5.1: Schumann, *Piano Concerto*, mm. 1-11

In Score Analysis 5.1, I present the first eleven measures of Schumann's *Concerto*, which is comprised of an opening statement and theme 1.²⁴ Roeder captures well the spirit of this excerpt by describing it as a “movement [that is] powerful and attention-getting...” and “is followed by a forceful, rhythmically energetic chordal cascade...”²⁵ As with Mozart's *Piano Concerto*, the language surrounding discussions of this concerto is permeated with motion metaphors. Here alone, Roeder refers to movement, force, energy, and cascade.²⁶ I begin my discussion by exploring the use of gravitational force, followed by processes of inertia. Then, I discuss elements of rhythmic processes and magnetism. I chose not to use a foreground or middleground

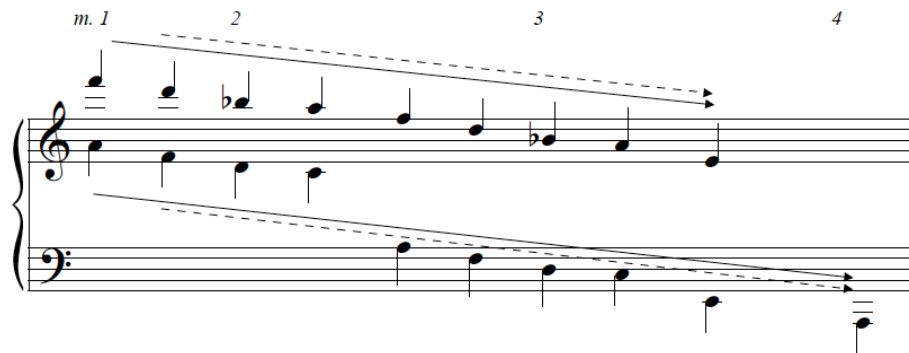
²⁴ See mm. 1-11 in Appendix B for a more complete analysis of this excerpt.

²⁵ Roeder, *A History of the Concerto*, p. 253.

²⁶ Cascade as a metaphor could align with notions of gravity and descent.

sketch in this excerpt because the main voice leading and forces are straightforward and can be easily identified in one sketch.

Schumann's *Concerto* opens with a strong example of musical motion through the force of gravity. In mm. 1-3.4, the descent in the treble voice from $F_6 - E_4$ (spanning two octaves) and in the bass in mm. 1-4 from $A_4 - A_1$ (spanning three octaves) produces a strong sense of gravity due to the registral shifts (see Figure 5.1). This gravitational descent is also aided by inertia as the line continues downwards in the piano. A second example of such a descending scalar gesture spanning more than an octave also occurs at m. 8.2 with the A_5 continuing the descent until m. 11.3 to $G\sharp_4$ (see Score Analysis 5.1).



A third prominent example of gravity occurs at the local level in mm. 4-5 and mm. 6-7 as a descending third filled in by passing notes. This motive occurs frequently throughout the movement since it connects other themes and material to theme 1. The first occurrence of this descending-third gesture (mm. 4-5) unfolds from $\wedge^3\text{-}\wedge^1$, supported by a tonic harmony in *a-minor*, while the second occurrence (mm. 6-7) produces a $\wedge^5\text{-}\wedge^3$ descent above *d-minor*, where $\wedge^5$ (of *a-minor*) acts as an added ninth. However, when taken in the context of *a-minor* (as it should be), this second occurrence highlights the shift from $\wedge^5\text{-}\wedge^3$. Thus, when combined, the first and second occurrences of this gesture

emphasize the stability of the tonic *a-minor* triad within the first theme (see Figure 5.2).²⁷ Furthermore, like mm. 4-5 and 6-7, a similar descending-third motion arises as F₅-D₅ in mm. 9-10 and B₄-G₄ in mm. 10-11.²⁸

These two examples of gravity from Score Analysis 5.1 highlight well the use of both large- and small-scale gestures that Schumann employs to create musical motion in a directional, ascending versus descending, manner. In this excerpt, descending motion occurs frequently in the remainder of the musical material as octave shifts and prominent descending-third motives.

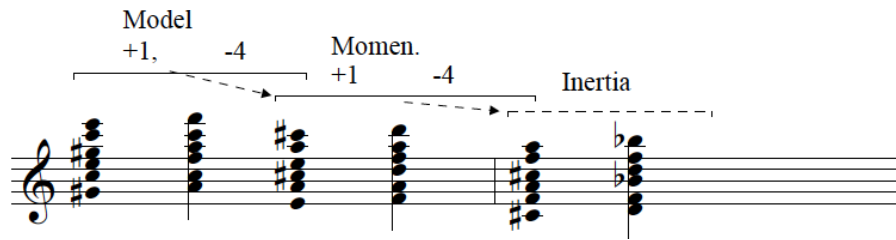
5.4.2: INERTIA

Score Analysis 5.1 presents two primary examples of musical motion expressed as the force of inertia. The first occurs through the directional continuation of the descending introductory gesture (mm. 1-4). Inertia in this instance duplicates the following pattern: ascending semitone motion to a primary harmony, followed by a descent to an applied chord that ascends again by semitone motion to another primary harmony (see Figure 5.2). This pattern is repeated seven times in the first three measures and creates certain expectations of continuation for the material that follows. Although inertial processes result in part from voice leading in this excerpt, inertia is projected primarily within the rhythmic scheme (discussed below).

²⁷ Although I have only sketched the treble voice in Figure 5.2, similar motion occurs in the tenor voice as well.

²⁸ When stacked in thirds, as done in Figure 5.2, this produces G₄, B₄, D₅, F₅, which is the diminished-seventh chord in *a-minor* – a highly unstable harmony.

Figure 5.2: Schumann, Melodic Inertia, Opening Gesture, mm. 1-3

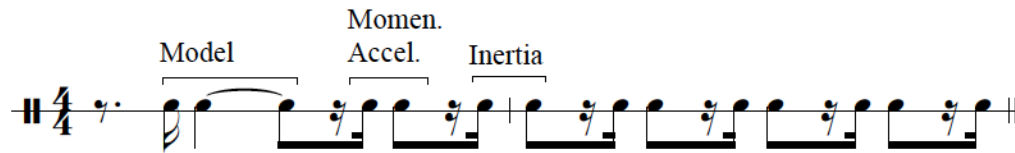


5.4.3: RHYTHMIC PROCESSES (Rhythmic Inertia, Metric Magnetism, Rhythmic Gravity)

Schumann employs many rhythmic figures and devices that provide a wealth of musical material as rhythmic processes, such as rhythmic inertia, metric magnetism, and rhythmic gravity. In this section, I first discuss two instances of rhythmic inertia that are evident in mm. 1-4 and mm. 4-8. Next, I focus on occurrences of metric magnetism highlighted again by the introductory gesture and theme 1's descending-third motive. I conclude this section by examining an example of a thwarting of rhythmic gravity in mm. 8-10.

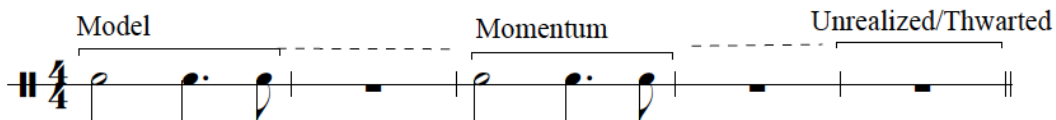
Score Analysis 5.1 highlights two instances of musical motion as rhythmic inertia. First, this force results from the rhythmic figure of the repeated opening gesture in mm. 1-3 (see Figure 5.3). Here, the sixteenth note, first followed by a dotted quarter-note duration and subsequently by eighth notes, creates a repetition that implies musical motion as inertia. In other words, we, as listeners, upon hearing the second two-note segment, anticipate the continuation of the pattern described as inertia. Furthermore, in addition to rhythmic inertia in this passage, we can also perceive an acceleration in m. 1, as the sixteenth and dotted-quarter notes accelerate to produce a sixteenth- and eighth-note segment, which occupies a smaller span than the first.

Figure 5.3: Schumann, Rhythmic Inertia, mm. 1-3



The second occurrence of musical motion through rhythmic inertia begins at m. 4 and continues until a thwarting of this inertia in m. 8. The model, consisting of the fourth measure's half note to dotted-quarter note to eighth-note figure (see Figure 5.4) is extracted from subgroupings of theme 1. In Figure 5.4, I identify the model in m. 4, followed by a measure of non-model material, then repetition of the model in m. 6 to create momentum. Although there is a measure of musical material separating the model from the momentum, there is still coherence to the rhythmic inertia force due to the proximity at which the segments sound. The model, when repeated two measures later, can still be recognized as the "same" within recent memory. The continuation of the model through inertia, projected to begin in m. 8, is thwarted by the sounding of new material. This is due to the first four measures operating as two repeated basic ideas (2+2) and the subsequent material diverging from the basic idea to contrast the first phrase and cadence. Thus, through phrase structure, rhythmic inertia is thwarted.

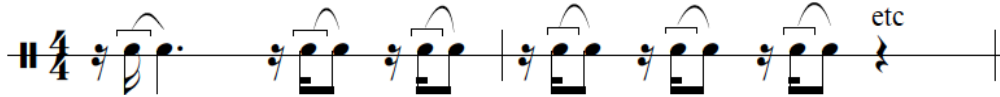
Figure 5.4: Schumann, Rhythmic Inertia Process, Theme 1, mm. 4-8



Metric magnetism, described as the tendency for shorter durations to be drawn to more stable durations of rest, usually on a stronger metrical beat, has two primary applications in this analysis. The first and perhaps most overt instance occurs in the

opening piano descending gesture, where sixteenth notes sound on weak beats, such as the second half of beat 2 and 4 (see Figure 5.5). In Figure 5.5, the sixteenth notes can be heard as attracted to the more stable and longer beats of 1 and 3.

Figure 5.5: Schumann, Metric Magnetism, mm. 1-2

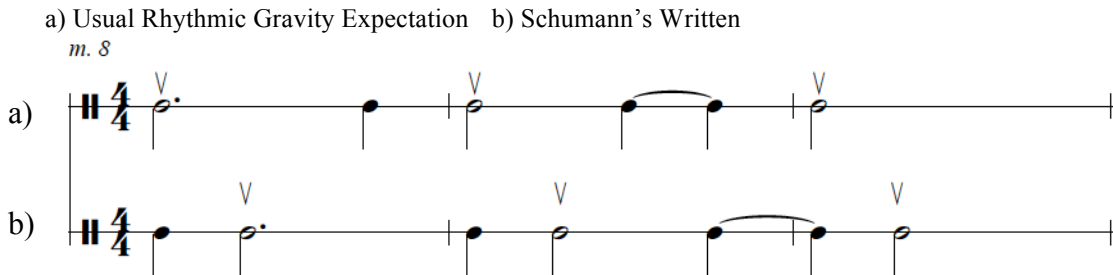


The second example of musical motion as metric magnetism occurs in mm. 4-5, where the anticipation pitches of m. 4.4 (eighth notes) are attracted to the downbeat of the next measure and longer duration (half-note duration). This also aligns with the conceptualization of rhythmic gravity (discussed in more detail below). The increasingly smaller durations in m. 4 (half note to dotted-quarter note to eighth note) move towards the downbeat of m. 5 with a half note providing metrical stability on a strong beat.

Lastly, rhythmic gravity describes the motion of rhythmic values to the downbeats of each measure. The tendency of a meter to accent the downbeat provides a large-scale (hypermetrical) pulse and goal for the rhythm. In Score Analysis 5.1, this is usually coupled with metric magnetism (as discussed above); however, in mm. 8-10, we can hear a divergence from this schema, which results in a shifting of metrical emphasis. In Figure 5.6, the half notes, which until this point, have sounded on beat 1, shift to emphasize beat 2, resulting in a thwarting of rhythmic gravity. Figure 5.6a produces a common rhythmic gravity scenario for the rhythm presented in mm. 8-10, while 5.6b displays Schumann's actual figure. In relation to this passage, Roeder supports my

interpretation by asserting that the “second phrase introduces syncopations tending to obliterate the down-beat...”²⁹

Figure 5.6: Schumann, Rhythmic Gravity Denial, mm. 8-10



Through rhythmic figures and devices used by Schumann in his *Concerto*, we have been able to identify processes as metaphors, such as rhythmic inertia, metric magnetism, and rhythmic gravity. Rhythmic inertia emerges as repeating rhythmic segments, while metric magnetism results from shorter durations being pulled or drawn to notes of longer duration. Lastly, the shift of rhythmic gravity occurring in mm. 8-10 denies and suspends our sense of a strong downbeat.

5.4.4: MAGNETISM

Two primary metaphors of magnetism describe musical processes within Score Analysis 5.1: melodic magnetism and orbit. Melodic magnetism occurs as a result of Schumann's voice leading and can be perceived at both the foreground and middleground levels. In Score Analysis 5.1, two examples of melodic magnetism are particularly noteworthy. The first occurs in m. 8.4 as a lower-neighbour tone, which is attracted by semitone up to $\wedge 5$ (D $\sharp$ -E). In this motion, $\wedge 5$ (E), the second most stable pitch, attracts the D $\sharp$ ($\sharp \wedge 4$). A second melodic gesture can be described as motion through magnetism in m. 10.3 where, due to a platform of stability shift (to local ii), C falls and is attracted to

²⁹ Roeder, *A History of the Concerto*, p. 252.

B (^1 of ii). In this instance, a shift in the reference platform provides the opportunity for an otherwise stable C (^3 in *a-minor*) to be attracted to B (normally a weaker ^2 in *a-minor*). Thus, the two examples of melodic magnetism discussed above reflect Schumann's tendency to use both the main key reference and goal alphabets of *a-minor*, as well as local harmonies, as reference platforms above which magnetism operates.

The metaphor of orbit can also be used to explain motion in the musical material of Score Analysis 5.1. In this excerpt, two primary instances of orbit occur: (1) the opening descending gesture and (2) neighbour motion. First, the opening descent metaphorically produces orbit figures through the stepwise semitone motion of tones of the applied chords that encircle the primary harmonies (see Figure 5.7). Thus, the harmonies articulated as sixteenth notes surround the more stable harmonies, to which they are attracted, on the stronger beats (represented by eighth notes in the full score).

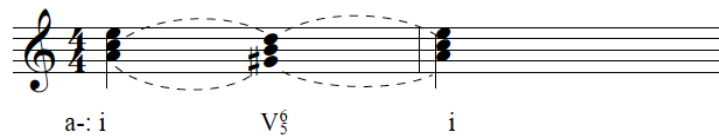
Figure 5.7: Schumann, Opening Gesture Orbit, mm. 1-4



In Figure 5.7, the relationship of the first harmony of the orbit (first dotted slur) to the second (second dotted slur) unfolds as either common-tone or semitone movement, which operate on either side of a chord tone; this chord tone belongs to a more stable harmony. The motion on either side of a stable harmony produces the metaphor and conceptualization of this musical process as an orbit.

Another example of orbit occurs through lower-neighbour motion. This results from, at least in part, the prolongation of a harmony. The first chord is stated, is followed by another harmony that is a stepwise descent from the first chord, and then moves back to the original position. For example, in the progression $i - V_5^6 - i$, the lower-neighbour harmony of V fills in or orbits the primary harmony of i (see Figure 5.8).

Figure 5.8: Schumann, Orbital Motion of i-V-i



By focusing on metaphors such as gravity, inertia, rhythmic forces, and magnetism, my analyses have described some of the inner workings of the introduction and theme 1 of Schumann's *Piano Concerto*. Through the use of descending registral shifts and descending-third motives, we have seen the manner in which Schumann manipulates materials to produce, and sometimes deny, musical forces that describe listeners' expectations of musical events and processes.

5.3.2: Score Analysis 5.2: Schumann *Piano Concerto*, mm. 19-47

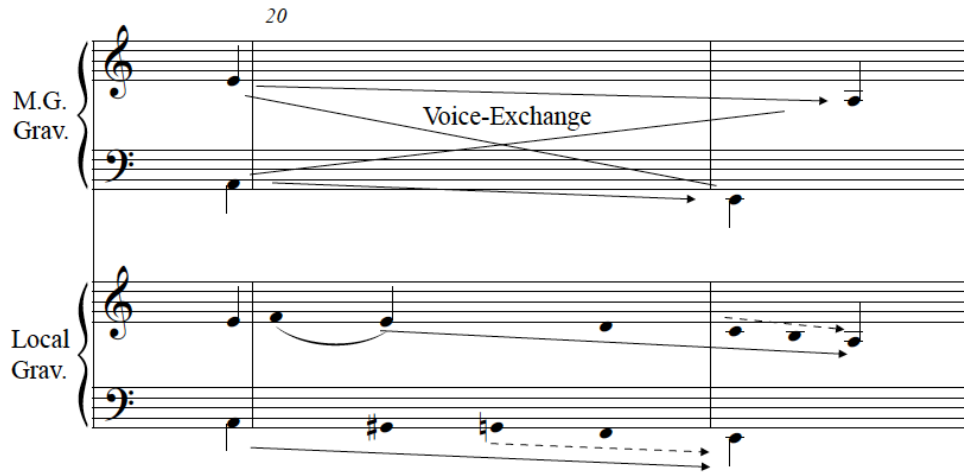
Score Analysis 5.2 shows motion interpreted as musical forces in mm. 19-47. The musical content of this section is centered on an extensive bridge statement connecting theme 1 (mm. 1-18) to theme 2 (starting in m. 67). The main metaphors that operate within mm. 19-47 include gravity, rhythmic inertia, and magnetism arising from orbit.

5.5.1: GRAVTIY

In mm. 19-47, gravity can be used to describe musical processes at both the local and middleground levels. In Score Analysis 5.2, I highlight several occurrences of gravity to explain the manner in which this metaphor contributes to our understanding of musical

processes. The main instance unfolds as a voice exchange in mm. 19.3-21.3 (A and E; see Figure 5.9). Here, the E₄ of the treble voice descends to A₃, while the A₂ of the bass voice descends to E₂ (see Figure 5.9).³⁰

Figure 5.9: Schumann, Gravity and Voice-Exchange, mm. 19-21



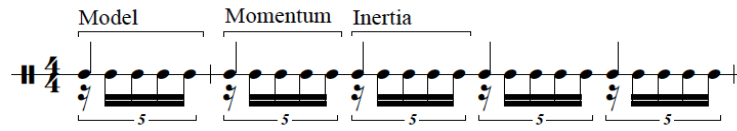
In Figure 5.9 both local and middleground levels articulate a descending gesture, produced by a voice exchange. At the local level, the lines move mainly as stepwise descending motion, while at the middleground, the voice exchange produces gravity through a consonant leap. Thus, a voice exchange can provide the foundation from which the metaphor of gravity can operate.

5.5.2: RYTHMIC INERTIA

Rhythmic inertia can be used as a tool to discuss three individual rhythmic processes in Score Analysis 5.2. Through a mapping of a model, repetition (momentum), proceeded by continuation, rhythmic inertia allows the listener to project and predict future rhythmic events. The first occurs in mm. 19.4-31.3 (Figure 5.10).

³⁰ The inner voices (alto and tenor) produce similar lines to the ones notated in the treble and bass voices of the musical forces sketches in Score Analysis 5.2.

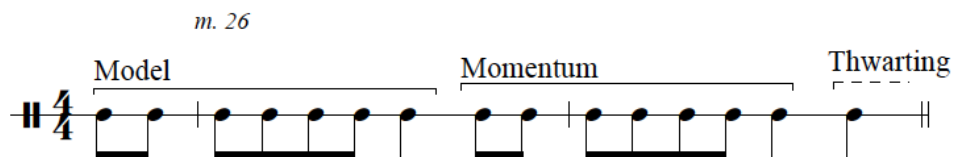
Figure 5.10: Schumann, Inertia, mm. 19.4-31.3



In Figure 5.10, the repetition and continuation of inertia occurs in the pattern of a quarter note followed by a quintuplet grouping of sixteenth notes. This continuation sounds only in the piano voice as a means to articulate a more rhythmically complex accompaniment pattern. Although this pattern changes in relation to pitch and harmonic structure, the rhythmic values remain the same for twelve measures, creating a strong sense of inertia.

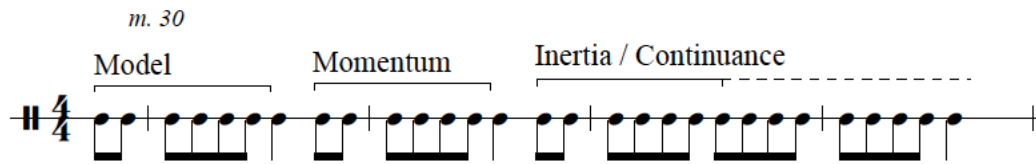
A second important rhythmic inertia pattern arises from mm. 25.4 to 27.4, and although it produces a model and momentum, the force of inertia is thwarted due to the incorporation of new material (see Figure 5.11). The model is established by six eighth notes starting on beat 4 of m. 25, which then conclude with a quarter note.

Figure 5.11: Schumann, Rhythmic Inertia, mm. 25-27



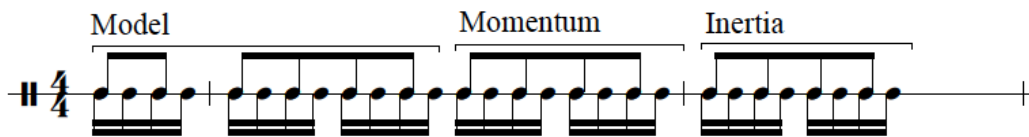
After the first occurrence of the second rhythmic inertia pattern (Figure 5.11), the same process begins in m. 29.4. This time, after the model and momentum, inertia commences. In addition to inertia, the rhythmic model is altered or extended through a continuation; in m. 32, instead of resting on a quarter note on beat 3, the eighth notes persist (see Figure 5.12). These eighth notes remain present at some structural level until the end of m. 32.

Figure 5.12: Schumann, Rhythmic Inertia and Continuation, mm. 29-32



The final example of rhythmic inertia examined in this excerpt occurs in mm. 41.4-45.4. Once again, Figure 5.13 begins on the fourth beat of a measure and is comprised of continuous eighth notes. However, unlike the earlier statements of the model, in addition to the eighth notes, this figure is also punctuated by sixteenth notes that subdivide the eighth notes and further continue through inertia (see Figure 5.13). Inertia is created in these measures by the repetition of the model (eighth notes subdivided by sixteenth notes).

Figure 5.13: Schumann, Rhythmic Inertia, mm. 41-45



As a result, inertia drives this excerpt forward because the rhythmic pattern unfolds in familiar manners (beginning on the fourth beats, repetition of rhythmic groupings, etc.). The figures explored above continue throughout the excerpt in some capacity and provide a sense of unity and coherence to the rhythmic elements in this section. Thus, whether through the use of a tuplet in an accompaniment piano line or through continuous eighth notes, a sense of the “same” permeates this excerpt through repetition, which can be interpreted metaphorically as inertia.

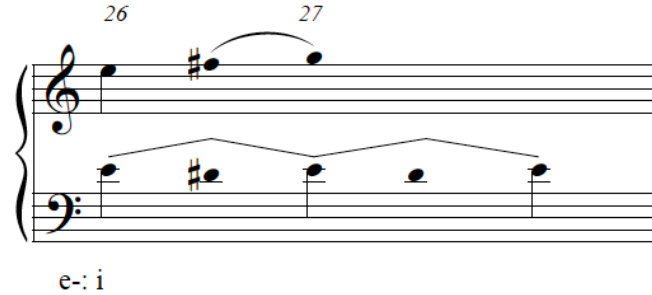
5.5.3: MAGNETISM

As discussed in preceding chapters, musical motion through non-chord tones moving to chord tones produces magnetism. In Schumann’s *Concerto*, the force of

magnetism largely arises as a result of third relationships by filling in passing motion of a third or double-neighbour tones (harmonic third); magnetism thus operates as a way of connecting the unstable material that fills in thirds with its stable framing pitches. Accordingly, magnetism acts in two main ways in mm. 19-47. The first occurs through melodic thirds filled in with passing motion, where the passing note is attracted to the stable third pitch of the melody. The second form of magnetism arises from orbital pitches encircling and being attracted to stable pitches. Furthermore, many instances of orbits result from the use of applied chords, which have a tendency to incorporate a number of neighbour notes (for example, see mm. 32-38).

I first examine magnetism that arises from filling in the interval of a third. This occurs through passing motion and can be seen in mm. 24-25 (as E-F-G), mm. 26-27 (as E-F $\sharp$ -G), and mm. 27-28 (as G-A-B). In these examples, the second pitch in the series is always attracted to the third. This results primarily because both the first and third pitches in these sets are supported by the harmony (the tones belong to the harmony), which means they create a stable platform to which the second tones are pulled and are attracted. For example, in mm. 26-27 (Figure 5.14) the stability platform is $\wedge^1$ (E), $\wedge^3$ (G), and $\wedge^5$ (B). Given that the first and last pitches consist of E and G, the F $\sharp$ is pulled to the nearest or closest stable pitch. In this case, the pitch G, which is a semitone, as opposed to the whole tone (as in the case of E) from F $\sharp$. In mm. 26-27, in addition to melodic magnetism, we can also interpret motion as magnetism through the oscillation in the bass voice with the E-D $\sharp$ -E.

Figure 5.14: Schumann, Magnetism of Passing Thirds, mm. 26-27



The second primary manner in which the force of magnetism operates is through orbits. Although found several times in Score Analysis 5.2, I focus on mm. 32-33. Figure 5.15 shows how orbit functions through a lower double-neighbour figure. The dotted slur, along with the unstemmed notes, depict the orbital pitches which encircle the stemmed primary harmony.

Figure 5.15: Schumann, Orbit through Applied Chord, mm. 32.3-33.2

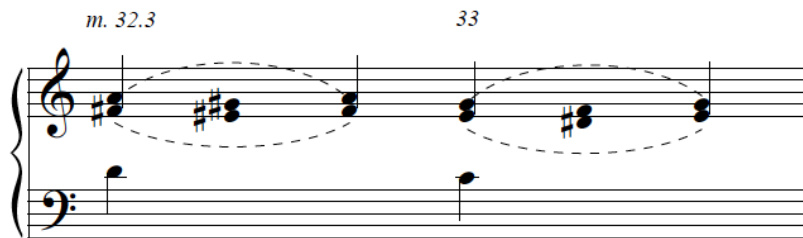


Figure 5.15 shows a *D-major* harmony (V in the key area of *G-major*) being orbited by a diminished-seventh harmony. In this figure, the notes E $\sharp$ and G $\sharp$ orbit D, F $\sharp$, and A. In other words, E operates on one side of D, E $\sharp$ and G $\sharp$ on either side of F $\sharp$, and G $\sharp$ on another side of A. As a result, they surround or encircle the primary harmony of *D-major* as orbital pitches, which are attracted through magnetism to the D, F $\sharp$, A of the *D-major* chord. This figure reappears as a diminished-seventh chord that encircles a *C-major* (IV in *G-major*) harmony on the next beat (m. 33).

Through the metaphors of orbit and melodic magnetism, we can describe musical processes that involve both harmonic and melodic voice-leading motion. These

metaphors allow for a conceptual understanding of the goals and motion of tones in a dynamic, yet stable, tonal context.

The primary metaphors of gravity, rhythmic inertia, and magnetism can be discussed as the main forces that operate within mm. 19-47. These metaphors are clearly demonstrated on varying levels of structure, and work in conjunction with one another to produce a musical reading that offers a convincing force analysis of musical motion.

5.3.3: Score Analysis 5.3: Schumann, *Piano Concerto*, mm. 47-52

Score Analysis 5.3 reproduces mm. 47-52 of Schumann's *Piano Concerto*. At the foreground or local level, gravity and inertia play important roles in musical processes, while, at the middleground level, orbit serves as an additional tool to describe these processes. In this section, I first explore gravity and melodic inertia (as they work in conjunction with one another), followed by a discussion of rhythmic processes, such as rhythmic inertia and rhythmic gravity. I then examine melodic magnetism at the local level, as well as orbit at the middleground level.

5.6.1: GRAVITY & MELODIC INERTIA

Measures 47-52 mark the start of a repeating pattern in which, at the local level, pitches descend the interval of either a seventh or ninth through stepwise motion in continuous eighth notes. As shown in Score Analysis 5.3, the first two-measure segment (mm. 47.4-49.4) leaps from A₅ up to F₆ (a sixth), which then descends through stepwise motion supported by i and VI harmonies in *d-minor*. The musical motion in these measures can be described as gravity moving the pitches through an arpeggiated B $\flat$, D, and F (VI) sonority before landing on an A (^5 of the i harmony). Inertia then continues the descending motion past this point of tonic stability (^5) to a chromatic lower

neighbour (G $\sharp$), which is then (in m. 50) pulled back up to the A stability point in a strong semitone motion (Figure 5.16).

Figure 5.16: Schumann, Local Gravity, Inertia, and Magnetism, mm. 47-49.4



At the middleground level, gravity mainly operates in stepwise motion, aligning with key changes. The stability notes of one key move down by stepwise motion to produce the stability tones of the next key. For example, the A common tone between *d*- and *a*-minor remains the same, while the tonic note of *d*-minor (D) descends by step to $\wedge^3$ (C) of *a*-minor. It could have ascended to E ($\wedge^5$ in *a*-minor) through magnetism; however, since C and E are equidistant from the D, gravity moves the line to the pitch C instead. Following this, the soprano and tenor voices' parallel octaves move the pitch A ($\wedge^1$ in *a*-minor) down to G ($\wedge^1$ in *g*-minor), which is the newly established key in m. 52. Thus, at the middleground level, gravity aligns and moves through stability points of the varying key changes, producing a descending reference platform.

One force not accounted for is the continuously ascending line of the voice leading at the background level. Usually, when this happens, a descending line (through gravity) leads to a cadence and concludes the phrase in the typical arch shape in the melody. However, in this excerpt, no descending line occurs, a direct result of Schumann using a gravitational figure so abundantly at the foreground level. In other words, with the arpeggiated chords, Schumann frequently employs gravitational gestures and thus

allows the melodic line to climb higher at the middleground level while still satisfying the need for the pitches to fall to stable platforms. Furthermore, the shift from the lower registers to the higher register, as shown in m. 74-75.1 and 75.3, can be problematic. The ascent back to the original higher register is not accounted for at the local level.

As explained above, we are able to perceive gravity operating on both local and middleground levels in this excerpt. In both instances, gravity works within and articulates the stability platform of the temporary key areas. In these examples, we can observe the close connection between the concept of gravity as a descending line and a harmonic reference platform.

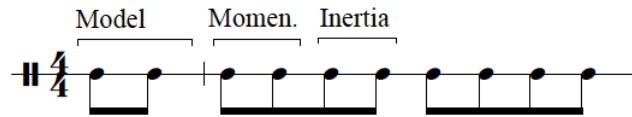
5.6.2: RHYTHMIC PROCESSES (Rhythmic Inertia, Metric Magnetism, Rhythmic Gravity)

Since Score Analysis 5.3 is mainly comprised of continuous eighth notes, it may seem that few rhythmic forces, aside from rhythmic inertia, are present. However, this is not the case, since mm. 47-52 can be described as a number of rhythmic processes that can be understood by our various rhythmic metaphors. The continuous eighth notes maintain rhythmic inertia; the articulation of orchestral accompaniment on the downbeats assert rhythmic gravity; and the left-hand part of the piano includes material that can be interpreted as metric magnetism.

Perhaps the most prevalent feature of this excerpt consists of the continuous sounding of eighth notes in the treble voice. Since this process commences on the fourth beat of m. 47 as two eighth notes grouped through slurs and staccatos (see Original Piano System), I produce a rhythmic inertia model that spans a quarter-note duration, articulated as two eighth notes (see Figure 5.17). This model then repeats to gain

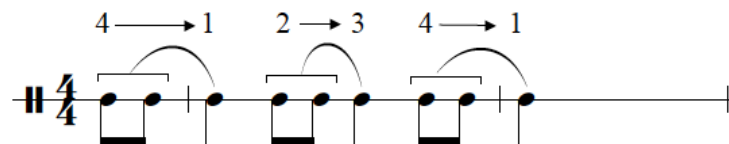
momentum and, with the third repetition, creates rhythmic inertia, whereby we, as listeners, expect the continuation of the eighth notes.

Figure 5.17: Schumann, Rhythmic Inertia, mm. 47-48.



As with the rhythmic inertia shown in Figure 5.17, metric magnetism tends to be located in the alto, tenor, and bass voices of the piano line. Much of the movement within these parts is derived from the sounding of a pattern that works either as two eighth notes moving to a quarter note (Figure 4.18) or three eighth notes followed by a rest. From this, we can conclude that the motion of the two eighth notes operating on weaker beats (beats 2 and 4) in common-time meter are attracted to the longer durations (quarter notes), which occur on more stable beats (beats 1 and 3). As a result, we can perceive musical motion as metric magnetism within the excerpt in Score Analysis 5.3.

Figure 5.18: Schumann, Metric Magnetism, mm. 47.4-50.1



Lastly, we can borrow the metaphor of rhythmic gravity to describe musical processes in mm. 48, 50, and 52, as the orchestral accompaniment punctuates the downbeat of every second measure. This is notated in Score Analysis 5.3 as “V”’s. This orchestral interjection allows the listener to hear the downbeat as separate from the stream of eighth notes within the piano line.

As a result, what appears as perhaps a very simple rhythmic statement of continuous eighth notes on the surface can be examined more closely to provide a subtle

interpretation of the rhythmic motion. In the case of Score Analysis 5.3, the three main rhythmic processes of rhythmic inertia, metric magnetism, and rhythmic gravity provide an interpretation of the rhythmic material, which allows the listener the means to discern individual rhythmic lines and processes.

5.6.3: MAGNETISM (Melodic Magnetism and Orbit)

Magnetism also plays an important role in describing musical processes and occurs at both the local and middleground levels in Score Analysis 5.3. At the local level, as previously discussed in Score Analyses 5.1 and 5.2, magnetism results from passing motion through the interval of a third. Magnetism at the middleground level functions harmonically through the process of orbit. In Figure 5.19, the orbit pitches from the VI harmony in *d-minor* (B $\flat$) are coupled with the leading tone of *a-minor* (G $\sharp$) to orbit the pitch A. The A pitch first operates as $\wedge 5$ in *d-minor* and then is reinterpreted as $\wedge 1$ in *a-minor* at the key change in m. 50. The pitches B $\flat$ and G $\sharp$ thus function above and below the A; in other words, they encircle the stable pitch, producing the perception of orbit at the middleground level. In this sketch, I recognize that difficulties arise on the part of the listener to hear this level since the foreground material is very dense. However, once the middleground orbiting is highlighted, one can easily perceive the larger-scale motion at the middleground level. The middleground voice leading also supports this analysis through the interpretation of the B $\flat$ and G $\sharp$ as upper and lower neighbour pitches, which, as described in the methodology chapter, creates the framework for orbital pitches.

Figure 5.19: Schumann, *Orbit*, mm. 47.4-50.1



Score Analysis 5.3 reproduces musical motion as expressed by musical force metaphors in mm. 47-52. These metaphors include local gravity, rhythmic forces (such as rhythmic inertia, metric magnetism, and rhythmic gravity), as well as magnetism through orbit at the middleground level. We have examined the manner in which voice leading and rhythmic processes can be explained using a metaphoric language.

5.3.4: Score Analysis 5.4: Schumann, *Piano Concerto*, mm. 67-77

Two primary motions comprise the processes that begin at m. 67 and continue until m. 112: gravity and rhythmic inertia. In Score Analysis 5.4, the musical material mainly arises from the arpeggiations of varying harmonies (many of which are prolongational in function), as well as through the continued use of a triplet-eighth note grouping, which is accentuated by half notes on beats 1 and 3. I approach Score Analysis 5.4 differently than previous analyses, since the arpeggiations of the chords, which would normally be reduced to one chord on voice-leading sketches, produce a key element of the musical-force realization. As a result, I include the gravity and inertia forces at the local level on one system, while the other presents magnetism and middleground gravity.

5.7.1: GRAVITY

An initial reading of the Musical Force system in Score Analysis 5.4 shows the significant role that gravity plays in the musical motion of this section. For example, in mm. 67-68 the descending arpeggiation articulates I and V harmonies above a C pedal

tone. The C pedal tone operates as a continued support for the platform (^1), above which the prolongational chords and arpeggiations fall (see Figure 5.20). This gravity gesture is further developed by the extension of the gesture to span over four octaves (see Figure 5.21).

Figure 5.20: Schumann, Gravity Through Chordal Arpeggiation, mm. 67-68

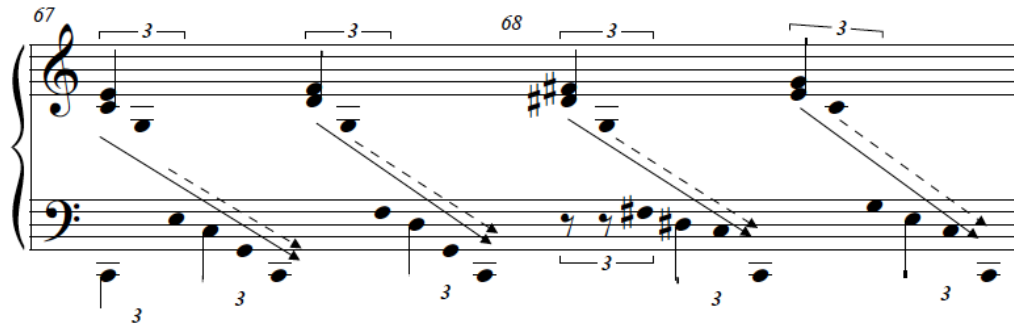


Figure 5.21: Schumann, Gravity, mm. 69.3-71.1

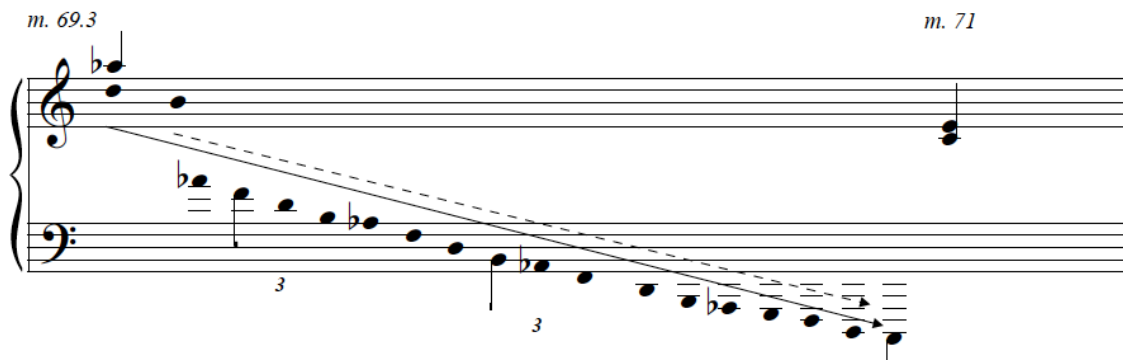


Figure 5.21 shows the development of the gravity gesture, and through this extension (in mm. 69.3-71.1), gravity can be perceived as functioning as a phrase ending, completing the first four-measure phrase. This aligns with other examples of gravity, which often occur at the end of phrases in a more cadential function, as shown in the Mozart case study; however, the gravity itself, and not the harmony, produces the concluding figure of the phrase through the descending line. As a result, gravitational figures provide pivotal formal functions in this section by marking the ends of phrases.

5.7.2: RHYTHMIC PROCESSES (Rhythmic Inertia and Rhythmic Gravity)

Measures 67-112 include a rhythmic inertia figure that, similarly to the quintuplets of Score Analysis 5.2, continues beyond the phrase endings to bring rhythmic cohesiveness to the section. As shown in the Rhythmic Forces system of Score Analysis 5.4, the prevailing figure that unfolds throughout the example consists of a triplet-eighth rhythm punctuated by half notes (see Figure 5.22).

Figure 5.22: Schumann, Rhythmic Inertia, m. 67

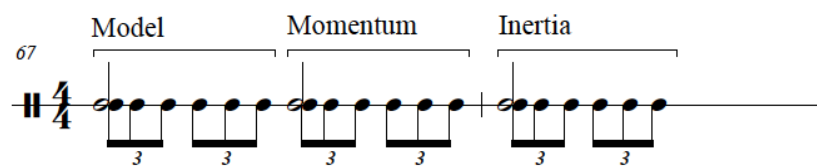


Figure 5.22 shows a reduction of the primary rhythmic gesture, which serves as the main source of motion. This rhythmic gesture functions primarily as accompaniment that unfolds as half-note durations in the piano and orchestra. Furthermore, the triplets of the piano line often work against the regular eighth notes of the orchestral melody, which creates an independence of musical motion between the two lines. This rhythmic juxtaposition allows the listener to perceive two different musical motions at the same time. Furthermore, this juxtaposition is a feature of the Romantic style.

The forces discussed above describe well the musical processes in mm. 67-77. By mapping forces, such as gravity and rhythmic inertia, we can identify the manner in which the forces affect our sense of expectation and continuation. Furthermore, the continuation of the rhythmic inertia figure of triplet-eighth notes provides a reliable sense of projection to which our expectations of musical content is linked within this section.

5.3.5: Score Analysis 5.5: Schumann, *Piano Concerto*, mm. 102-106

Many elements of Score Analysis 5.5 have already been discussed. This includes the notions of rhythmic inertia (Score Analysis 5.4), as well as gravity (Score Analysis 5.4). For this reason, I focus on magnetism in terms of melodic motion at the local level and as orbit at the middleground level in my discussion of this excerpt.

5.8.1: MAGNETISM

Within mm. 102-106, magnetism functions melodically in terms of voice leading and harmonically in terms of orbiting tones around a stable harmony. I begin by examining the voice leading of the melodic line at the local level. This melody first occurs in the orchestra (mm. 102.4-104.3) and then passes to the piano line in mm. 104.4. Since the key is *d-minor*, the reference alphabet can be identified as the *d-minor* scale (harmonic: D, E, F, G, A, B $\flat$, C $\sharp$, D) and the goal alphabet as the tonic triad (D, F, A). The melody here articulates the goal alphabet and is usually filled in with passing motion. The D-E-F progression that begins this excerpt provides an example of magnetism with the attraction of the E to the F through semitone motion (Figure 5.23). The melody then includes a lower-neighbour motion F-E-F with musical motion interpreted as magnetism, once again moving the less stable pitch E up to the more stable F ($\wedge^3$). The F $_5$ that follows then ascends to A $_5$, a motion that attracts a stable pitch ($\wedge^3$) to an even more stable pitch ($\wedge^5$). For this gesture, it is difficult to account for this motion at the local level, since the pitch departs from an already stable tone. However, at the middleground level, we can conclude that inertia continues the motion of the descending thirds, thus sounding the D-F-A tonic sonority. This motion repeats in the piano line in mm. 104.4-105.

Figure 5.23: Schumann, Melodic Magnetism, mm. 102.4-103

The figure displays two levels of musical notation: 'Local' and 'M.G.' (Middleground). The 'Local' level shows a melodic line in the treble clef with a dashed arrow indicating a leap from measure 103 to a later point. The 'M.G.' level shows a harmonic progression in the bass clef with a dashed arrow indicating a leap from measure 103 to a later point. The key signature is indicated as 'd-' (D minor).

In addition to musical motion through melodic magnetism, at the middleground level motion can be understood as the metaphor of orbit, operating through the prolongation of tonic in *d-minor* through dominant harmonies (i.e., $i-V^7-i^6-V^7$, etc.), as shown in Figure 5.24. The *d-minor* tonic harmony (D-F-A) is orbited by four orbital pitches: A, C $\sharp$, E, and G (V^7).

Figure 5.24: Schumann, Orbit Through Tonic Prolongation, mm. 103-105

The figure displays a musical score for measures 103-105. The top staff (treble clef) shows a melodic line with a dashed arrow indicating a leap from measure 103 to measure 105. The bottom staff (bass clef) shows a harmonic progression with dashed lines indicating the orbit of the tonic harmony (D-F-A) through dominant harmonies (A, C $\sharp$, E, and G). The key signature is indicated as 'd-' (D minor).

As a result of both melodic and harmonic musical processes, we are able to discern two main metaphors of magnetism in Score Analysis 5.5. These metaphors of melodic magnetism and orbit serve to articulate an understanding of musical motion as

movement to and from a stable platform. Through passing and neighbouring motion of non-chord tones, dynamic melodic lines and harmonic progressions result.

5.5: Conclusion

The analysis presented above provides a metaphoric reading of select processes and thematic material from first movement of Schumann's *Piano Concerto in A minor*, *op. 54*, a work written in the Romantic style. Drawing from the stylistic overview presented in the introductory pages of this chapter, I now examine how these characteristics align with the musical motion discussed in the examples. The first characteristic of the Romantic period involves melodic lines, which tend to be longer, to be more extensive, and to be comprised of larger leaps.³¹ Although I segmented melodic lines in my examples, Schumann's melodic lines continue beyond typical closing or resting points through specific compositional strategies. For example, Schumann frequently uses the interval of a third as a structural motive, which produces long melodic lines through the repetition of this motive at different pitch levels. From this, musical forces, in terms of melody, are less confined to or defined by phrase structures, as they were in Mozart; rather, Schumann's melodies rely on the reiteration and restatement of segments, such as the third motive, for entire sections (for example, Theme B, Score Analysis 5.3, mm. 67-112). Furthermore, in Schumann's *Concerto*, the orchestra and piano parts exchange the melodic lines, instead of a soloist with an accompanying orchestra.³² This results in melodies that are constantly in motion due to the dynamic way in which the themes move from soloist to orchestra. These longer melodic lines preserve

³¹ This contrasts with the typically more segmented, symmetrical, and quasi-formulaic tendencies of the Classical phrase structure.

³² This is in contrast to Mozart's *Concerto*, where the orchestra plays a prominent role in the ritornello sections and an accompanying role in the solo sections.

the voice-leading tendencies that are present in Mozart's *Concerto*; however, the faster rate of key area change and the increased use of chromaticism create many strong motions that can be explained as magnetism that operates as a result of the more functional harmonies within the melodic line. Additionally, melodic inertia (directional) does not accurately account for many lines in Schumann's work since the composer frequently changes melodic direction and includes many large leaps within the melodies.

The second characteristic discussed in relation to the Romantic style centers on rhythm, more specifically the use of cross-rhythms, freedom from the barline, and the reliance on rhythmic patterns. Schumann's work adheres to these general rhythmic characteristics in a number of ways. First, he frequently employs cross rhythms, such as triplets against eighth notes (see mm. 67-112), and other interesting subdivisions, such as quintuplet-sixteenth notes (five sixteenth notes to one quarter note, see mm. 19.4-31), as well as sextuplet-eighth notes (seven eighth notes against one dotted-half note, see mm. 162-164). In general, these subdivided rhythms do not obscure the perception of musical forces given that they can easily be grouped into larger durations, which are more predictable in the context of the work. Secondly, "freedom from the barline," as Beethoven so eloquently put it, has direct implications on the perception of rhythmic gravity, and, as shown on multiple occasions within our analyses, Schumann frequently displaces the metrical downbeat to the second beat. This suspends our expectation of "landing" on downbeats and affects our ability to project certain rhythmic events. In some instances, he shifts the accent from the downbeat to a weak beat so frequently, that, if it were not for other articulations of the downbeat in other instruments, we would lose the sense of a strong meter. This loosening of metrical stability has one main implication

within the analysis. It makes it difficult to interpret this shift in musical time, since the composer shifts back and forth between attacks on the beat and those on the offbeat. Lastly, the Romantic style includes the reliance on rhythmic patterns.³³ This feature is abundantly clear in Schumann's work through his continued use of rhythmic figures in accompanying voices. For example, the quintuplets and triplet rhythms discussed above tend to continue through rhythmic inertia for extended periods of time. This continuation allows for a strong sense of rhythmic inertia in Schumann; as the "same" process repeats, it is solidified in musical memory and easily understood as an important, if not fundamental, driving motion.

The final characteristic of the Romantic style mentioned at the beginning of this chapter centers on an expanded harmonic language with dissonances as functional harmony, as well as more complex chords. This characteristic results primarily through Schumann's many articulations of applied chords and tonicizations. These types of sonorities (applied chords) often produce harmonies with many neighbouring tones to the stable harmony, creating strong magnetic motion between the two chords. Furthermore, increasing dissonances and altered harmonies allows Schumann more freedom in his voice-leading motions. With the incorporation of more chromatic tones, the composer links distant harmonies to one another or fundamentally changes the function (and direction) of chord progressions.

In the analyses, we have seen how forces operate differently at the local and middleground levels. For example, passing notes of harmonies or prolongations at the local level can function simply as melodic magnetism, whereas, at the middleground

³³ This is not to say that Classical composers did not rely on rhythmic patterns or forms. This particular characteristic refers to the continued use of rhythmic motives over extended periods of time (not just motivic in smaller segments).

level, orbit and larger inertial processes take a more important role in describing musical motion. Furthermore, the problem of an ascent as a metaphor is further complicated in this case study since ascending lines work well at the local level due to the presence of non-chord tones; but, these are more difficult to apply at the middleground level because there are sometimes not enough neighbour and passing tones for inertia to act on to push the tones in an ascending manner (see Schumann, m. 40 for example).

In conclusion, this chapter has demonstrated the manner in which a musical force model can successfully describe musical processes in works of the Romantic style. Schumann's *Piano Concerto in A minor, op. 54, First Movement* serves as representative of a work written in the Romantic style to show how metaphors, such as gravity, magnetism, and inertia, can be applied to this repertoire. I now turn to a comparison of the Classical and Romantic styles through musical forces.

Chapter 6 : SYNTHESIS and CONCLUSIONS

In Chapters 4 and 5, I provided an analysis rooted in the theory of musical forces to describe musical processes in two prominent works from the Classical and early-Romantic eras. This chapter presents three main sections: (1) synthesis and comparison of results, (2) limitations and potential for future research, and (3) concluding thoughts.

6.1: Synthesis and Comparison

In this chapter, I first compare the two case studies and situate my analytical observations within a stylistic context. Our perception of some musical processes changes only slightly with the shift in musical style from the Classical to the Romantic era, but subtle differences do exist. The mapping of musical forces from one case study to the next enables me to produce narratives that describe how these forces operate within certain eras. I first explore the metaphor of gravity and its application to the two case studies, followed by the melodic form of inertia. I then compare the rhythmic metaphors of the concertos, which include rhythmic inertia, metric magnetism, and rhythmic gravity. I also discuss various types of magnetism and their processes. Finally, I conclude with questions regarding the usefulness of this analytical approach. Thus, I seek to explore some of the ways in which our conceptions and interpretations differ from one piece to another in relation to stylistic characteristics. In doing so, I propose that musical forces can be adapted and expanded to works of two stylistic periods of music in order to explain similar processes.

6.1.1: Comparison of Gravity

As one of the main metaphors of the analytical model, gravity plays a primary function or role in the interpretation of musical processes in both the Mozart and

Schumann case studies. As described frequently, gravity as the tendency of descending motion above a stable platform occurs at both the local and middleground levels. In the analyses provided in Chapters 4 and 5, this distinction between hierarchal musical levels has shown that gravity, although continually present in the excerpts, operates in different manners depending on the hierarchal level. From one level to the next, platforms can shift, the “goal” note can change, and the interval size of the gesture can be altered. These variations from level to level provide the source of how gravity works differently in the concertos. First, at the local level, gravity changes from more conjunct motion (Mozart) to more disjunct motion (Schumann). Secondly, at the middleground level of analysis, we can observe a shift from predictable phrasal arches in Mozart’s work with gravity strengthening cadential gestures, while in the Schumann's *Concerto*, this principle is not as strongly adhered to. Thus, the different levels of perception in Mozart and Schumann's works offer a varying conceptualization of the force of gravity.

Local gravity is perhaps one of the more intuitive metaphors used within this model. It consists of downward motion from one note to the next, which occurs over a stability platform; at the local level, this platform is usually determined by the supporting harmony. Furthermore, local gravity often features non-chord tones falling to stable tones of the sounding harmony ($\wedge 1$, $\wedge 3$, $\wedge 5$) and works with forces such as magnetism and inertia. In both case studies, local gravity rarely deviates from this schema. As a result, the only significant difference comes from the interval by which the melodic and harmonic notes (through inversions) fall. Thus, in the Mozart *Concerto*, the descending interval at the local level consists of mainly stepwise motion, whereas the descending

interval within the Schumann excerpts often occurs through more disjunct motion.¹ Consequently, the Classical style perpetuates local gravity as sounding in stepwise motion, whereas the Romantic style often includes descending leaps. In Mozart's work, at the middleground level, gravity can be used primarily to explain the end of phrases. Gravity acts as a way to articulate a cadential descent and phrase closure. This punctuation accentuates the descent back to the initial pitches of the phrase and completes the musical arch. Moreover, middleground gravity in Mozart occurs from registral shifts. These registral shifts usually arise out of a complementary statement within a new instrumental group.² Therefore, cadential arrivals and falling registral shifts in the Classical style, as demonstrated through the Mozart case study, can be explained using the metaphor of gravity at the middleground level.

Comparatively, at the middleground level, the Schumann *Concerto* can be interpreted as gravity having less to do with phrase structure and more with general musical accentuation. In Mozart's work, the ascending and descending motion followed a typical arch; however, in Schumann's work, although many descending motions can be easily conceived as gravity, this generally occurs with shorter gestures, not complete phrases.

As a result, our conceptions of the function of gravity at the middleground level must change from a more phrasal articulation to that of a gestural motion from the

¹ This may be a direct result of the prevalence of the descending-third motive that Schumann utilizes.

² Complementary statement in this case refers to either the repetition of a musical event in another voice, or the complement of a portion of melody or harmony of a phrase structure in a different voice.

Classical to the Romantic styles.³ Thus, as shown through a comparison of both local and middleground musical events and processes, we are able to perceive gravity as a primary metaphor operating within both the Mozart and Schumann case studies. Differences arise between the Classical and Romantic use of descending motion, mainly through either stepwise or leaping motion, as well as either punctuating a phrase ending or gesture.

6.1.2: Comparison of Melodic Inertia

Given that melodic inertia reflects the tendency for directional continuation, the conception of melodic inertia as a way to explain musical motion remains largely the same between the two case studies. In other words, since melodic inertia is the repetition of the “same” by means of either continued direction or a sequencing method, the musical content itself has minimal bearing on the force. In Mozart’s *Piano Concerto*, the use of linear intervallic patterns (LIP’s) is apparent and often can be explained as melodic inertia (either at the local or middleground level). In comparison, the musical content within Schumann’s *Concerto* relies largely on cycling through key areas or harmonies in which the melodic gestures are repeated with slight variations. Furthermore, the increased use of chromaticism in Schumann’s *Concerto* allows the composer to include voice-leading motion that would rarely occur in works of the Classical era.

Although repeating patterns in the two works can be explained through melodic inertia, the way in which the case studies reflect “the same” differs greatly. Thus, the force of melodic inertia can be used to explain a continuation of melodic musical

³ I do recognize that other Romantic composers and works would perhaps reflect a similar phrasal articulation, more in line with Mozart than with Schumann. However, this was usually not the case with Schumann’s work.

processes that aligns with our conceptualization and understanding of the works' respective styles.

6.1.3: Comparison of Rhythmic Processes (Rhythmic Inertia, Metric Magnetism, Rhythmic Gravity)

In both concertos, as in most common-practice music, rhythmic elements play a fundamental role in the unfolding of musical time; these were explored through rhythmic inertia, metric magnetism, and rhythmic gravity. Although the rhythmic processes that occur in the works analyzed result primarily through the rhythmic motives employed by the composers, rather than a shift in musical style from Classical to Romantic, an increase in the use of syncopations and off-the-beat accentuations occur in Schumann's work. This feature primarily affects our perceptions of rhythmic gravity. Additionally, as discussed in the introduction to Chapter 5, Romantic composers often repeated rhythmic devices and patterns, which leads to a high degree of continuation in the rhythmic figures of Schumann's *Concerto*.

Rhythmic inertia plays a significant role in the continuation of musical process through the repetition of rhythmic patterns. Since metrical structures persist throughout the eighteenth and nineteenth centuries, the accentuation of strong and weak beats remains in place. It is through the length of gestures and the punctuation of formal divisions that rhythmic processes differ stylistically. More precisely, within the Mozart case study, rhythmic inertia is confined to the phrase form and sometimes only the subgroups of phrases, whereas in the Schumann case study, inertial processes extend beyond that of the phrase in many cases. Although both composers repeat gestures in order to build rhythmic inertia, Schumann uses longer gestures than Mozart and often uses these gestures to connect larger structures.

Since metric magnetism involves the concept of notes of shorter durational values being attracted to those of longer durational values, this process is not dependent on stylistic characteristics. Both Mozart and Schumann utilize this type of magnetism in the same manner, which usually accentuates stronger beats.

Both concertos include syncopations and accentuate offbeats. And, as a result, they both have a tendency to often thwart our expectations for the fulfillment of rhythmic gravity. Thus, describing musical motion as rhythmic gravity relies more on the composer than on stylistic characteristics.

Rhythmic forces (inertia, metric magnetism, and rhythmic gravity) operate in a similar manner in both works; it is the individual composer's style that produces slightly different rhythmic processes. Accordingly, we can observe rhythmic structures and forces within Mozart's *Concerto* as being more confined to phrase structures, whereas Schumann's *Concerto* employs a more liberal metric structure resulting in greater continuation and longer gestures.

6.1.4: Comparison of Magnetism

Magnetism includes melodic magnetism, orbit, oscillation, and wave metaphors. The force of magnetism is an important concept that can be used to describe a shift in style or different processes as a result of the development of the harmonic language from the Classical to the Romantic style. Before discussing the use of magnetism in the case studies, it is important to reflect on the way in which stability is established within the works. Notably, the stability platforms in which magnetism operates impact the musical forces; this can be used to explain harmonic development in different stylistic eras by focusing on the frequency of shifting platforms. The Romantic style includes many

shifting key areas in contrast to the use of more primary key areas in the Classical style. Additionally, some of the tones and harmonies which are considered unstable in works of the Classical era become stable in works of the Romantic era; the Schumann example employs harmonies that would have been considered unstable in the Classical era, but became stable harmonies in the context of the Romantic era due to the increased use of chromatic and other altered harmonies. The way that we interpret musical motion as magnetism does not change from the Classical to Romantic era; rather, it is the context in which it operates that changes.

Melodic magnetism can be used to explain musical motion in both concertos at the local level. This perhaps results from the frequent use of non-chord tones - passing and neighbour tones—that connect to tones of more stability for melodic interest. In the analyses of the concertos, musical motion was described as orbit, oscillation, and wave in Mozart's work, while orbit was almost exclusively used to explain motion in Schumann's work.

The orbit metaphor arising from magnetism occurs prominently within each case study. Although both works include this type of motion, in Mozart's work orbits are used to describe a figure that usually spans one or two measures, while in Schumann's work it is more frequently two to four measures in length. This subtle difference supports the argument that an orbit within Mozart's *Concerto* usually occurs as a double-neighbour figure around a cadential note, while orbits within Schumann's work tend to be prolongational in nature. In other words, the orbits within Mozart's work tend to arise through melodic processes that can be reinterpreted as harmonic orbits, whereas orbits within Schumann's work articulate a harmonic prolongation.

Oscillation, as a refinement of the metaphor of magnetism, does not occur as frequently as perhaps initially expected. In the excerpts analyzed, it almost exclusively appears within the Mozart *Concerto*, but not the Schumann *Concerto*. There are two main reasons for this. Firstly, the excerpts chosen for the case study only reflect a portion of the musical content within the work. Secondly, since Mozart's lines tend to move in more stepwise motion, as opposed to Schumann's disjunct lines, there is a greater probability that oscillation will occur within Mozart's work. However, as was noted in the methodology, oscillation need not be stepwise motion, but simply the departure and return from one pitch to another. Even with this criterion, the frequency with which Schumann utilizes different chordal inversions and arpeggiations prevents him from repeating notes through oscillation. The wave motion, like the oscillation metaphor, does not occur very frequently and is more prevalent in Mozart's work than in Schumann's. This can be attributed to Mozart's melodic writing style, which includes more stepwise motion.

In this synthesis, I have discussed how the musical forces model can be used to describe stylistic changes between works of different eras. Gravity articulates a strong perception of phrasing in the Classical era that is loosened in the Romantic era. Furthermore, the melodic writing tendencies in the works of the two eras, in particular the increased use of chromaticism in the Romantic era, can be explained through the ways in which forces, such as magnetism, function in their musical space. Lastly, the looser forms (melodically, rhythmically, and harmonically) of the Romantic era create a space in which the model must be developed - to a certain extent - in order to remain practical.

6.1.5: Further Observations

Since the model must be expanded to accommodate different repertoire, I now seek to answer two general primary questions: (1) How is this model useful and why are the metaphors important? and (2) What does this model bring out that other analyses do not?

This analytical model is useful for two primary reasons. First, it provides a vocabulary to describe musical processes perceived by the listener and sets up a context in which to interpret musical material. In discussing this musical material, the manner in which we approach the music itself is naturally structured around motion metaphors (the seventh falls, the melody ascends, etc.). This model, thus, offers a means to explore and relate what listeners “feel” to the music itself. Second, the model presents the musical content in a dynamic way and offers insight into narrative possibilities otherwise overlooked in traditional analyses. By utilizing conceptual metaphors, the music is described in a relatable and familiar manner. These metaphors are important since they offer a useful tool to establish a language around musical analysis. Moreover, these conceptual metaphors allow listeners to conceive and understand how independent elements develop and work together to produce a cohesive work.

The answer to my second question lies with the potential for this model to be expanded further and be combined with other models. As discussed in previous chapters, this model relies on other models, such as voice-leading graphs, harmonic analysis, formal analysis, and a variety of other theoretical models. This type of analysis also encompasses many musical parameters by focusing on motion through rhythmic, melodic, and harmonic elements in the music.

With an extensive history, the field of energetics promotes an understanding of music as motion, in which dynamic forces and energies interact to produce a cohesive musical whole. Having developed a sufficient language for many musical processes, ideas, and perceptual experiences, this model is a useful tool that should be further researched, refined, and implemented. Unlike most analytical approaches, this model focuses on processes or how we experience music, instead of analyzing parts as objects. It is a wonderful tool through which we, as musicians, listeners, and theorists, can communicate our musical experience from a technical perspective.

6.2: Limitations, Challenges, and Potential for Future Research

Although the model is incredibly useful in the analysis of tonal works, it does have its limitations and challenges, three of which I discuss below, but it also has much potential for future research. One drawback of this model is the inability to measure the degree of motion for the metaphors themselves. While I recognize that metaphors by their very nature are fluid and comparative, a method of measuring the forces and metaphors could prove beneficial to further promote the merits of the model. This model also relies on, to a certain degree, on the assumption that the listener has a strong background in tonal music, which could affect its usefulness for audiences without this background. In addition, the field of energetics has not developed fully, which creates problems with multiple terms used differently in the literature. Another limitation relates to ascending motion, which cannot be described metaphorically as a physical force since none exists. The only way to account for ascending motion in musical forces is through (melodic) inertia. Even with these limitations, the model offers far more than traditional models and has the potential to be developed further.

My second main critique in relation to the limitations of the model concerns Larson's data and experiments around this field inquiry. Although he presents some excellent and foundational results pertaining to human expectations, there is a lack of conclusions for larger musical structures. For example, his main experiments that apply to musical continuation (inertia) of melodic processes only deal with projections that are three to five pitches in length.⁴ This severely limits the conclusions that analysts can draw from phrases, motives, or processes that exceed a certain length. As a result, instead of segmenting musical phrases to align with what findings have been produced (three-note segments), analysts must assume the outcomes without experimental data. Lastly, and perhaps most evident, is the lack of notational tools for score analysis and the need for additional metaphors to further expand its applicability to other repertoire.

This model produces a narrative reading of music in a dynamic and engaging manner, and as such, it has much potential as a tool for many areas of research, in particular those that deal with works containing a visual element. For example, the model could be used to analyze ballet music, where movement and motion are already present on stage through choreographed motion. Visual music, such as software visualizations and other digital media, could also benefit from this approach. Lastly, this model would be useful to analyze narratives within film music. For example, how composers project the sense of space on the screen through musical space in films, such as *Gravity* (2013), *Avatar* (2009), and the *Star Wars* franchise (started in 1977), could be explored using metaphors. Moreover, this model could be further developed by combining it with other well-known models, such as neo-Riemannian theory with its

⁴ Larson, "Musical Forces' and Melodic Expectations: Comparing Computer Models with Human Subjects," *Music Perception* 21, no. 4 (2004), p. 484 for example.

emphasis on extended tonality and harmony mapping. It could also have potential in the analysis of non-Western music through its emphasis on the listener's experience. Finally, as Larson argues, this model has potential benefits within the field of music pedagogy, both theory and instrumental.⁵ By using this language, students may better understand the processes of musical motion due to their embodied reasoning and aural logic.

6.3: Summary of Research and Concluding Thoughts

In this thesis, I have demonstrated the dynamic way in which musical processes can be described as metaphors. Using Larson's three main metaphors (gravity, inertia, and magnetism) as a starting point, I proposed additional metaphors (friction, repulsion, momentum, wave, orbit, oscillation, trajectory, and ascent) to analyze the first movements of Mozart's *Piano Concerto No. 20 in d minor, K 466* and Schumann's *Piano Concerto in A minor, op. 54*. The metaphors provided a means to discuss points of convergence and divergence between the Classical style and the early-Romantic style. Additionally, most theorists of the energeticist tradition only *discuss* motion through prose; in this thesis, I introduced a way to represent these metaphors as musical examples. By focusing on the listener's experience through musical motion, the model proposed is useful, not only for the theorist, but for all who wish to communicate ideas about music in a dynamic way.

⁵ Steve Larson, "Scale-Degree Function: A Theory of Expressive Meaning and Its Application to Aural-Skills Pedagogy," *Journal of Music Theory Pedagogy* 20 (1993), pp. 69-84.

Appendix A

Score Analysis 4.1-4.7

Mozart, *Piano Concerto No. 20 in d minor, K. 466*

The image displays a musical score analysis for measures 1-16 of Mozart's *Piano Concerto in D minor*, K. 466. The score is organized into five systems, each with a label on the left and a corresponding musical staff on the right.

- Musical Forces Profile (MG):** The first system, showing the initial musical forces in measures 1-16.
- Rhythmic Forces:** The second system, featuring a 4/4 time signature and annotations for "Model", "Momentum", "Inertia", and "continues until m. 16".
- Musical Force Profile (FG):** The third system, showing the musical force profile in measures 1-16.
- Voice-Leading (MG):** The fourth system, showing voice-leading in measures 1-16.
- Voice-Leading (FG):** The fifth system, showing voice-leading in measures 1-16.
- Orch. Reduction:** The sixth system, showing the orchestral reduction in measures 1-16, with annotations for V1 and V2.

The score is written in D minor (three flats) and 4/4 time. The measures are numbered 1 through 16 at the top of the page.

Score Analysis 4.1: Continued

9 10 11 12 13 14 15 16

M.F. MG

Rhythmic Forces

Acceleration via Harmonic Rhythm

Friction

M.F.P. (MG)

Orb.

V.L. MG

V.L. BG

LIP: 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6

Orch. Reduction

ii⁵ V³/iv - iv⁶ V V³/N V³ i V³ iv⁶ V i

The score analysis is presented in six systems, each with a label on the left:

- Musical Forces (M.G.):** Shows the piano (p) and strings (Fric. (Upper Strings)) parts. Measures 16, 17, 18, and 19 are indicated. Annotations include 'Model' and 'Momen. Inertia'.
- Rhythmic Forces:** Shows the piano (p) and strings (Fric. (Upper Strings)) parts. Measures 16, 17, 18, and 19 are indicated. Annotations include 'etc.' and 'Fric. (Upper Strings)'.
- Musical Forces (Local):** Shows the piano (p) and strings (Fric. (Upper Strings)) parts. Measures 16, 17, 18, and 19 are indicated. Annotations include 'Register Transfer' and 'Coupling'.
- Voice-Leading (MG):** Shows the piano (p) and strings (Fric. (Upper Strings)) parts. Measures 16, 17, 18, and 19 are indicated. Annotations include 'Register Transfer' and 'Coupling'.
- Voice-Leading (F.G.):** Shows the piano (p) and strings (Fric. (Upper Strings)) parts. Measures 16, 17, 18, and 19 are indicated. Annotations include 'Register Transfer' and 'Coupling'.
- Orch. Reduction:** Shows the piano (p) and strings (Fric. (Upper Strings)) parts. Measures 16, 17, 18, and 19 are indicated. Annotations include 'Register Transfer' and 'Coupling'.

The score is written in D minor, 4/4 time, and includes a key signature change to D major in measure 19. The piano part is marked with a forte (f) dynamic in measure 16. The strings are marked with a forte (f) dynamic in measure 16. The woodwinds are marked with a forte (f) dynamic in measure 16. The piano part is marked with a forte (f) dynamic in measure 16. The strings are marked with a forte (f) dynamic in measure 16. The woodwinds are marked with a forte (f) dynamic in measure 16.

The musical score for "The Great Wall" by John Adams is presented in a multi-staff format. The staves are labeled as follows:

- M.F. (M.G.):** Melody for the first vocal part, featuring a melodic line with various intervals and a final cadence.
- R. Forces:** Rhythmic forces, represented by a series of vertical lines and dots, indicating the timing and duration of the vocal parts.
- M.F. (Local):** Melody for the second vocal part, featuring a melodic line with various intervals and a final cadence.
- V.L. (M.G.):** Melody for the third vocal part, featuring a melodic line with various intervals and a final cadence.
- V.L. (F.G.):** Melody for the fourth vocal part, featuring a melodic line with various intervals and a final cadence.
- Orch. Reduc.:** Orchestral reduction, featuring a complex arrangement of instruments and a final cadence.

The score includes various musical notations, including notes, rests, and dynamic markings. It also features several annotations, such as "Orb.", "W.", "Osc.", "Model", "Momentum", "Inertia: Unrealized", "Implied", and "P". The score is written in a key signature of one flat (B-flat) and a time signature of 4/4.

Score Analysis 4.2: Continued

The score analysis is divided into six systems, each with a staff and associated annotations:

- M.F. (M.G.):** Measures 27-32. Annotations include *Orb.* (Orbit) and measure numbers 27, 28, 29, 30, 31, 32.
- R. Forces:** Annotations include *Inertia* (until m. 32), *Momentum*, *Model*, and *Inertia*.
- M.F. (Local):** Annotations include *Implied* and *Orb.*
- V.L. (M.G.):** Annotations include *p* (piano) and *Voice Transfer*.
- V.L. (F.G.):** Annotations include *UN*, *P*, *LN*, *P*, *LN*, *P*, *etc.*
- Orch. Reduc.:** Annotations include *vii^{o7}*, *i*, *V⁷*, *i*, *V⁷*, *i*, *V⁷*, and *V*.

The score analysis for measures 33-44 of Mozart's *Piano Concerto in D minor*, K. 466, is presented in five systems. The first system, 'Musical Forces (M.G.)', shows the piano and violin parts with measures 33, 34, 35, 36, 37, and 38. The second system, 'Rhythmic Forces', includes 'Model' and 'Momentum' markings. The third system, 'Musical Forces (Local)', includes 'Inertia' and 'F+' markings. The fourth system, 'Voice-Leading (MG)', includes 'g-' and 'a-' markings. The fifth system, 'Voice-Leading (F.G.)', includes 'LN' and 'P' markings. The sixth system, 'Orch. Reduction', includes 'F: I', 'vii°6', 'I6', 'V4', 'I6', 'g: i', 'vii°6', 'i6', 'V4', 'i6', 'a: i', 'vii°6', 'i6', 'V4', and 'II' markings.

Musical Forces (M.G.)

Rhythmic Forces

Musical Forces (Local)

Voice-Leading (MG)

Voice-Leading (F.G.)

Orch. Reduction

F: I vii°6 I⁶ V⁴ I⁶ g: i vii°6 i⁶ V⁴ i⁶ a: i vii°6 i⁶ V⁴ II

Score Analysis 4.3: Continued

39 40 41 43 44

M.F. (M.G.)

Rhythmic Forces

M.F. (Local)

Orb.

Bb +

d-

VL. (M.G.)

VL. (F.G.)

LIP: 6 - 10 - 10 - 10 - 10 - 6 - 10 - 8

Orch. Reduc.

Bb: I⁶ II⁶ V vi|d-: i IV⁶ V⁶ i iv⁶ ii⁶ V i

The score analysis is organized into six systems, each with a label on the left:

- Musical Forces (M.G.)**: Measures 44-48. Includes a dashed line indicating a melodic line across measures 45 and 46.
- Rhythmic Forces**: Measures 44-48. Includes a wavy line labeled "Fric." above measure 47.
- Musical Forces (Local)**: Measures 44-48. Includes a dashed line indicating a melodic line across measures 45 and 46.
- Voice-Leading (MG)**: Measures 44-48. Includes a "LIP: 8" marking above measure 44 and a "Register Shift" label above measure 48.
- Voice-Leading (F.G.)**: Measures 44-48. Includes "UN" and "P" markings above measures 45 and 46 respectively.
- Orch. Reduction**: Measures 44-48. Includes Roman numeral harmonies: $d-i$, iv^6 , v^6 , III , iv^6 , V^7 , and i^6 . Measure numbers 44, 45, 46, 47, and 48 are indicated at the beginning of their respective measures.

Score Analysis 4.4: Continued

The score is divided into six systems, each with a label below the staff:

- M.F. (M.G.):** Measures 49-53. Includes a melodic line with a dashed line indicating a continuation or connection to measure 53.
- Rhythmic Forces:** Measures 49-53. Includes a rhythmic pattern with a wavy line indicating a continuation or connection to measure 53.
- M.F. (Local):** Measures 49-53. Includes a melodic line with a dashed line indicating a continuation or connection to measure 53.
- V.L. (M.G.):** Measures 49-53. Includes a melodic line with a dashed line indicating a continuation or connection to measure 53.
- V.L. (F.G.):** Measures 49-53. Includes a melodic line with a dashed line indicating a continuation or connection to measure 53.
- Orch. Reduction:** Measures 49-53. Includes a melodic line with a dashed line indicating a continuation or connection to measure 53. Harmonic analysis labels are present below the staff: V^6 , VI , ii^6 , V_4^6 , V_3^5 , and i^6 .

Measure numbers 49, 50, 52, and 53 are indicated at the beginning of their respective measures. The score is written in a key signature of one flat (B-flat) and a common time signature (C).

The image displays a musical score for the piece "The Great Wall" by John Adams. The score is presented in a multi-staff format, showing the orchestral reduction and individual parts for various instruments and voices. The measures shown are 54, 55, 56, 57, and 58. The parts are labeled as follows:

- M.F. (M.G.):** Music for the Male Soprano (M.G.) part.
- Rhythmic Forces:** The rhythmic section of the orchestra.
- M.F. (Local):** Music for the Male Soprano (Local) part.
- V.L. (M.G.):** Music for the Voice (Local) part.
- V.L. (F.G.):** Music for the Voice (Foreign) part.
- Orch. Reduction:** The full orchestral reduction.

The score includes various musical notations, such as notes, rests, and dynamic markings. The measures are numbered 54, 55, 56, 57, and 58. The score is written in a multi-staff format, with each part having its own staff. The notation is in a standard musical notation style, with notes, rests, and dynamic markings. The score is presented in a clear and legible format, with the parts labeled and the measures numbered.

Score Analysis 4.5 Mozart: *Piano Concerto in D minor, K. 466* Musical Forces, mm. 77-91

The score analysis is presented in seven systems, each with a label on the left and musical notation on the right. The systems are:

- Musical Forces (M.G.):** Shows the original musical notation for measures 77-91.
- Rhythmic Forces:** Analyzes the rhythmic structure. It includes annotations for *Model*, *Momentum*, *Inertia*, *Orbit*, *Wave*, and *Orbit*.
- Musical Forces (Local):** Shows the original musical notation for measures 77-91.
- Voice-Leading (M.G.):** Analyzes the voice-leading in the original manuscript.
- Voice-Leading (F.G.):** Analyzes the voice-leading in the final edition.
- Original Piano:** Shows the original piano part notation.
- Orchestral Reduction:** Shows the orchestral reduction with Roman numeral chord symbols: *d-: i V*, *i*, *V7*, *ξ*, *iv6*, *i*, *iv6*, *V8/V*, *V*.

Score Analysis 4.5: Continued

The score analysis displays measures 88 through 91 across seven staves, comparing the original composition with a reduced version. The staves are labeled as follows:

- M.F. (M.G.):** The first staff, showing the original melody with measure numbers 88, 89, 90, and 91 indicated above it.
- Rhythmic Forces:** The second staff, featuring annotations for **Model**, **Momentum**, and **Inertia** above specific musical phrases.
- M.F. (Local):** The third staff, showing a localized version of the melody.
- VL. (M.G.):** The fourth staff, showing the original melody.
- VL. (FG):** The fifth staff, showing a version of the melody with various musical notations.
- Orig. Piano:** The sixth staff, showing the original piano accompaniment.
- Orch. Reduc.:** The seventh staff, showing the reduced orchestral version, including harmonic symbols like V_4^6 , V_4^6 , and V_4^6 .

The score includes various musical notations such as notes, rests, and dynamic markings, with dashed lines indicating specific musical relationships or transitions between measures.

Score Analysis 4.5: Continued

This musical score analysis covers measures 88 to 91. It is organized into two main systems, each with a bracketed group of staves. The first system includes:

- M.F. (M.G.)**: Melody and harmony for measures 88-91.
- Rhythmic Forces**: A section with three staves labeled **Model**, **Momentum**, and **Inertia**, showing rhythmic patterns.
- M.F. (Local)**: A section with two staves showing local melodic and harmonic details.
- V.L. (M.G.)**: Violin and Viola parts for measures 88-91.
- V.L. (FG.)**: Violin and Viola parts for measures 88-91.

The second system includes:

- Orig. Piano**: Original piano part for measures 88-91.
- Orch. Reduc.**: Reduced orchestral part for measures 88-91, featuring chords labeled V^7 , i , iV , and V_4^3 .

Measures 88, 89, and 90 are indicated at the beginning of their respective staves. Measure 91 is indicated at the end of the first system. The score uses various musical notations including notes, rests, beams, and dynamic markings.

Musical Forces (M.G.)

Rhythmic Forces

Model Momen, Inertia

Musical Forces (F.G.)

Melodic Inertia: Sequence etc.

Wave simile

Voice-Leading (M.G.)

Voice-Leading (F.G.)

Original Piano

Orchestra Reduction

d:- V⁶ i V⁴/iv ^bII⁶ iV⁶

Score Analysis 4.6: Continued

101 102 103 104 105 106

M.F. (M.G.)

Rhythmic Forces

M.F. (F.G.)

Ascending Waves

Ch.P. P Ch.P.

V.L. (M.G.)

Voice Exchange

V.L. (F.G.)

Register Transfer

Orig. Piano

Orch. Reduc.

d:- v $V^{\frac{3}{2}}/v$ v^6 $V_3^{\frac{3}{2}}$ i^6 $V_3^{\frac{3}{2}}$ i $V_2^{\frac{3}{2}}/iv$ iv^6 $V_2^{\frac{3}{2}}/iv$ iv V/VII VII^6 $V_2^{\frac{3}{2}}$ i^6 $V_3^{\frac{3}{2}}$

Score Analysis 4.6: Continued

108 109 110 111 112 113 114

M.F. (M.G.)

Rhythmic Forces

M.F. (F.G.)

Wave

Oscil.

Wave

V.L. (M.G.)

Pedal: A

V.L. (F.G.)

107 108 109 110 111 112 113 114

Orig. Piano

Orch. Reduc.

d-: i 6 iv iv⁶ V⁷

The score analysis is presented in eight systems, each with a label on the left:

- Musical Forces (M.G.):** Shows the main melodic lines with annotations for *Transfer* (measure 138) and *Orbit* (measures 137-143).
- Rhythmic Forces:** Displays rhythmic patterns with annotations for *Model*, *Momentum*, *Inertia*, and *Moment*.
- Musical Forces (Local):** Focuses on local musical details with annotations for *Orbit* and *Model*.
- Voice-Leading (M.G.):** Illustrates voice-leading patterns in the main system.
- Voice-Leading (Local):** Illustrates voice-leading patterns in the local system.
- Original Piano:** Shows the original piano part with annotations for *Orbit* and *Model*.
- Orchestra Reduction:** Provides a harmonic analysis of the orchestra reduction, including Roman numerals and figured bass notation.

The harmonic analysis at the bottom of the Orchestra Reduction system is as follows:

Measure	135	136	137	138	139	140	141	142	143
Harmony	F:	I	V ³	I ⁶	vi ⁷ I	V	V ⁴	ii ⁶	ii ⁶
Figured Bass									

Score Analysis 4.7: Continued

144 145 146 147 148 149 150

M.F. (M.G.)

Rhythmic Forces

M.F. (Local)

Oscil.

Register Transfer

V.L. (M.G.)

Implied

V.L. (Local)

Pedal: C

Orig. Piano

Orch. Reduc.

F: V⁷ I⁶ ii⁶ V⁷ I⁶ vii⁶/vi VII/IV vii⁶/iii vii⁶/ii⁶ §

Score Analysis 4.7: Continued

151 152 153 154 155 156

M.F. (M.G.)

Rhythmic Forces

M.F. (Local)

Wave

V.L. (M.G.)

V.L. (Local)

Pedal: B-flat

Pedal: F

Orig. Piano

Oreh. Reduc.

F: V^q - § I ii⁶ IV⁶ V^q v⁶ IV⁶ § vii⁶

Score Analysis 4.7: Continued

The score analysis displays measures 157 through 167. It includes the original piano score and a reduced version, with annotations for harmonic and rhythmic forces.

Measures 157-167:

- M.F. (M.G.):** Melody and accompaniment. Measure 158 features a *Register Transfer* annotation.
- Rhythmic Forces:** A horizontal line with vertical tick marks indicating rhythmic activity across measures 157-167.
- M.F. (Local):** Local melody and accompaniment. Measure 159 includes a *simile* annotation.
- V.L. (M.G.):** Violin and Viola parts. Measure 167 includes a *Pedal: F until m. 167* annotation.
- V.L. (Local):** Local violin and viola parts.
- Orig. Piano:** Original piano score.
- Orch. Reduc.:** Reduced orchestral score.

Harmonic Analysis (Right Side):

Measure	Harmony
157	F: I ⁶
158	vii ^o /V
159	V ₄ ⁶
160	I
161	§
162	V ₄ ⁶
163	IV
164	IV
165	vi ⁶
166	V
167	vi I ⁶

Score Analysis 4.7: Continued

The image displays a musical score for 'The Great Gatsby', featuring a variety of instrumental parts and a piano reduction. The score is organized into several systems, each with a label on the left:

- M.F. (M.G.)**: Middle Force (Middle Group) part, showing a melodic line with a crescendo and a fermata.
- Rhythmic Forces**: A section with a double bar line, indicating a change in the rhythmic structure.
- M.F. (Local)**: Middle Force (Local) part, showing a melodic line with a crescendo and a fermata.
- VL. (M.G.)**: Violin (Middle Group) part, showing a melodic line with a crescendo and a fermata.
- VL. (Local)**: Violin (Local) part, showing a melodic line with a crescendo and a fermata.
- Orig. Piano**: Original Piano part, showing a complex melodic line with a crescendo and a fermata.
- Orch. Reduc.**: Orchestrated Reduction part, showing a simplified version of the piano part.

The score includes various musical notations such as notes, rests, and dynamic markings. The piano part is particularly detailed, showing a complex melodic line with a crescendo and a fermata. The orchestrated reduction part shows a simplified version of the piano part, with a focus on the harmonic structure.

Score Analysis 4.7: Continued

The score is divided into two systems, each containing six staves. The first system includes:

- M.F. (M.G.):** Melody in the right hand, starting at measure 169 and ending at 174. It features a series of eighth notes and a final quarter note.
- Rhythmic Forces:** A staff with a single measure of a half note, indicating a rhythmic pulse.
- M.F. (Local):** Melody in the left hand, starting at measure 170 and ending at 174. It features a series of eighth notes and a final quarter note.
- V.L. (M.G.):** Melody in the right hand, starting at measure 170 and ending at 174. It features a series of eighth notes and a final quarter note.
- V.L. (Local):** Melody in the left hand, starting at measure 170 and ending at 174. It features a series of eighth notes and a final quarter note.
- Pedal: F:** A staff with a single measure of a half note, indicating a pedal point.

The second system includes:

- Orig. Piano:** Melody in the right hand, starting at measure 169 and ending at 174. It features a series of eighth notes and a final quarter note.
- Orch. Reduc.:** Melody in the left hand, starting at measure 170 and ending at 174. It features a series of eighth notes and a final quarter note.

The score is written in a key signature of one flat (B-flat) and a 4/4 time signature. The measures are numbered 169, 170, 171, 172, 173, and 174.

F: V₄

I

Appendix B

Score Analysis 5.1-5.5

Schumann, *Piano Concerto in A minor, Op. 54*

Musical Forces (Piano)

Orb.

2 3 4 5 6

Rhythmic Forces

Model

Accel. Momen. Inertia etc.

Momentum

Voice-Leading

P

Original Piano

2 3 4 5 6

Orchestra Reduction

a-: V V⁶ vi I₄³ vi vi₄⁶ I₄³ vi V₄⁶/i⁶ V₄⁶/i⁶ vi₄⁶ I₄³ vi V₄⁶/i⁶ iv V₄⁶ - 5 i₄³ V₄⁶ i₄³ - 8 vii^{o7}/V

Score Analysis 5.1: Continued

7 8 9 10 11

M.F. (Orchestra)

Rhythmic Forces

V.L. (Orchestra)

Orch. Reduction

Unrealized / Thwarted Inertia

Reg. Shift

CS

LN

App.

P

A = Ant.

V

ctpt

if₈

iv⁶

vii^o/V

V₄⁴

Musical Forces (M.G.)

Rhythmic Forces

Musical Forces (Local)

Voice-Leading (MG)

Voice-Leading (F.G.)

Original Piano

Orch. Reduction

Annotations: Voice Exchange, Model, Momen., Inertia

Chord Progression (Orch. Reduction):

a-: i VI V⁵ vii⁵/iv iv V⁴ - 5 i VI V⁵ vii⁵/iv iv V⁴ - 5 i vi C⁺

Score Analysis 5.2: Continued

This musical score analysis displays measures 24 through 28 across seven staves, comparing the original composition with a reduced version. The staves are labeled as follows:

- M.F. (M.G.):** Melody in Middle/Guest part.
- Rhythmic Forces:** A staff showing rhythmic patterns with labels for **Model**, **Momentum**, and **Thwarted**.
- M.F. (Local):** Local melody in Middle/Guest part.
- V.L. (M.G.):** Melody in Violin/Local part.
- V.L. (F.G.):** Melody in Violin/Far Guest part.
- Orig. Piano:** Original piano accompaniment.
- Orch. Reduction:** Reduced orchestral accompaniment.

The score includes various musical notations such as notes, rests, and slurs. Measure numbers 24, 25, 26, 27, and 28 are indicated at the beginning of their respective staves. The **Orch. Reduction** staff includes Roman numeral chord symbols: IV^6 , I , IV^6 , V^6 , I , V , i , iv , V^6 , and i . A **UN** (Unison) label is present in the **V.L. (F.G.)** staff at measure 26. The **Orch. Reduction** staff also features a **(C+)** marking at the beginning.

Score Analysis 5.2: Continued

This musical score analysis covers measures 29 through 33. It is presented in two systems: the original score and a reduced score. The original score includes parts for M.F. (M.G.), Rhythmic Forces, M.F. (Local), V.L. (M.G.), and V.L. (F.G.). The reduced score includes parts for Orig. Piano and Orch. Reduction. The score is annotated with various musical notations and harmonic analysis symbols.

Measure 29: The original score shows a melodic line in M.F. (M.G.) and a rhythmic pattern in Rhythmic Forces. The reduced score shows the piano part with a melodic line and a bass line. The Orch. Reduction shows a complex harmonic structure with various chords and intervals.

Measure 30: The original score shows a melodic line in M.F. (M.G.) and a rhythmic pattern in Rhythmic Forces. The reduced score shows the piano part with a melodic line and a bass line. The Orch. Reduction shows a complex harmonic structure with various chords and intervals.

Measure 31: The original score shows a melodic line in M.F. (M.G.) and a rhythmic pattern in Rhythmic Forces. The reduced score shows the piano part with a melodic line and a bass line. The Orch. Reduction shows a complex harmonic structure with various chords and intervals.

Measure 32: The original score shows a melodic line in M.F. (M.G.) and a rhythmic pattern in Rhythmic Forces. The reduced score shows the piano part with a melodic line and a bass line. The Orch. Reduction shows a complex harmonic structure with various chords and intervals.

Measure 33: The original score shows a melodic line in M.F. (M.G.) and a rhythmic pattern in Rhythmic Forces. The reduced score shows the piano part with a melodic line and a bass line. The Orch. Reduction shows a complex harmonic structure with various chords and intervals.

Annotations: The score is annotated with various musical notations and harmonic analysis symbols. These include:

- Harmonic Analysis:** Symbols such as iv , V^6 , i , V , iii^{I} , I , V , $\text{vii}^{\text{O7}}/\text{IV}$, $\text{vii}^{\text{O7}}/\text{I}$, and G^+ are used to indicate the harmonic structure of the chords.
- Interval Analysis:** Symbols such as 3/1 , 3/2 , 3/1 , 3/2 , and 3/1 are used to indicate the intervals between notes.
- Dynamic Markings:** Symbols such as p (piano) and f (forte) are used to indicate the dynamics of the music.
- Articulation:** Symbols such as acc (accents) and stacc (staccato) are used to indicate the articulation of the notes.

Score Analysis 5.2: Continued

The score analysis displays measures 34 through 38 across seven staves. The first two staves represent the original score, while the remaining five staves show a reduced version with harmonic annotations.

- M.F. (M.G.):** Measures 34-38, showing melodic lines in treble and bass clefs.
- Rhythmic Forces:** A single staff with a vertical line indicating a rhythmic event.
- M.F. (Local):** Measures 34-38, showing melodic lines with dashed lines indicating local connections.
- V.L. (M.G.):** Measures 34-38, showing melodic lines in treble and bass clefs.
- V.L. (F.G.):** Measures 34-38, showing melodic lines with annotations *LN* (Local Note) and *P* (Phrase).
- Orig. Piano:** Measures 34-38, showing piano accompaniment in treble and bass clefs.
- Orch. Reduction:** Measures 34-38, showing a reduced version of the piano accompaniment with harmonic analysis.

Harmonic analysis for the Orch. Reduction staff:

- Measure 34: I
- Measure 35: vii^{o7}/V
- Measure 36: vii^{o7}/IV
- Measure 37: vii^{o7}/V and vii^{o7}/IV^6
- Measure 38: V and vii^{o7}/IV

Additional annotations in the Orch. Reduction staff include vii^{o7}/V , I , $C+$, and V .

Score Analysis 5.2: Continued

The score analysis displays five staves, each with two systems of music. The first system (measures 39-41) and the second system (measures 42-43) are shown for each staff. The staves are labeled as follows:

- M.F. (M.G.):** Melody in the middle register.
- Rhythmic Forces:** A staff with a double bar line, indicating a rhythmic structure.
- M.F. (Local):** Melody in the local register.
- V.L. (M.G.):** Melody in the lower register.
- V.L. (F.G.):** Melody in the lower register, featuring a *Pedal: C* marking.

The second system (measures 42-43) includes additional markings: *Model*, *Momentum*, and *Inertia* for the M.F. (M.G.) staff; *Pedal: C* for the V.L. (F.G.) staff; and *IV⁶*, *V*, *I*, *IV¹*, and *F+* for the Orch. Reduction staff.

Score Analysis 5.2: Continued

This musical score analysis displays measures 44 through 47 across several staves, comparing the original orchestration with a reduced version. The staves are labeled as follows:

- M.F. (M.G.):** Measures 44 and 45 show a melodic line with a dashed line indicating a continuation or connection to measure 46.
- Rhythmic Forces:** A single staff line with a double bar line, indicating a rhythmic structure or a break in the sequence.
- M.F. (Local):** Measures 44 and 45 show a melodic line with a dashed line indicating a continuation or connection to measure 46.
- VL. (M.G.):** Measures 44 and 45 show a melodic line with a dashed line indicating a continuation or connection to measure 46.
- VL. (F.G.):** Measures 44 and 45 show a melodic line with a dashed line indicating a continuation or connection to measure 46.
- Orig. Piano:** Measures 44 and 45 show a complex melodic line with a dashed line indicating a continuation or connection to measure 46.
- Orch. Reduction:** Measures 44 and 45 show a simplified melodic line with a dashed line indicating a continuation or connection to measure 46.

The score includes various musical notations such as notes, rests, and dynamic markings (e.g., f , p , mf , ff). Measure numbers 44, 45, 46, and 47 are clearly marked at the beginning of their respective staves.

The score analysis is presented in seven systems, each with a label on the left and a corresponding musical staff or staves. Measure numbers 47, 48, 49, 50, 51, and 52 are indicated at the top of the first staff in each system.

- Musical Forces (M.G.):** Shows the initial musical forces with a dashed line indicating a melodic contour from measure 48 to 50.
- Rhythmic Forces:** Displays rhythmic patterns with labels "Model" and "Momen, Inertia" above the staff.
- Musical Forces (Local):** Focuses on local musical forces, with a dashed line indicating a melodic contour from measure 48 to 50.
- Voice-Leading (MG):** Shows voice-leading for the MG system, with labels "UN", "LN", "ARP", and "P" above the staff.
- Voice-Leading (F.G.):** Shows voice-leading for the F.G. system, with labels "P", "ANT", "LN", and "P" above the staff.
- Original Piano:** Shows the original piano part with a dashed line indicating a melodic contour from measure 48 to 50.
- Orch. Reduction:** Shows the orchestral reduction with a dashed line indicating a melodic contour from measure 48 to 50. At the bottom, Roman numerals and figured bass notation are provided: $d\text{-}; i$, $V I^6$, i , $V I$, i , 7 , $V I I^{\#} V^{\#} I^6$, a , III , 7 , i^6 , III , $\flat II$, i^6 , g .

Musical Forces
(Magnetism and M.G. Gravity)

Rhythmic Forces

Musical Forces
(Gravity and Inertia)

Voice-Leading (MG)

Voice-Leading (F.G.)

Original Piano

Orch. Reduction

Model Momen. Inertia

Reg. Shift

Reg. Shift

p

p

67 68 69 70 71

C: I V³ Alt.V I⁶ vii^{o7} I V³

C Pedal Tone until m. 73

Score Analysis 5.4: Continued

72

M.F.
(Mag. and M.G. Grav.)

73 74 75 76 77

Rhythmic Forces

M.F.
(Local Grav. and Inertia)

VL. (M.G.)

VL. (F.G.)

Reg. Shift

Orig. Piano

Orch. Reduction

Alt. V 1^6 vii^{+57}/ii ii vii^{+57}/iii iii i 6^-

The score analysis is presented in seven systems, each with a label on the left:

- Musical Forces (M.G.):** Shows the musical forces in measures 102, 103, 104, 105, and 106. It includes a 'Model' section with 'Momentum' and 'Inertia' labels.
- Rhythmic Forces:** Shows the rhythmic forces in measures 102, 103, 104, 105, and 106.
- Musical Forces (Local):** Shows the musical forces in measures 102, 103, 104, 105, and 106.
- Voice-Leading (MG):** Shows the voice-leading in measures 102, 103, 104, 105, and 106.
- Voice-Leading (F.G.):** Shows the voice-leading in measures 102, 103, 104, 105, and 106.
- Original Piano:** Shows the original piano score in measures 102, 103, 104, 105, and 106.
- Orch. Reduction:** Shows the orchestral reduction in measures 102, 103, 104, 105, and 106.

The analysis includes various musical notations such as treble and bass staves, chords, melodic lines, and dynamic markings. Key features include a 'Model' section with 'Momentum' and 'Inertia' labels, and a 'Voice-Leading' section with 'MG' and 'F.G.' labels. The 'Original Piano' section shows the original score with dynamic markings like 'p' and 'f'. The 'Orch. Reduction' section shows the orchestral reduction with dynamic markings like 'd:-' and 'i'.

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