Expanding Steve Larson's theory of musical forces

Wim Henderickx's Raga I and Raga III

RJ Meyer

Student number: 20776918

ORCID: 0000-0002-5281-3834

Thesis submitted in fulfilment of the degree

PHILOSOPHIÆ DOCTOR IN MUSIC

at the North-West University

Advisor: Prof DJ Taljaard

2018

ABSTRACT

Expanding Steve Larson's Theory of Musical Forces: Wim Henderickx's *Raga I* and *Raga III*

Steve Larson's theory of musical forces is an important recent addition to music theory and a valuable tool in music analysis. Larson's first book on his theory of musical forces – *Musical Forces: Motion, Metaphor, and Meaning in Music* – was published in 2012. Although Larson discusses a vast array of topics and presents and supports his theory meticulously, this book is not a culmination of his theory because he narrowed the scope of his theory and some shortcomings are evident. Larson was aware of these shortcomings and indicated that he had been planning a sequel to his book, but he passed away shortly before the publication of *Musical Forces*. Shortly after the publication of the book, expansions of the theory of musical forces were published by scholars who worked closely with Larson.

In this research project, I expand Larson's theory of musical forces and focus on addressing two shortcomings: Larson's choice of repertoire for analyses and the change of terminology in his book. The two compositions by Wim Henderickx, *Raga I* and *Raga III*, upon which I base observations, allow me to clarify concepts and terms, and to expand the theory of musical forces. The primary research question of this research project is as follows: what expansions of the theory of musical forces can be proposed on the basis of analyses and comparisons of the different versions of Wim Henderickx's *Raga I* and *Raga III* in terms of Steve Larson's theory of musical forces?

Both *Raga I* and *Raga III* exist in different versions: *Raga I* for percussion and two pianos, *Raga I* for percussion and orchestra, *Raga I* for percussion solo, *Raga I* for percussion and concert band, *Raga III* for viola and large orchestra, *Raga III* for viola solo, *Raga III* for viola solo and electronics, and *Raga III* for viola and smaller orchestra. I organise the different versions of these two compositions into two groups according to similarities in the way they were orchestrated, and interpret each group as a case of a multiple instrumental case study. I compare and analyse the different versions, interpreting and comparing my analyses specifically in terms of how musical forces operate. I also compare the two cases to highlight aspects of how musical forces operate.

The comparative analyses of the different versions in each case and a cross-case analysis enable me to identify ways in which musical forces can be amplified when compositions are orchestrated. These comparisons also lead to inquiries into other aspects of musical forces and support arguments in which I address shortcomings identified in Larson's theory of musical forces. My findings on how musical forces can be amplified, new insights into the theory of musical forces, and my solutions to the two shortcomings in Larson's theory of musical forces are significant contributions to Larson's theory of musical forces.

My analyses in terms of musical forces not only illustrate how the theory of musical forces can be employed as a useful tool in music analysis, but also hold constructive implications for the use of this theory in music theory, composition, music education, musicology, and other studies related to motion, metaphors, and meaning in music.

Keywords: theory of musical forces; melodic forces; rhythmic forces; Steve Larson; expansion of musical forces; amplification of musical forces; music analysis; composition; Wim Henderickx; Raga I; Raga III

OPSOMMING

'n Uitbreiding van Steve Larson se Teorie van Musikale Kragte: Wim Henderickx se *Raga I* en *Raga III*

Steve Larson se teorie van musikale kragte is 'n belangrike onlangse bydrae tot musiekteorie en 'n waardevolle gereedskapstuk in musiekanalise. Larson se eerste boek oor sy teorie van musikale kragte – *Musical Forces: Motion, Metaphor, and Meaning in Music* – is in 2012 gepubliseer. Alhoewel Larson 'n groot verskeidenheid onderwerpe bespreek, en sy teorie noukeurig aanbied en argumente ondersteun, is hierdie boek nie die voleinding van sy teorie nie, want hy het die omvang van sy teorie vernou en sommige tekortkominge het duidelik geword. Larson was bewus van hierdie tekortkominge en hy het aangedui dat hy 'n opvolgboek wou skryf, maar hy is oorlede kort voordat *Musical Forces* gepubliseer is. Kort ná die publikasie van sy boek is sommige uitbreidings van sy teorie van musikale kragte gepubliseer deur navorsers wat nou met Larson saamgewerk het.

In hierdie navorsingsprojek brei ek Larson se teorie van musikale kragte uit en fokus ek op twee spesifieke tekortkominge: Larson se keuse van repertoire vir analises en veranderinge van terminologie in sy boek. Die twee komposisies van Wim Henderickx, *Raga I* en *Raga III*, waarop ek waarnemings baseer, stel my in staat om konsepte en terme te bespreek en die teorie van musikale kragte uit te brei. Die primêre navorsingsvraag vir hierdie navorsingsprojek is as volg: watter uitbreidings op die teorie van musikale kragte kan voorgestel word wanneer die verskillende weergawes van Wim Henderickx se *Raga I* en *Raga III* volgens Steve Larson se teorie van musikale kragte geanaliseer en vergelyk word?

Daar bestaan verskillende weergawes van beide *Raga I* en *Raga III*: *Raga I* vir perkussie en twee klaviere, *Raga I* vir perkussie en orkes, *Raga I* vir solo perkussie, *Raga I* vir perkussie en blaasorkes, *Raga III* vir altviool en groot orkes, *Raga III* vir solo altviool, *Raga III* vir solo altviool en elektronika, en *Raga III* vir altviool en kleiner orkes. Ek organiseer die verskillende weergawes van die twee komposisies in twee groepe volgens ooreenkomste in die manier waarop hulle georkestreer is en ek interpreteer elke groep as 'n geval van 'n veelvoudige instrumentale gevallestudie. Ek analiseer die verskillende weergawes en vergelyk hulle met mekaar en daarna interpreteer en vergelyk ek my analises, spesifiek in terme van die werking van musikale kragte.

Die vergelykende analises van die verskillende weergawes in elke geval, asook kruis-geval analises, stel my in staat om maniere te identifiseer waarop musikale kragte versterk kan word wanneer komposisies georkestreer word. Hierdie vergelykings lei ook tot verdere ondersoek rakende ander aspekte van musikale kragte en dit ondersteun my argumente oor tekortkominge in Larson se teorie van musikale kragte. My bevindinge oor hoe musikale kragte versterk kan word, nuwe insigte in die teorie van musikale kragte en my oplossings vir tekortkominge in Larson se teorie van musikale kragte is beduidende bydraes tot Larson se teorie van musikale kragte.

My analises in terme van musikale kragte illustreer nie net hoe die teorie van musikale kragte kan dien as 'n bruikbare gereedskapstuk in musiekanalise nie, maar dit het ook konstruktiewe implikasies vir die gebruik van hierdie teorie in musiekteorie, komposisie, musiekonderrig, musiekwetenskap en ander studies wat verband hou met beweging, metafore en betekenis in musiek.

Sleutelwoorde: teorie van musikale kragte; melodiese kragte; ritmiese kragte; Steve Larson; uitbreiding van musikale kragte; versterking van musikale kragte; musiekanalise; komposisie; Wim Henderickx; Raga I; Raga III

SAMENVATTING

Een Uitbreiding van Steve Larson's Theorie van Muzikale Krachten: Wim Henderickx's *Raga I* en *Raga III*

Steve Larson's theorie van muzikale krachten is een belangrijke recente aanvulling op de muziektheorie en zij is een waardevol instrument in muziekanalyse. Larson's eerste boek over zijn theorie van muzikale krachten – *Musical Forces: Motion, Metaphor, and Meaning in Music* – werd gepubliceerd in 2012. Hoewel Larson een breed scala aan onderwerpen bespreekt, evenals zijn theorie zorgvuldig presenteert en argumenten ondersteunt, is dit boek niet het hoogtepunt van zijn theorie, omdat hij de reikwijdte van zijn theorie beperkt heeft, en enkele tekortkomingen zijn duidelijk geworden. Larson was zich bewust van deze tekortkomingen en hij gaf aan dat hij een vervolgboek wilde schrijven, maar hij stierf kort voordat *Musical Forces* werd gepubliceerd. Kort na de publicatie van zijn boek werden enkele uitbreidingen van zijn theorie van muzikale krachten uitgegeven door onderzoekers die nauw samenwerkten met Larson.

In dit onderzoeksproject breid ik Larson's theorie van muzikale krachten uit en focus op twee specifieke tekortkomingen: Larson's keuze van repertoire voor analyses en verandering van terminologie in zijn boek. De twee composities van Wim Henderickx, *Raga I* en *Raga III*, waarop ik opmerkingen baseer die me in staat stellen om begrippen en termen uit te leggen en de theorie van muzikale krachten uit te breiden.

De voornaamste onderzoeksvraag voor dit onderzoeksproject is als volgt: welke uitbreidingen van de theorie van muzikale krachten kunnen worden voorgesteld wanneer de verschillende versies van Wim Henderickx's *Raga I* en *Raga III* worden geanalyseerd en vergeleken aan de hand van Steve Larson's theorie van muzikale krachten?

Er zijn verschillende versies van zowel *Raga I* als *Raga III: Raga I* voor percussie en twee klaviere, *Raga I* voor percussie en orkest, *Raga I* voor percussie solo, *Raga I* voor percussie en harmonieorkest, *Raga III* voor altviool en grote orkest, *Raga III* voor altviool solo, *Raga III* voor altviool solo en elektronica, en *Raga III* voor altviool en kleinere orkest. Ik verdeel de verschillende versies van de twee composities in twee groepen op basis van overeenkomsten in de manier, waarop ze georkestreerd werden, en ik interpreteer elke groep als een geval van een meervoudige instrumentale casestudy. Ik vergelijk en analyseer de verschillende versies, en ik interpreteer en vergelijk mijn analyses, met name wat betreft het functioneren van muzikale krachten.

De vergelijkende analyses van de verschillende versies in elk geval, als ook de cross-case analyses, maak me in staat om manieren vast te stellen, waarop muzikale krachten kunnen worden versterkt, wanneer ze worden georkestreerd. Deze vergelijkingen leid mij ook tot verder onderzoek naar andere aspecten van muzikale krachten en het steun mijn argumenten over tekortkomingen in Larson's theorie van muzikale sterkte. Mijn bevindingen over hoe muzikale krachten kunnen worden versterkt, nieuwe inzichten in de theorie van muzikale krachten en mijn oplossingen voor tekortkomingen in Larson's theorie van muzikale krachten zijn belangrijke bijdragen aan Larson's theorie van muzikale krachten.

Mijn analyses in termen van muzikale krachten illustreren niet alleen, hoe de theorie van muzikale krachten gebruikt kan worden als een nuttig instrument bij muziekanalyse, maar bevatten ook constructieve implicaties voor het gebruik van deze theorie in muziektheorie, compositie, muziekopvoeding, musicologie en andere studies gerelateerd aan beweging, metaforen en betekenis in muziek.

Trefwoorden: theorie van muzikale krachten; melodische krachten; ritmische krachten; Steve Larson; uitbreiding van muzikale krachten; versterking van muzikale krachten; muziekanalyse; compositie; Wim Henderickx; Raga I; Raga III

ACKNOWLEDGEMENTS

To conduct a research project on a doctoral level might feel like a solitary enterprise that can easily lead to despondence, but I was fortunate to have received constructive support throughout this onerous study in order to remain sanguine and to be successful. I am beholden to many individuals, but regrettably, I cannot express my gratitude to all the individuals who played a role in this research project over the past four years. I will thus only acknowledge institutions and individuals, in no particular order, who played a notable role in participating and constructively engaging in this research project.

Personal

- Professor Hannes Taljaard, my promotor, who provided me with guidance in aspects that surpass the boundaries of this research project. His time and work in order to buttress my research project, his hospitality, and soup are appreciated.
- Fébé Meyer, my wife, who is my ultimate inspiration. Thank you for your exceptional support and patience, your encouragement, invigorating me during strenuous times, and the effort you made to gain understanding of my work.
- Isie Meyer, my grandmother, who sadly passed away during the course of this research project. I am indebted to her for the many hours she spent taking me to my music lessons, attending my practice sessions, and showing immense interest in me and my music.
- My parents, Kobus and Anita Meyer, for their support and generosity that enabled me to pursue my studies this far.

North-West University

- The Dean of the Faculty of Arts, Prof Jan Swanepoel, who encouraged me and promoted me in my applications for funding. Also, his wife, Prof Rita Swanepoel, and his secretary, Lucinda Muller.
- Staff members at the North-West University who made constructive contributions and who had a considerable impact on this research project: Prof Liesl van der Merwe, Dr Catrien Wentink, Ms Janelize van der Merwe, Dr Chris van Rhyn, Prof Waldo Weyer, and Mr George Fazakas.
- Mrs Retha Badenhorst, librarian at the Music Library, who enthusiastically aided me in obtaining sources from around the globe.

Organisations

- Bursars and institutions who supported me financially: the North-West University (NWU), the South African Humanities Deans' Association branch of the National Institute for the Humanities and Social Sciences[*] (NIHSS-SAHUDA), the Southern African Music Rights Organisation (SAMRO), and the Oppenheimer Memorial Trust (OMT).[†]
- Organisations that gave me the opportunity to present my research and receive critical inputs from my peers: Musical Arts in South Africa: Resources and Applications (MASARA), the South African Society for Research in Music (SASRIM), and Musica Impulscentrum voor Muziek.

[*] The financial assistance of the National Institute for the Humanities and Social Sciences, in collaboration with the South African Humanities Deans Association towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at are those of the author and are not necessarily to be attributed to the NIHSS and SAHUDA.

[†] Also organisations that offered financial support for this research project: the National Arts Council of South Africa and the National Research Foundation (NRF).

- The Center for Research on Concepts and Cognition for providing sources, Anne-Marie Micoulaut from CeBeDeM for providing scores, and Lisbet Frøystadvåg and Skjalg Reithaug from Norsk Musikforlag for providing scores.

Participants and Scholars

- Prof Wim Henderickx, for sacrificing his valuable time to support my inquiry into his music, for his critical feedback on my work, his splendid music, inspiration, and for entrusting musicological documents and information to me. His wife, Mrs Bea Henderickx-Steylaerts, for her quick and eager responses to all my questions, her assistance, and hospitality. His assistant, Mr Diederik Glorieux, for verifying some information and assisting Wim in some interviews.
- The other research participants for this project, Gert François, Leo De Neve, and Jorrit Tamminga, for their time and enthusiasm, and for their keen participation.
- Prof Robert Hatten and Prof Matthew BaileyShea for clarifying concepts and putting me on the correct path regarding sources.

Language Editing

- Mrs Hendrine Krieg for her thorough language editing of this thesis.
- Ms Zelda Wolfsohn for her language editing of the transcribed interviews.
- Mr Eugène Ceulemans for his language editing of my Dutch abstract.

Jaco Meyer

rjmeyer.music@gmail.com

****

CONTENTS

DIAGRAMS

TABLES

EXAMPLES

IMAGES

CHAPTER 1

Introduction

1. Introduction and Research Problem

Steve Larson (1955-2011) was Robert M. Trotter Professor of Music at the University of Oregon and a respected pioneer in research on music cognition and perception, music theory, and music analysis.[1] He introduced a theory of musical forces in 1993 as an analogy of the work of Rudolf Arnheim (1904-2007), a German art theorist and perceptual psychologist who worked in the visual arts (Larson, 1993a).[2]

The Importance of the Theory of Musical Forces

Larson's theory of musical forces has been employed by scholars from various fields of research to make significant contributions to those fields (Hatten, 2012a:ix) and is described as a powerful tool for analysing music (Larson, 2012:180). This statement is supported by Matthew BaileyShea (2012), professor of music theory at the University of Rochester, when he describes the theory of musical forces in his article as "a powerful framework for analyzing music". This theory was developed and refined over more than twenty years, and I have used it to shed new light on compositions (Meyer, 2014; Meyer, 2017b). Furthermore, it is being expanded by theorists who apply the theory on cognitive and perceptual levels (Hatten, 2012b; Hatten, 2015; BaileyShea, 2012). This theory is useful in music theory (Svard, 2012-2013:53) and received positive reviews (Graybill, 2012; Margulis, 2013; Svard, 2012-2013).

[1] See Addendum A, §1 for a biography of Steve Larson.
[2] See Addendum A, §2 for a biography of Rudolf Arnheim.

The theory of musical forces is considered an important theory in music for the following reasons:

- While it explains observations of music-theoretical aspects, it is primarily concerned lwith what listeners hear and explaining why listeners hear music in a certain way. Thus, the theory of musical forces is an important theoretical framework for scholars who work with listeners' experiences. Research and empirical evidence for the development of the theory of musical forces was also performed. It is thus a theory that can be applied practically and not only in theoretic ways.
- It is a concrete and embodied theory that provides a structured lens that can be employed to reflect on listeners' experiences. This implies that the theory of musical forces relates closely to the realities of listeners and that it can be employed in multicultural contexts.
- Larson's work does not fall into the category of music-theoretical work that "make an initial bow in the direction of psychology of perception and then carry on with [...] theorizing regardless, but claiming the enduring benediction of psychology" as described by Cook (1994:67). This is because Larson sought empirical evidence for his theory and collaborated with specialists in other fields. These specialists include Robert Hatten (musical gestures), Mark Johnson (metaphor and embodied reasoning), Leigh VanHandel (cognitive science), Henry Martin (composition and jazz history), Steven Strunk (music theory and composition), and Keith Waters (music theory).
- The theory of musical forces can be crystallised into other fields of research and theories in music and can thus be employed to enhance our understanding of those fields of research and theories.

- There are only a few theoretical models like Larson's theory of musical forces, and his is the first and only theory that works with cross-domain mappings between physical forces and music.

The Development of Larson's Theory of Musical Forces

Larson theorised Arnheim's thoughts on perceptual forces in visual arts and music by developing thoughts and metaphors in the field of music. He published thoughts on the perception of stability in music, and provided metaphors and evidence for attractive forces in music. Arnheim's work enabled Larson to create a unique theory of musical forces that is considered an important contribution to the field of music theory (BaileyShea, 2012). However, Larson's theory of musical forces is not fully developed and my study seeks to build on the strong foundations provided by Larson.

An understanding of Larson's melodic forces, a part of his theory of musical forces, is important in order to understand the research problem; therefore, I provide a concise overview of the melodic forces, best described in Larson's own words. The most important concepts of Larson's theory are stability, melodic gravity, melodic magnetism, and musical inertia.

At this point of the research problem it is important to distinguish between the terms 'musical forces' and 'melodic forces'. When Larson (1993a) first published his analogy of Arnheim's work, he used the term 'musical forces' to refer to – what he at first called – 'musical gravity', 'musical magnetism', and 'musical inertia'. These first two terms were changed by Larson (2012) to 'melodic gravity', 'melodic magnetism', but 'musical inertia' remained unchanged. These terms are used to describe Larson's 'melodic forces', a central part of his larger theory, the theory of 'musical forces'. However, Larson's change of terminology is not applied consistently in his last publication. This change in terminology will be addressed and discussed later.

Larson argues in his theory of melodic forces that "[i]n a passage of tonal music individual notes have varying degrees of stability" (Larson, 1993a:98). Larson (2012:100) writes that "[s]tability is a comparative quality that we attribute to a note. We hear a note as unstable to the degree that it leads us to auralize another (more stable) pitch – and a path that will take the melody to that pitch." He identifies three "attractive power[s]" that cause unstable notes to be attracted to more stable pitches. These attractive powers are the melodic forces he named melodic gravity, melodic magnetism, and musical inertia (Larson, 1993a:98-99; Larson, 2012:82-109).

Melodic gravity is defined as "the tendency of an unstable note to descend to a *lower*, more stable pitch" (Larson, 1993a:98; Larson, 2012:83). Melodic magnetism is described as "the tendency of an unstable note to move (up or down) to [the nearest] more stable pitch" (Larson, 1993a:98; Larson, 2012:88). Larson (2012:88) writes that the tendency of the unstable note to move to the closest stable pitch "grows stronger as we get closer to that goal [(the stable pitch)]". Musical inertia is described as "the tendency of a pattern of musical motion to continue in the *same* fashion" (Larson, 1993a:99; Larson, 2012:96).

Larson's theory of musical forces – a broad theory that addresses, for example, the ways in which metaphors are used when conceptualising music, as well as musical expectation and meaning in music – was developed over a period of twenty years. Larson completed the manuscript of his first book, entitled *Musical Forces: Motion, Metaphor, and Meaning in Music*, in 2010. This book was published posthumously in 2012.

This book not only provides evidence of Steve Larson's excellence as a researcher in music, but also contains exemplary syntheses of a large part of relevant literature that relates to musical meaning, metaphors, musical forces[3], complex algorithms, computer models, research on composition and improvisation, and the musical expectations of listeners. However, I do not consider this book to be the culmination of Larson's theory of musical forces[4] Among other important matters, Larson changed terminology – possibly because he uses only simple music and melodies for his analyses – and he narrowed the scope of his theory. The narrow scope of Larson's theory is also criticised by other authors. Arnie Cox (2013), Associate Professor of Music Theory at Oberlin College and Conservatory, who focuses on embodied cognition and metaphoric conceptualisation in his research, writes that he has a fundamental concern with Larson's choice of repertoire for analyses. He also writes that Larson, in referring to 'musical forces', is arguably too ambitious due to the nature of the

[3] A large part of Larson's theory of musical forces includes a critical review of existing literature that relates to the melodic forces which Larson describes. However, this critique of the literature mainly shows that authors merely used terms such as 'gravity' to describe observations in analyses, and that their views are not theoretical, but descriptive. Thus, no comparable literature prior to Larson's pioneering work on a theory of musical forces exists. Larson's own writings on his theory and reviews on his book thus comprise the largest part of current literature on the theory of musical forces. Other authors who are also working with Larson's theory of musical forces include BaileyShea (2012), Cox (2013), Hatten (2012b), Keesecker (2016), Lee (2014), Marshall (2016), Monahan (2013), Peterson (2014), and Roy (2015).

[4] Robert Hatten, Professor of Music Theory at the Butler School of Music of The University of Texas at Austin, agrees and writes in the foreword of Larson (2012a:ix) that "*Musical Forces* is the culmination of over 25 years of speculation, research, and empirical inquiry into the ways we experience motion, and hence meaning, in music." However, *Musical Forces* is certainly not a culmination of the theory of musical forces because work on this theory – like in this research project – continues. I understand Hatten's sentence as referring to the culmination of Larson's work, and not a culmination of the theory.

compositions that are analysed by Larson. Two of these concerns form the basis of my research project that addresses the narrow scope of Larson's theory: 1) Larson's choice of repertoire for analyses and 2) the change of terminology.

Larson's Choice of Repertoire for Analysis

From his analyses it is evident that Larson's theory of musical forces is narrow, in spite of the broad methodological scope of his life's work. He explains and illustrates the operation of melodic forces by means of simple[5] melodies like *Twinkle, Twinkle, Little Star*; *Happy Birthday*; *Dido's Lament* from Purcell's *Dido and Aeneas*; and *Hickory Dickory Dock*. Larson only follows a linear, horizontal[6] approach in describing the interaction of musical forces in these simple melodies. Although it is clear that these explanations and illustrations are provided with the purpose of introducing concepts, his analyses are not later complemented by analyses of more substantial compositions and the use of more complex analytical approaches in the theory.

[5] By 'simple melodies' I refer to tonal melodies that have a range of not more than an octave, and that involve mostly quavers, crotchets, and minims. The harmonic implications of these melodies are conventional. Aspects such as tonality, register and range, and note values influence the interaction and perception of musical forces. He does not refer to harmony or accompaniment in his analyses.

[6] Cox (2013) also mentions that the vertical dimension is lacking in Larson's analyses.

Change of Terminology

The most significant change of terminology in his book concerns the fact that Larson (2012) specifically refers to "melodic forces", "melodic gravity", and "melodic magnetism" instead of "musical forces"[7], "musical gravity" and "musical magnetism", the terms he used in his earlier research articles since 1993. A possible explanation for this change in terminology, albeit applied inconsistently as argued above, is that Larson realised that the term 'musical forces' was too comprehensive at that stage of his research and for the exemplars provided, whereas the term 'melodic forces' has a more restricted scope. Larson thus narrowed the scope of this part of his theory by referring to 'melodic forces' instead of 'musical forces'. Larson (2012:136-179) also added "rhythmic forces" for the first time alongside melodic forces. This change in terminology and addition of rhythmic forces enables us to distinguish between 'melodic forces', 'rhythmic forces', and 'musical forces'. 'Melodic forces' and 'rhythmic forces' are only parts of Larson's theory of musical forces. The different parts of Larson's theory combined, which include 'melodic forces' and 'rhythmic forces', are understood as his theory of 'musical forces'.

Enlarging the scope and expanding the theory of musical forces is necessary because of the importance of this theory in the field of music theory and analysis. The melodic forces are the point of departure and form the basis of Larson's theory of musical forces, a narrowing in the scope of melodic forces consequently leads to a narrowing of his theory of musical forces. When the scope of melodic forces is enlarged, Larson's theory of musical forces will again be enlarged and expanded as a result. The scope of melodic forces can be enlarged when music is analysed in more complex contexts[8]. These more 'complex contexts' which I refer to

[7] Larson previously used the term 'musical forces' to refer to 'melodic gravity', 'melodic magnetism', and 'musical inertia'.

[8] The issue of simplicity and complexity concerns the "neutral level" of analysis as identified by Molino (1990).

include the following: analysis of a composition as a whole and the different segments of the composition, and analysis of multiple horizontal and vertical musical lines simultaneously.

From Larson's own thoughts it is clear that he wished to enlarge and expand the theory. Larson (2012:180) indicated that he was planning a sequel for his book that would deal with musical analysis, but also suggests in the last pages of his book "potentially useful avenues for further research in music analysis, experimental psychology, the pedagogy of musicianship, phenomenology, cognitive linguistics, ethnomusicology, and computer science." (Larson, 2012: 322.) I identified further research possibilities in music analysis, following Larson's first suggestion, by choosing to study music in more complex contexts in which the interaction of musical forces[9] can be studied.

Such more complex contexts are not presented in Larson's work, and thus I constructed potentially more complex contexts while exploring the topic. Contexts can include the complex relationships between

- musical forces and the processes of composition (creating and teaching);
- musical forces and orchestration;
- musical forces and performance practice;
- musical forces and conducting;
- musical forces and eurythmics[10] or movement to music; and
- musical forces and dance.

[9] I use the term 'musical forces' here because this research project seeks to enlarge the scope of Larson's 'melodic forces' to such an extent that it will be legitimate to change the terminology back to 'musical forces'.
[10] Also referred to as 'the Dalcroze Approach'.

I have made a pragmatic choice to study only the complex relationship between musical forces and orchestration[11] in this research project. In order to study musical forces and orchestration, suitable compositions had to be chosen. I decided on the selection criteria below in order to identify suitable compositions.

The selection criteria I created are as follows:

a) The compositions should be tonal. Tonal compositions allow for the application of Steve Larson's theory of musical forces and provide applicable exemplars for my expansion of Larson's theory of musical forces.[12]

b) Compositions that exist in different versions of which at least one version is an orchestrated version. In order to analyse the operation of musical forces in the different versions, significant compositional differences need to be present. Merely different instrumentations of the same composition are not sufficient.

c) Compositions are orchestrated by the composer of the original composition, other prominent composers or orchestrators. The conceptualisation of the orchestration(s) or different versions is considered to be more closely related when it was orchestrated by the composer who composed the original composition.

d) The original and orchestrated versions are published and publically available for music score analyses and investigation into how the composition was orchestrated.

[11] By studying orchestration, many of the compositional processes will also be discussed because of the close relationship between orchestration and the process of composition. In this way, my study to some extent also addresses the first of the complex contexts that I identified.
[12] The meaning of the term 'tonal' is taken here in a broad sense.

e) Compositions by a prominent and established composer that also meets the high standards of a doctoral research project. Compositions that enable me to analyse and describe the artistic choices made by a prominent composer, rather than compositions that force me to deal with limitations of a composer's technique. In other words, when analysing the orchestration of a skilful composer, one can assume that choices were made to realise creative intentions, rather than as results result of limitations in technique.

f) Compositions that are sufficiently complex to allow me as researcher and analyst to present interpretations and findings that address the research problem of this research project.

I created a list of possible compositions and orchestrations that might have met the criteria. This list consists of compositions I studied before or compositions that are known to me – see Addendum B for the list of possibilities. Two suitable compositions that met the criteria were identified and used in this research project. These two compositions are *Raga I* and *Raga III* by the internationally renowned Belgian composer and percussionist, Wim Henderickx (b. 1962).

Raga I and *Raga III* by Wim Henderickx were chosen because they met the criteria set out above in the following ways:

a) *Raga I* and *Raga III* are tonal compositions and were influenced by Eastern philosophy and religion. The melodic material of *Raga I* was inspired by Indian modi and is based on the scale D, E, F♯, G♯, A, B♭, C, (D). *Raga III* also relates to Indian modi and is based on two scales: C, D♭, E, F♯, G, A♭, B, (C) and C, D♮, E♭, F♮, G, A♮, B♭, (C). [13]

b) *Raga I* exists in four versions: the first version for percussion and two pianos (1994), the second version for percussion and orchestra (1996), the third version for percussion solo (1996), and the fourth version for percussion and concert band (2016). *Raga III* also exists in four versions: the first version for viola and large orchestra (1995), the second version for viola solo (2003), the third version for viola and electronics (2010), and the fourth version for viola and (smaller) orchestra (2012). [14] These four versions of each composition created the possibility to compare the different versions. The original versions of *Raga I* and *Raga III* were both composed and later orchestrated by Wim Henderickx.

c) The scores of all four versions of *Raga I* and all four versions of *Raga III* are available from CeBeDeM music publishers[15] in Brussels, Belgium, and Norsk Musikforlag[16] in Oslo, Norway.[17]

---

[13] For *Raga I* and *Raga III* the meaning of the term 'tonal' is taken here in a broad sense.

[14] A fifth version exists for viola d'amore that was created in 2016 and was performed by Marco Fusi on 11 March 2017 at the Project(ion) Room in Belgium and on 23 April 2017 at Spectrum in the United States of America. This version is excluded here because there is no final version as the composer is still working on improvements of the composition (Steylaerts-Henderickx, 2017).

[15] The following scores are available from CeBeDeM music publishers: *Raga I* for percussion and two pianos (1994); *Raga I* for percussion and orchestra (1996); *Raga I* for percussion solo (1996); *Raga III* for viola and large orchestra (1995); *Raga III* for viola solo (2003).

[16] The following scores are available from Norsk Musikforlag: *Raga I* for percussion and two pianos (1994); *Raga I* for percussion and orchestra (1996); *Raga I* for percussion solo (1996); *Raga I* for percussion and

d) Wim Henderickx is a prominent living[18] international composer, lecturer and percussionist who received numerous prestigious awards and commissions for his compositions.[19] Hubert Culot (1999) writes that Henderickx's music is "[r]eally well worth investigating for Henderickx is undoubtedly one of the most endearing composers of his generation." Belgian musicologist Jan Vandenhouwe (2001) also comments on Henderickx's orchestration and describes Henderickx as a "virtuoso orchestrator". In my opinion, supported by the literature on Henderickx, his compositions are of a sufficiently high standard for this doctoral research project. Also, the different versions of both *Raga I* and *Raga III* were performed widely by renowned soloists, ensembles, and orchestras – a further proof of their quality.[20]

e) The complexity of the different versions of *Raga I* and *Raga III* was suitable for this research project and allowed me as researcher and analyst to present interpretations and findings that addressed the research problem of this research project.

---

concert band (2016); *Raga III* for viola solo and electronics (2010); *Raga III* for viola and smaller orchestra (2012).

[17] The website of the CeBeDeM publishing company in Brussels erroneously listed that a version of *Raga III* for chamber orchestra is also available, which is not the case (Henderickx, 2015c).

[18] The fact that Henderickx is a living composer who could be involved in this study played an important role in my decision of compositions.

[19] See Addendum C, §1 for a short biography of Wim Henderickx and a list of his accolades and awards, as well as Addendum C, §1.3 for a complete list of compositions by Wim Henderickx.

[20] See Addendum D for more information with regards to the Ragas.

Raga I and *Raga III* are two of three compositions from Wim Henderickx's Raga cycle. This cycle is summarised in Diagram 1-1.

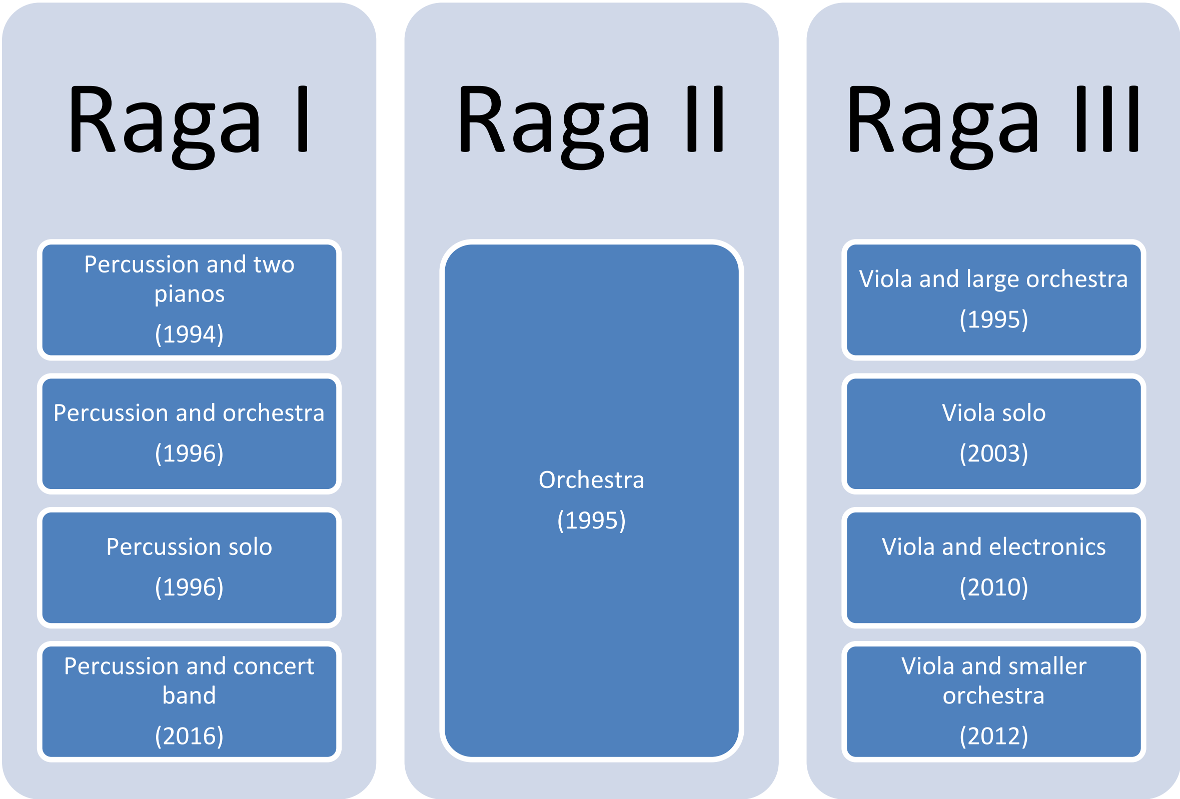


Diagram 1-1

Wim Henderickx's Raga cycle

Wim Henderickx's *Raga II* (1995) was excluded from this research project because this composition only exists in a version for orchestra and there are no other versions to analyse and compare. Studying *Raga II* would not have contributed towards answering the research questions.

Diagram 1-2 shows a timeline of the composition process of the different versions of *Raga I* and *Raga III*.

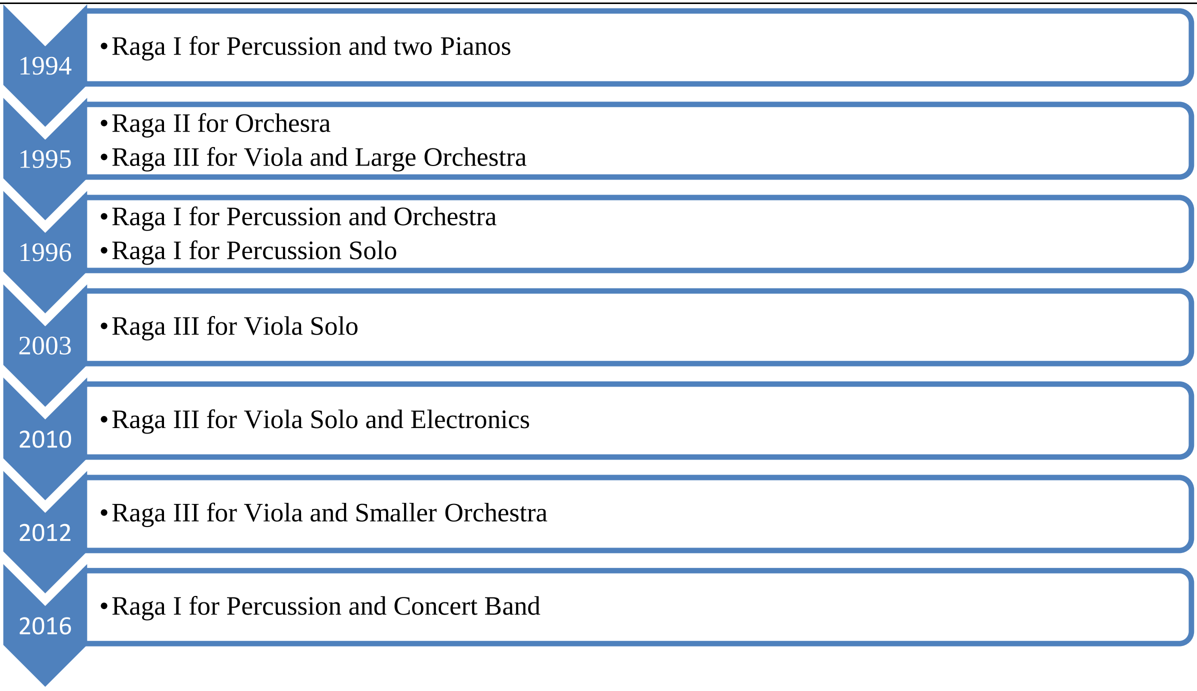


Diagram 1-2

Timeline of the composition of the different versions of Raga I *and* Raga III

The different versions of Wim Henderickx's *Raga I* and *Raga III* are the most suitable compositions I could find to study the complex relationship between musical forces and orchestration, and to help me answer the research questions. These compositions are used as examples, and sometimes as exemplars and as sources of data that enable me to generate and illustrate my arguments. It is thus not within the scope of this thesis to discuss the compositions of Wim Henderickx or to gain deeper insights into *Raga I* or *Raga III*.

2. Purpose Statement

The purpose of this multiple instrumental case study is to enlarge the scope and expand the theory of musical forces in a context that is more complex than the contexts presented in Larson's theory. This will be achieved by aural and score analyses, and comparisons of the operation of musical forces in the different versions of Wim Henderickx's *Raga I* and *Raga III* in terms of Steve Larson's theory of musical forces; addressing and discussing shortcomings in literature; and interviews with four research participants. This is not an analytical study, even though music analysis is employed as a tool. This is a music-theoretical study.

3. Research Questions

3.1 Primary Research Question

The primary research question of this research project is as follows: What expansions of the theory of musical forces can be proposed on the basis of analyses and comparisons of the different versions of Wim Henderickx's *Raga I* and *Raga III* in terms of Steve Larson's theory of musical forces?

3.2 Secondary Research Questions

The secondary research questions of this research project are

- What is Steve Larson's theory of musical forces as described in the primary literature, i.e. Larson's own work? (Chapter 2)
- What shortcomings in literature on Larson's theory of musical forces should be addressed and discussed? (Chapter 2)
- How can the different versions of *Raga I* and *Raga III* by Wim Henderickx be divided into cases? (Chapter 3)
- How can the operation and interaction of musical forces in the different versions of Wim Henderickx's *Raga I* and *Raga III* be analysed? (Chapter 3)
- Which aspects of the interaction of the musical forces in the different versions of Wim Henderickx's *Raga I* and *Raga III* are the same and which are different when compared in terms of the cases, and how do these aspects relate to the theory of musical forces? (Chapters 4, 5, and 6)
- What changes and additions to Larson's theory of musical forces are suggested when the results from the cross-case analyses and insights from comparable studies that rely on Larson's theory are fused with Larson's theory? (Chapter 7)

4. **Research Procedures**

4.1 Research Design

This research project uses a multiple case study to achieve the research aims. To use case studies as a research method is considered valuable by Rule and John (2011:7) because of the following reasons:

- An understanding of and insight into particular instances can be generated. A thick, rich description of the cases can be provided and the relations of the case can be extrapolated to broader contexts.
- A problem can be explored within certain limitations and with a specific focus.
- Theoretical insights can be generated.
- Other similar cases can be illuminated.
- Theoretical and contextual points can be expanded.

Rule and John (2011:21) write that "[i]f multiple case studies reveal common findings they [...] can also generate new theory." Multiple cases were selected for this study because[21]

- the different cases could be compared,
- they provided more depth to the research project and
- methodological replication was possible.

[21] Adapted from Rule and John (2011:21).

The case study followed a convergent parallel mixed method research design that includes both qualitative and quantitative aspects. Creswell (2014:219) writes that "[i]n this approach, a researcher collects both quantitative and qualitative data, analyzes them separately, and then compares the results to see if the findings confirm or disconfirm each other". Rule and John (2011:61) write that if a researcher's purpose is "to gain a holistic understanding of a case, then collecting and analysing both qualitative and quantitative data are often required."

A mixed method design was suitable for this research project because it involves the collection of open-ended (qualitative) and close-ended (quantitative) data which was needed to gain a holistic understanding of the cases and to answer the research questions rigorously.

The interviews, documents and media analyses, and music score analyses in this research project constitute the qualitative aspects of the research design and the music score analyses constitute a part of the quantitative aspects of the research design. The qualitative and quantitative data are used to gain a holistic understanding of cases, as suggested by Rule and John (2011:61), rather than separating the analyses of data sources to see how findings confirm or disconfirm each other, as suggested by Creswell (2014:219).

Some of the versions of Wim Henderickx's *Raga I* and *Raga III* were divided into three cases. The remaining versions that were not divided into a case will be discussed separately. The division of the different versions into cases is explained in Chapter 3.

4.2 Research Approach

A multiple instrumental case study was conducted. Rule and John (2011:9) write that "[a]n instrumental case study takes as its focus a particular issue and examines cases to explore this issue in depth." The particular issue that is examined in depth in this research project is Larson's theory of musical forces and the expansion thereof.

An approach will be followed that allows a dialogical interaction, as described by Rule and John (2011:100), between the theory and the case (theory-case-theory) in the research process. Due to the limited application of Larson's theory of musical forces in existing literature, the case study will also be exploratory in nature.

The dialogical interaction between theory and case was not completely sufficient for this research project, and therefore I also followed an iterative approach with the cases. This iterative approach allowed me to answer the research question more rigorously, conduct cyclical inquiry in my expansions, and critically reflect on my arguments (Kekeya, 2016).

4.3 Research Participants

Four persons were purposefully chosen as research participants in this research project. These research participants were chosen because of their involvement in the composition and/or performance of *Raga I* and/or *Raga III*. They participated in this research project and served as secondary data collection sources, mainly by means of interviews. Research participants were also involved in various levels in the validation strategies employed in this research project.

The following persons were involved as research participants in this research project:

- **Wim Hendericks:** Composer of *Raga I* and *Raga III*. See Addendum C, §1 for a short biography of Wim Henderickx.[22]
- **Gert François:** Percussionist for the first performance of *Raga I*. He worked closely with the composer regarding the selection of percussion instruments and concert setup. François is also the dedicatee of *Raga I*. See Addendum C, §2 for a short biography of Gert François.
- **Leo De Neve:** Viola player of the first performance of *Raga III*. He worked closely with the composer regarding viola performance and interpretation. De Neve is the dedicatee of *Raga III*. See Addendum C, §3 for a short biography of Leo De Neve.
- **Jorrit Tamminga:** Developer of the electronics of *Raga III*. He worked closely with the composer to develop the electronics. See Addendum C, §4 for a short biography of Jorrit Tamminga.[23]

The involvement of these research participants in this research project will be highlighted in the sections that follow.

[22] Henderickx is also a percussionist who was able to provide details regarding the performance of percussion parts in *Raga I*.
[23] Tamminga is also a composer who was able to comment insightfully about his involvement in the composition process of *Raga III* for viola solo and electronics.

4.4 The Role of the Researcher

The researcher gathered and interpreted all the data of this research project. The research methods used in this research project required that I act as an analyst, listener, and critic; interviewer; and participant as observer.

Analyst, Listener, and Critic

The analytical strategy that was employed in this study involved many aural observations and interpretations, specifically in terms of segmentation and the operation of musical forces. These aural interpretations were based upon my personal experiences and critical interpretations (see validation strategies, §4.6). I acknowledge that cultural background and training play an important role in aural observations and interpretations (Garfias, 2004), and therefore it is important to mention that I was trained within a Western framework of music studies and I present my findings within Western contexts, on music from the Western traditions of composing.

Trained and untrained listeners, and musicians and theorists do not listen to music in the same way (Cook, 1994:67-68). Although the effect of how musical forces operate is also heard by untrained listeners, I specifically target trained listeners and I am also a trained listener. The nature of this study also requires of me to listen from a theoretical perspective.

Interviewer

As interviewer I had to arrange and conduct interviews with the research participants. I had to construct questions about topics that would contribute to my data collection procedures and to achieve my research aims. As an interviewer collecting qualitative data, I had to steer conversations and ask secondary questions. I was also responsible for the recording and transcription of these interviews.

Participant Observer

Apart from being a researcher, I am also a composer. In July 2016 I acted as an observing participant at the SoundMine international master classes in orchestration presented by Wim Henderickx, Diederik Glorieux[24], and Jorrit Tamminga in Neerpelt, Belgium (see Addendum E for events of importance that relate to this research project). During these master classes I participated as a composer and orchestrator, studying (observing) orchestration with Wim Henderickx. By studying orchestration with Wim Henderickx I could get his perspectives of orchestration, specifically his perspectives as a teacher of orchestration and as a composer.

My composition entitled *Du bist mein Herzschlag*[25] which was composed during SoundMine 2016 was selected as one of the compositions to be performed by the Antwerp Symphony Orchestra[26] with Wim Henderickx as conductor. This concert, SoundMine Toonmoment, took place on 24 May 2017 in the new Queen Elisabeth Hall, Antwerp, Belgium.

[24] Diederik Glorieux (b. 1976) is a Belgian composer and music coordinator, as well as musical assistant for Wim Henderickx.
[25] You are my heartbeat.
[26] The Antwerp Symphony Orchestra is the new name (changed in April 2017) of deFilharmonie (Koninklijke Filharmonie van Vlaanderen) which is the same orchestra that performed many of Wim Henderickx's compositions.

Previous Work in the Field of Musical Forces

Ideas for expanding Larson's theory of musical forces stemmed from my Master's Degree research project entitled *Principles of orchestration and the analysis of musical gestures* (Meyer, 2012b) where I employed Larson's theory of musical forces as a way to understand musical gestures in order to research principles of orchestration. In that research project I studied the works of Adler (1982), Belkin (2008), Berlioz & Strauss (1948), Cogan & Escot (1976), Collinson (1941), Jacob (1962), Jacob (1977), Kennan & Grantham (1997), Koechlin (1955), McKay (1969), Parrott (1957), Piston (1980), Rauscher (1963), Read (1976), Rimsky-Korsakov (1964), Wagner (1959), and Widor (1946). Research ideas, discussions, and preliminary studies that relate to this research project were presented at research symposia and conferences before this project was undertaken (see validation strategies, §4.6 and Addendum E for events of importance relating to this research project).

4.5 Data Collection

Data for this research project was collected by means of various methods which include music score analysis, document and media analysis, and interviews. Each data collection method will be discussed briefly below.

4.5.1 Music Score Analysis

The scores of the different versions of Wim Henderickx's *Raga I* and *Raga III* were obtained from CeBeDeM publishers in Brussels and Norsk Musikforlag in Norway. The scores I worked with in this research project are summarised in Table 1-1.

Table 1-1

Summary of scores used in this research project

CeBeDeM	Norsk Musikforlag
Raga I for percussion and two pianos (1994)	*Raga I* for percussion and two pianos (1994)
Raga I for percussion and orchestra (1995)	*Raga I* for percussion and orchestra (1995)
Raga I for percussion solo (1996)	*Raga I* for percussion and concert band (2016)
Raga III for viola and large orchestra (1995)	*Raga III* for viola solo and electronics (2010)
Raga III for viola solo (2003)	*Raga III* for viola and smaller orchestra (2012)

The scores were analysed according to the analysis methods mentioned in Chapter 3 in order to collect data from the scores. Data of the music score analysis was documented with the music notation programme, Sibelius version 8. Applicable examples of music segments documented in Sibelius 8 were exported from this program to illustrate my analyses and discussions, and to serve as examples in the thesis.

There are very few differences between the CeBeDeM and Norsk Musikforlag editions of *Raga I* and *Raga III*, and relevant differences are highlighted in the thesis. The editions by Norsk Musikforlag are the most recent editions and they are preferred by Wim Henderickx (Henderickx, 2015a). I primarily used the editions by Norsk Musikforlag in this thesis.

4.5.2 Document and Media Analysis

Apart from the primary literature on the theory of musical forces[27], other documents were also incorporated in the literature review, background to the compositions, and an understanding of the cases. These documents include published and unpublished interviews with Wim Henderickx by other interviewers, music reviews, album cover texts, and sketches of compositions. Rule and John (2011:67) find document analysis "a useful place to start data collection in a case study, particularly if the research design includes other methods such as interviews and/or observations."

The analysis of media sources is also an integral part of this research project, as well as the analytical strategy that will be employed in this research project. Published and unpublished audio recordings of *Raga I* and *Raga III* were obtained – unpublished recordings were obtained from the composer. Video recordings on the internet of *Raga I* for percussion and two pianos as well as a fragment of *Raga III* for viola and electronics were included among media sources for this research project, and I made simulations with Sibelius 8 and Garritan Personal Orchestra 4 of versions that were not recorded yet.

[27] Larson's own work is the primary literature on his theory of musical forces, as argued above.

Table 1-2 below summarises all the media sources that were used in this research project. The analysis of these sources is discussed in Chapter 3.

Table 1-2

Summary of media sources used in this research project

Unpublished audio recordings	
Raga I for percussion and two pianos	Gert François, Heidi Hendrickx, and Levente Kende (1995)
Published audio recordings	
Raga I for percussion and two pianos	Jaume Santonja, Mathias Coppens, and Geert Callaert. *Radio Klara* (2015)
Raga III for percussion and large orchestra	Leo De Neve and The Royal Flemish Philharmonic – conductor Grant Llewellyn *Meesterlijk – Strijkers* (2004)
Raga III for percussion and large orchestra	Leo De Neve and The Royal Flemish Philharmonic – conductor Grant Llewellyn *Raga I, II, III* (1999)
Raga III for viola solo and electronics	Marc Tooten and Jorrit Tamminga *Disappearing in light* (2015)
Video recordings	
Raga I for percussion and two pianos	Ruud Roelofsen, Lan Thanh Cao, and Ivan Kerekosvky (2013)
Raga I for percussion and two pianos	Bart Vanderbeke, Dasha Vogeleer, and Martin Gallez (2015)
Raga I for percussion and concert band	Gert François the Royal Symphonic Band of the Belgian Guides (2016)
Fragment of *Raga III* for solo viola and electronics	Leo De Neve and Jorrit Tamminga (2009)
Simulations	
Raga I for percussion solo	Sibelius 8 and Garritan Personal Orchestra 4
Raga III for viola solo	Sibelius 8 and Garritan Personal Orchestra 4

4.5.3 Interviews

Rule and John (2011:64) present interviews with research participants as the most popular data collecting method used in case studies. They consider interviews as a way of collecting data and of involving research participants important because "[i]nterviews usually imply one-on-one discussions between the researcher and research participants" (Rule & John, 2011:64).

Multiple formal semi-structured interviews were conducted with the research participants. The questions of these interviews were mainly based on the research problem and research questions that deal with my music analyses, analytical findings and interpretations. Transcribed versions of these interviews were used to support my analyses and interpretations, and contributed to validating my findings.

Both open-ended and closed-ended questions were asked during interviews. In the open-ended questions, I focused on the research participants' involvement in the composition process and performance of *Raga I* and/or *Raga III*, observations about the operation of musical forces in these compositions, and details regarding compositions. In the closed-ended questions, I focused on the clarification of concepts, specific information in certain topics, and facts.

In-depth interviewing, as described by Seidman (2006:7-14), was conducted with Wim Henderickx. Four interviews were conducted at different times, starting with biographical data about Henderickx and working towards more specific questions that relate to the research project. I later probed issues that emerged from earlier interviews. Rule and John

(2011:65) write that "Seidman uses multiple interviews with a single person to achieve substantial depth."

Table 1-3 summarises my data collection process by means of research participant interviews. This table shows the date, time, place, duration, and topics discussed during interviews with research participants. The analysis of these interviews is discussed in Chapter 3.

4.6 Validation Strategies

I sought to enhance the trustworthiness of this research project through a number of validation strategies. I relied mainly on some of the validation strategies proposed by Creswell and Miller (2000). The validation strategies chosen are the following: crystallisation, researcher reflexivity, member checking and collaboration, and peer debriefing. Each of these validation strategies will be discussed briefly below.

4.6.1 Crystallisation

Rule and John (2011:109) explain that crystallisation "points to the multi-faceted nature of reality, where additional sources and methods show up additional facets rather than confirming some true position". They (Rule and John, 2011:109) also point out that crystallisation is a fruitful strategy out of the incongruence of triangulation that was highlighted by Van der Mescht (2002:47-48).

Table 1-3

Summary of interviews conducted with research participants

Research participant	Date	Time	Place	Duration
Wim Henderickx	Wednesday 16 December 2015	12:00	Koninklijk Conservatorium, Antwerp, Belgium	00:48
	Topics discussed: Biographical information; publication of scores; clarification of ambiguous information found.			
	Friday 18 December 2015	08:00	Wim Henderickx Studio, Antwerp, Belgium	00:52
	Topics discussed: Different versions of *Raga I*; performances and recordings of *Raga I*; *Raga III*; different versions of *Raga III*; performances and recordings of *Raga III*.			
	Monday 21 December 2015	17:00	Wim Henderickx Studio, Antwerp, Belgium	01:52
	Topics discussed: Segmentation of *Raga I*, the scale and series of *Raga I*, orchestration of *Raga I*; *Raga I* for percussion solo; segmentation of *Raga III*; analysis of *Raga III*; the operation of musical forces.			
	Tuesday 12 July 2016	16:30	Musica Impulscentrum voor muziek, Neerpelt, Belgium	00:41
	Topics discussed: Scale of *Raga I*; new material in *Raga I* for percussion and orchestra; performance instructions in *Raga I* for percussion and orchestra; orchestrated pedal effects in the orchestration of *Raga I*; orchestration and the amplification of musical forces; dyads with trills in *Raga I* for percussion and orchestra; clarification of parts of *Raga I* for percussion and orchestra; doublings of instruments in *Raga I* for percussion and orchestra; scale of *Raga III*.			
Gert François	Thursday 17 December 2015	18:00	Paleis voor schone kunsten, Brussels, Belgium	00:45
	Topics discussed: *Raga I* for percussion and two pianos; *Raga I* for percussion and orchestra; *Raga I* for percussion solo; different versions of *Raga I*; the Raga cycle; the operation of musical forces in *Raga I*.			
Leo De Neve	Wednesday 16 December 2015	15:00	Koninklijk Conservatorium, Antwerp, Belgium	00:28
	Topics discussed: *Raga III* for viola and orchestra; other versions of *Raga III*, the operation of musical forces in *Raga III*.			
Jorrit Tamminga	Thursday 14 July 2016	14:45	Musica Impulscentrum voor muziek, Neerpelt, Belgium	00:19
	Topics discussed: *Raga III* for viola and electronics; the operation of musical forces in *Raga III*.			

I used crystallisation as a validation strategy in order to search for convergence among different information sources. I employed this strategy to validate my findings through different lenses of the analyses of scores, interviews with the research participants, as well as multiple documents and media sources.

Convergence between these data sources served as verification that data from other sources and my interpretation of data were valid. Convergence between data collected during interviews and findings from analyses was the most prominent in the crystallisation strategy.

4.6.2 Researcher Reflexivity

Creswell and Miller (2000:127) write that "[i]t is particularly important for researchers to acknowledge their entering beliefs and biases".

Due to my beliefs, I chose to conduct interviews in person rather than through electronic devices or in writing because I can develop personal relationships with the research participants and conduct interviews on a more personal level. I also chose to incorporate into these interviews music score analysis and aural analysis. Aural analysis is in my opinion more valid than working with a music score only. This belief led to my decision to involve the performers who participated in the performances of *Raga I* and *Raga III* as research participants in this research project.

Because the analytical strategy that was used in this research project involves aural interpretation, I acknowledge that some musical segmentations and interpretations of the operation of musical forces were based upon my personal perceptions and experiences of *Raga I* and *Raga III*, and that other listeners could have different experiences.

I did not start this research project with any biases in favour of the compositions chosen, research participants, or other aspects that relate to this research project.

In Chapter 8 I reflect on the values of this research project for me as listener, musician, and composer.

4.6.3 Member Checking and Collaboration

Member checking is described by Creswell and Miller (2000:127) as a validity strategy where "the validity procedure shifts from the researchers to participants in the study." Rule and John (2011:108) write that member checking "involves getting research participants to verify the accuracy of what has been written about them."

Research participants were involved in the member checking validation strategy when transcriptions of the interviews were sent to them for verification. This was done to ensure that all data transcribed is accurate and complete.

Preliminary findings of this research project were discussed with collaborating research participants when interviews were conducted. Further procedures and findings of this research project were discussed and validated by means of member checking by Wim Henderickx. My approach to this validation strategy overlaps with the collaboration validation strategy because I also involved Wim Henderickx in a collaborative way in this research project.

Wim Henderickx was collaborating as a research participant by providing me with

- electronic scores. He provided PDF and Sibelius versions of scores used in this research project.
- hard copies of scores. He provided me with hard copies of scores he had available and put me in contact with his publishers to obtain all other scores.
- documents, sketches of compositions, and concert programmes.
- recordings of works. Some recorded compositions have not been published and in possession of only the composer and performers involved.

Some data, findings, and procedures of this research project were validated by Wim Henderickx:

- My research approach, research design, procedures, and research questions were discussed with Wim Henderickx. I explained how I aim to expand Larson's theory of musical forces in this research project and discussed his views on Larson's theory of musical forces.
- Biographical data were provided and expanded by Wim Henderickx.
- Segmentation of some segments was verified by Wim Henderickx, especially ambiguous segments that can be understood in different ways.
- Interpretation of scores and performance instructions were discussed and verified in order to ensure that I also understand the scores from the perspective of the composer.
- The interaction of musical forces in *Raga I* and *Raga III* was an important topic of discussions with him.
- My work on the amplification of musical forces was explained to Wim Henderickx in order to get insights into his understanding of the amplification of musical forces.

- My understanding of orchestration techniques employed to create different versions of *Raga I* and *Raga III* was checked by Wim Henderickx.
- Various other uncertainties and questions about findings were posed as interview questions or sent as questions in emails to Wim Henderickx for clarification, commentary and/or validation. Notable instances were mentioned in this thesis.

4.6.4. Peer Debriefing

"A peer review or debriefing is the review of the data and research process by someone who is familiar with the research or the phenomenon being explored." (Creswell & Miller, 2000:129.) Rule and John (2011:108) argue that "[g]etting fellow students or colleagues to check one's interpretation of data and conclusions can be helpful."

In this research project, my supervisor, members of the research committee of the North-West University School of Music and Conservatory, and conference delegates acted as peer reviewers. Feedback and discussions at regular post-graduate research symposia at the School of Music and Conservatory also provided opportunities for peers from various universities to comment and provide input in my research ideas.

The focus of these discussions was mainly to situate musical analysis and ideas regarding this research project in the required research approaches and paradigms. Peers also commented on practical and ethical considerations regarding this research project.

After the research proposal for this research project was approved by the Research Committee of the School of Music and Conservatory of the North-West University, the proposal was presented orally to peers for further input and questions regarding the research project.

Preliminary studies relating to this research project were also presented at national and international music research congresses (Meyer, 2012a; Meyer, 2014; Meyer, 2017a; Meyer, 2017b) in order to obtain inputs from peer researchers and scholars in the field of music analysis.

In my conference paper entitled *To be heard and not to be seen: Why music is gesturing in the dark to analysts* that was presented at the 16th conference of the South African Society for Research in Music (SASRIM) on 21 July 2012 at the Tshwane University of Technology in Pretoria I proposed alternative ways to understand and classify musical gestures in Wim Henderickx's *Raga I*. Feedback from delegates drew my attention to the following:

- The theory of musical forces is an integral part in understanding musical gestures.
- New analytical strategies and procedures are needed in music theory.
- Musical gestures and the theory of musical forces enable us to gain new insights into music compositions.

My conference paper *Understanding 'Syrinx' by Claude Debussy differently - Gestures and perception* that was presented at the 18th conference of the South African Society for Research in Music (SASRIM) on 12 September 2014 at the University of the Witwatersrand in Johannesburg took Larson's theory of musical forces as a point of departure. In this conference paper I showed how Claude Debussy's solo flute composition, *Syrinx*, can be understood differently when musical forces are included as an analytical tool. Feedback at this conference drew my attention to the following:

- Larson's theory of musical forces is still a relatively new concept for many peers.
- The metaphoric understanding of Larson's theory of musical forces should be stressed when it is introduced as an analytical tool.
- The application of Larson's theory of musical forces in musical analysis is a topic that interests many conference delegates.

An overview of this research project and preliminary findings were presented at the National Institute for the Humanities and Social Sciences (NIHSS) National Doctoral Conference on 2 November 2016 at Birchwood Conference Centre in Johannesburg for fellow PhD candidates in faculties of Arts and Humanities of various universities in South Africa. Discussions and questions at this conference were mostly regarding the integration of other fields of study, further implications of this research project, and suggestions for further study.

In my conference paper *Steve Larson's Theory of Musical Forces: Expanding the Theory* that was presented at the 21st conference of the South African Society for Research in Music (SASRIM) on 31 August 2017 at the North-West University in Potchefstroom I presented preliminary findings from this research project on how the theory of musical forces can be expanded. Feedback at this conference drew my attention towards the following:

- Larson's theory of musical forces is a field of interest for some musicologists.
- The link between my study and my work as a composer is important.
- The theory of musical forces is a tool to explain what we hear when we listen to music.
- The theory of musical forces is an embodied theory.

A colloquium was held on 7 September 2017 with staff members of the School of Music and Conservatory of the North-West University to discuss the place of musical analysis and ideas regarding this research project in the required research approaches and paradigms. Critical feedback was provided by the attendees on my abstract, research problem, research approach and methodology.

My conference paper *Musical Forces can save Analysts from Cumbersome Explanations* was presented on 14 September 2017 at the 10th International Conference of Students of Systematic Musicology, held at the Queen Mary University of London. In this paper I discussed the value and importance of the theory of musical forces in music analysis. Delegates were particularly interested in the following.

- The application of musical forces in music analysis.
- The value of the theory of musical forces to address discourse in music analysis.
- A new way to analyse compositions and reinterpret existing analyses.

Professor Johann van der Walt was appointed by NIHSS-SAHUDA to act as my mentor in this research project from 2015 to 2017. He was occasionally involved in different stages of this research project and put me in contact with other PhD candidates from the North-West University in order to encourage conversation amongst peers.

See Addendum E for events of importance during this research project.

5. Ethics

Ethical considerations for this research project were included in different phases of the project in order to protect the research participants, develop a trust with the research participants, promote integrity of the research project, and guard against ethical misconduct (Creswell, 2014:92).

Five phases during which ethical considerations for this research project were important were

- prior to beginning the study;
- at the beginning of the study;
- when the data were collected;
- when the data were analysed; and
- when the data were reported, shared and stored.

5.1 Prior to beginning the Study

The code of ethics and ethical guidelines of the North-West University were followed meticulously throughout this research project.[28] Permission was obtained from the Research Ethics Committee of the Faculty of Arts from the North-West University in order to involve research participants who will give written informed consent to be participants in this research project, as well as authorship for publication.

The ethical application was approved on 26 August 2015 and an ethics number was issued: NWU-00321-15-A7. See Addendum F for the ethics approval certificate.

5.2 Beginning of the Study

Informed consent forms were sent to all research participants via email before interviews were conducted. The research participants only participated after these forms were completed. See Addendum G for a template of the informed consent form that was used in this research project.

It was made clear on the informed consent forms that the research participants would

- voluntarily participate in this research project;
- positively benefit from the research project as the research project would not only benefit the research or the project itself;
- not incur any costs by participating in this research project;
- know and understand what the purpose of the study is;

[28] http://www.nwu.ac.za/content/new-research-support-policies

- have a free choice to give their consent to participate in this research project and they could decide at any point to withdraw their participation without stating reasons or being harmed by withdrawing;
- give consent for the data that would be generated and used for research purposes as the researcher sees fit;
- be given access to their own data;
- be allowed to correct themselves during the interview or afterwards, and only corrected parts of the interview would be transcribed;
- have sufficient opportunity to ask questions regarding the research project and related procedures;
- be contacted to discuss suitable times to conduct the interviews;
- not be anonymous – their names would be mentioned in the thesis;
- be recorded during interviews;
- receive interview questions in advance to prepare for the interviews; and
- have to sign the consent form in order to participate in this research project.

5.3 Collecting Data

The researcher as well as research participants benefitted from participating in this research project. There was continuous reciprocity between the research participants and the researcher during different stages of the research project.

Procedures followed during the interviews to ensure an ethical approach and successful collecting of data were as follows:

- Research participants were informed of my ethical obligations.
- Interaction with research participants was according to the ethical guidelines of the North-West University and the informed consent document sent to research participants because it was important that research participants were treated with respect and in an ethical and professional manner throughout.
- Interviews were conducted on the times arranged in advance.
- The nature and purpose of the research project were explained to the research participants.
- Interview questions did not deviate from the questions sent to research participants in advance.
- Recording and transcription procedures were explained to research participants and they were given the opportunity to ask questions regarding their participation in this research project. Informed consent forms were also discussed briefly with the research participants before the interviews were conducted.
- Research participants were put at ease and reminded that they can return to questions at any time or make corrections afterwards.
- A conversational rather than inquisitorial approach was followed.
- Written notes were taken to supplement the interviews.
- I began with the least demanding and complicated questions, working towards more demanding and complicated questions.
- My understanding of answers was communicated with the research participants.
- Only research participants were interviewed.
- Only original scores were used to work from.

Final drafts of the interview transcriptions were sent to research participants involved as interviewees and a final version of the approved thesis will be sent to each participant.

5.4 Analysis of Data

No results were casted in a favourable light to the researcher's or participants' inclinations. In order to ensure that the analysis of data was objective, all findings were reported. Findings deducted from analyses were also accompanied by exemplars from scores.

5.5 Reporting Data, sharing Data, and storing Data

The reporting of data was handled in the following ethical ways:

- I attempted to report accurate data in the thesis.
- All findings were reported.
- I had no conflict of interest when data were reported.
- Plagiarism was avoided by giving credit to the original sources where material was quoted and paraphrased. No material was copied from other sources.[29]

The sharing of unprocessed data was handled in the following ethical ways:

- All unprocessed data were only shared with Prof Hannes Taljaard, the doctoral advisor for this research project.
- Unprocessed data of research participants was made available to research participants upon request. However, no research participant requested unprocessed data during the course of this research project.

[29] Turnitin Feedback Studio was used to scan this thesis for plagiarism in order to enhance the ethical status of this document.

- All data that was shared at conferences and colloquia was processed data and it was clearly indicated that preliminary findings were presented at the conferences and colloquia.

The storing of data was handled in the following ethical ways:

- All data were securely stored on password protected devices.
- Access to data was limited to myself and my advisor.
- Transfers of some data were encrypted for security purposes.

5.6 Overview of Interview Process

The overview below shows the process followed in order to conduct all interviews ethically:

- Potential research participants were contacted and informed of my research project and that I would like them to participate in the research project.
- All potential research participants indicated their interest in the research project and their details were provided to the Research Ethics Committee of the Faculty of Arts from the North-West University.
- The ethics approval certificate[30] was issued on 26 August 2015.
- Suitable dates, places, and times were determined by the research participants and myself in order to conduct the interviews.
- Research participants received the informed consent forms, ethical approval certificate, and background information regarding the study.
- Informed consent forms were completed by research participants and sent back to me electronically. The hard copies of the completed informed consent forms were kept by the research participants and given to me when interviews were conducted.

[30] See Addendum F.

Research participants also gave consent that the interviews could be recorded and authorship of the interviews was negotiated.

- Interview questions were provided to research participants in advance in order for them to prepare for the interview(s).
- Interviews were conducted and recorded.[31]
- Recorded interviews were transcribed with no changes.
- Transcribed interviews were qualified, interpreted, proofread and spellchecked.
- A draft of the transcribed interviews was sent individually to research participants.
- Commentary, suggestions, and changes were made by research participants on the draft provided and sent back to me. Research participants indicated their approval of the transcriptions.
- Final versions of the interviews were created and sent to research participants.
- The final versions of the interviews, drafts, and recordings were stored securely.
- None of the research participants withdrew from the research project by the time of completion.

[31] Interviews were recorded on a Philips DVT4000 Voice Tracer in SHQ stereo at 192kbps.

Table 1-4 below summarises my interaction with the research participants regarding the interviews conducted for this research project.

Table 1-4

Interaction with research participants regarding interviews

Research participants	First contact with research participants regarding participation	Dates, times, and places confirmed with research participants	Interview questions and ethical documents sent to research participants	Conducting of interviews	First drafts of transcriptions provided to research participants	Feedback regarding transcriptions from research participants	Final versions of transcriptions sent to research participants
Wim Henderickx	2015-04-14	2015-05-13	2015-12-08	2015-12-16 2015-12-18 2015-12-21	2016-03-30	2016-04-09	2016-05-10
	2016-07-06	2016-07-06	2016-07-06	2016-07-12	2016-10-11	2016-10-14	2016-10-18
Gert François	2015-05-08	2015-10-26	2015-12-08	2015-12-17	2016-03-30	2016-04-13	2016-05-10
Leo De Neve	2015-05-08	2015-10-26	2015-12-08	2015-12-16	2016-03-30	2016-05-05	2016-05-10
Jorrit Tamminga	2015-06-08	2016-05-06	2016-06-27	2016-07-14	2016-10-11	2016-11-08	2016-11-09

6. The Importance and Relevance of the Research Project

I consider this research project an important and topical addition to the theory of musical forces for reasons listed below:

- My expansion of Larson's theory of musical forces was done within the same framework as Larson's frameworks for developing the theory of musical forces. Thus, my expansions also work with what listeners experience and are not merely observations, they can be employed in other fields of study, and they are embodied expansions.
- Although I start my theorising with observations as a first step, I do not merely observe and reflect on my observations. My observations are analysed, compared, and interpreted to come to conclusions that enable me to expand Larson's theory of musical forces.
- This research project enables me to situate myself within a niche area. I do not merely situate myself and work in this niche area, but also contribute to the niche area I am working in. My work with this research project also allowed me to connect with leaders in this niche area and to explore how this niche area crystallises into other fields of research.
- My expansions were approached with the structured theoretical lens of Larson's theory of musical forces. Similarly, my analyses were focused and I searched for specific phenomena. When these phenomena are interpreted through the structured theoretical lens of musical forces, I am able to make specific conclusions. My conclusions are exemplars that demonstrate the value of a theory in music analysis, which allows me to move away from mere observations and metaphors, and expand the theory of musical forces.

- My research project is a clear project: I clearly discuss how the project was done, I provide clear examples to illustrate how analyses were done, and I suggest expansions that can be applied practically. My analyses, comparisons, interpretations, and theoretical expansions are also examples of thorough work that explains phenomena. I believe that this makes a contribution to the field of music analysis, even though I have situated my project in the field of music theory.
- My expansions are theories about experiences we take for granted. The implication of the observation that these experiences are usually found within an aura of invisibility is that we do not have a structured framework to explain what we hear, and that these experiences of listeners cannot be enhanced or manipulated from a theoretical perspective – subsequently, it can also not be taught. This is important for me, because it is difficult to critically reflect on experiences we take for granted.
- The overlapping nature of the theory of musical forces, and my expansions, can be crystallised into other fields of study, and this crystallisation enables one to understand those fields of study better and/or differently.

7. Chapter Division

Chapter 2: Steve Larson's Theory of Musical Forces

In this chapter I present a review of literature on the theory of musical forces. I start with a discussion of how Larson's theory of musical forces developed from Larson's background as a Schenkerian analyst and the influences of the work on perceptual forces of Rudolf Arnheim on Larson's theory of musical forces. I present Larson's theory of musical forces, firstly the three melodic forces – melodic gravity, melodic magnetism, and musical inertia – and secondly the rhythmic forces – rhythmic gravity and rhythmic magnetism –

and I clarify discourse in literature with regards to these musical forces. Other fields of music study that involves musical forces are discussed, and shortcomings of Larson's theory of musical forces are identified. Criticism of Larson's theory of musical forces is discussed, as well as existing expansions of the theory of musical forces. Significant contributions to the theory of musical forces in this chapter are levels of stability, a discussion of the vertical and horizontal dimensions of music and the theory of musical forces, and an integrative approach of Larson's theory and existing expansions that I will employ in this research project to help me to rigorously answer the research questions of this project.

Chapter 3: Research Procedures

This chapter is an account of the methodological steps followed in the research. Various data sources were collected for this research project, and the analyses of these data sources is discussed here. Furthermore, I discuss how the different versions of Wim Henderickx's *Raga I* and *Raga III* were divided into three cases, and which music-analytical procedures were followed to analyse and compare the operation of musical forces in the different versions. I also explain why some phenomena were included and other phenomena excluded in my analyses, and what my analytical focus entails. My abductive process followed in the three cases is also discussed in more detail in this chapter.

Chapter 4: Case 1: Wim Henderickx's *Raga I*

Case 1 is made up of Wim Henderickx's *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra. The operation of musical forces in *Raga I* for percussion and two pianos is analysed and compared with the operation of musical forces in *Raga I* for percussion and orchestra. The comparisons of the analyses are categorised and the different categories enable me to theorise how the operation of musical forces can be amplified when they are orchestrated.

Chapter 5: Case 2: Wim Henderickx's *Raga I* and *Raga III*

Raga I for percussion and orchestra, *Raga I* for percussion and concert band, *Raga III* for viola and large orchestra, and *Raga III* for viola and smaller orchestra (Case 2) are discussed in this chapter. In this chapter I critically discuss the operation of musical forces among different musical instruments, and differences in the operation and amplification of musical forces when *Raga I* for percussion and orchestra is compared with *Raga I* for percussion and concert band. I also discuss the impact of orchestral reductions, like in the case of *Raga III* for large orchestra and *Raga III* for smaller orchestra, on the operation of musical forces.

Chapter 6: Case 3: Wim Henderickx's *Raga III*

Case 3 is made up of Wim Henderickx's *Raga III* for viola and orchestra, *Raga III* for viola solo, *Raga III* for viola solo and electronics, and *Raga I* for percussion solo. The abductive approach followed after the operation of musical forces in the different versions was analysed and compared enables me to theorise about various aspects that serve as expansions of the theory of musical forces. Some aspects of Larson's theory of musical forces are critically discussed and clarified, new aspects that can be added to Larson's theory of musical forces are suggested, and critical inquiries are made about my expansions to the theory of musical forces.

Chapter 7: Musical Forces: Motion, Meaning, and Metaphor

Analyses, comparisons, and discussions of the preceding chapters are critically cross-case analysed, and I show how my work fits into Larson's theory of musical forces. I also make suggestions for additions to the theory of musical forces that will expand Larson's theory of musical forces. The data, conclusions, and procedures of this study are brought into relation with recent studies that also apply and expand Larson's theory of musical forces.

Chapter 8: Conclusions and Suggestions for Further Study

Concluding remarks and suggestions for further study are presented in this chapter. I also present a self-reflection here to discuss how my expansions of the theory of musical forces were of value to me. The suggestions for further study are aspects that were not discussed in broad detail in the thesis, as well as other aspects that can be researched in terms of the theory of musical forces which were not discussed in this thesis.

Addenda

Addendum A – Addendum H

Reference List

Sources in this thesis are referenced according to the Harvard reference style, which is the referencing style prescribed by the North-West University.

CHAPTER 2

Steve Larson's Theory of Musical Forces

Steve Larson was a prominent researcher in music and cognition who presented conference papers, published journal articles, research dissertations, and books on Schenkerian analysis (Larson, 1987b; Larson, 1987c; Larson, 1994; Larson, 1996b; Larson, 1998), jazz music (Larson, 1982; Larson, 1987d; Larson, 1988; Larson, 1993b; Larson, 1996a; Larson, 1996c; Larson, 1997c; Larson, 1998; Larson, 1999; Larson, 2006b; Larson, 2009), music analysis (Larson, 1981; Larson, 1987a; Larson, 1997b; Larson, 2001; Larson, 2003; Larson, 2005), and musical forces (see Diagram 2-1). Larson's biography and bibliography of concluded research outputs are included in Addendum A, §1. In this chapter, I will focus on Larson's theory of musical forces in a literature review of the relevant aspects of his theory of musical forces in order to show how this theory developed over time from 1992 to 2012.

Diagram 2-1

Steve Larson's fields of research

Larson's fields of research include Schenkerian analysis, jazz music, music analysis, and musical forces. The focus of this study will be on Larson's theory of musical forces.

After I presented the literature on Larson's theory of musical forces, I will summarise and discuss expansions of Larson's theory by Hatten (2012b), BaileyShea (2012), Peterson (2014) and Lee (2014). The outline of this chapter is shown in Diagram 2-2.

1. Scope of Literature Review on Larson's Theory of Musical Forces

Larson searched for evidence and support of his theory of musical forces, citing comprehensive literature on existing research that relates to his theory of musical forces (see Larson, 2004; Larson & VanHandel, 2005; Larson, 2012). This literature will not be discussed here, because this will merely duplicate Larson's work. In order to understand my expansion of Larson's theory of musical forces in this thesis, it is important to understand the principles of Larson's theory of musical forces as well as to gain insight on how the theory developed over time (1992 to 2012). An understanding of the principles of the theory of musical forces and how they developed over time will also enable the reader to follow the developments and adaptations of Larson's thoughts regarding his theory, as well as to contextualise the opportunities for further research suggested in Chapter 8.

1.1 Three Forms in which Musical Forces found Empirical Support

Larson and VanHandel (2005:119) identified three forms in which work on musical forces has found empirical support:

- The distribution of melodic patterns within compositions, improvisations, and analyses;
- The behaviour of computer models of melodic expectation; and
- The responses of participants in psychological experiments.

All three of these forms of empirical support will be contextualised in this literature review. Attention will be given to the fundamental aspects of Larson's theory of musical forces, namely 'stability', 'gravity', 'magnetism', and 'inertia'. Detailed explanations and discussions of the studies on improvisation, the computer models, and psychological experiments are not within the scope of this thesis, and will only be cited where it is applicable to enhance my discussion of musical forces.

Larson's theory of musical forces has been used to explain various phenomena in music, including motion, metaphor, and meaning in music. My focus in this research project will be on the operation of the musical forces themselves, and therefore, in this literature review, I do not discuss the applications of Larson's theory.

- **Schenkerian analysis**
  - The influence of Schenkerian analysis on the theory of musical forces
- **Theory of musical forces**
  - Larson's observations of the operation of musical forces
  - Larson's presentation of his theory of musical forces
  - Analogy to Arnheim's theory of visual forces
  - Theory of musical forces in tonal music
  - Metaphor of musical forces
- **Stability**
  - Arnheim's norm base
  - Larson's tonal centre
  - Stability and instability
  - Contextual stability and inherent stability
  - Stability and instability versus consonance and dissonance
  - Quantification of stability
- **Melodic forces**
  - Melodic gravity
  - Melodic magnetism
  - Musical inertia
  - Melodic gravity, melodic magnetism, and musical inertia
- **Change of terminology**
  - Comprehensiveness of initial terms
  - The addition of rhythmic forces
- **Other fields of music study**
  - Melodic expectation and computer models
  - Aural-skills training
  - Music perception
  - Learning music theory and composition
  - Jazz music
  - Musical gestures
  - Meaning in music
- **Criticism of Larson**
  - Review by Arnie Cox
  - Metaphoric understanding of musical magnetism
  - Larson's choice of repertoire
- **Expansion of Larson's theory**
  - Robert Hatten
  - Matthew BaileyShea
  - John Peterson
  - Elizabeth Lee
- **Conclusion**
  - An integrative approach
  - My expansion of Larson's theory of musical forces: amplification of musical forces

Diagram 2-2

Outline of Chapter 2

1.2 Sources Consulted

Many of Larson's research papers are speculative and deal with research in progress with the aim to engage in constructive conversation with researchers in similar fields. These speculative works will enable me to show developments of Larson's theory of musical forces. Larson's book, *Musical Forces*, can also be considered as a work in progress, although Hatten (2012a:ix) writes that it "is the culmination of over 25 years of speculation, research, and empirical inquiry into the ways we experience motion". Responses to Larson's theory of musical forces, reviews of his book *Musical Forces*, and an expansion of Larson's theory of musical forces will also be referenced here.

2. Steve Larson as a Specialist in Schenkerian Analysis

Larson was a scholar and follower of Heinrich Schenker's theories and analysis methods. His PhD research project was an application of Schenkerian analysis to modern Jazz (see Larson, 1987c). Lerdahl (1997:153) observed and criticised the influence of Schenkerian theory in Larson's work, and asserts that one needs to abandon Schenkerian theories when working in the field of cognition. Larson (2002:363) responded to criticism on the influence of Schenkerian theory on his work by writing that "[t]o some readers, my reliance on Schenkerian theory may seem at odds with my emphasis on expectation. Perhaps this is because some theorists who have written about expectation in music (especially Leonard Meyer and Eugene Narmour) have distanced themselves from Schenker's theories." Larson and VanHandel (2005:119) did not abandon Schenkerian theories after the criticism, but instead highlighted that Schenkerian theory is central to the theory of musical forces (also see §12 and §13 below).

Understanding Larson's background as a Schenkerian analyst and his application of Schenkerian theories helps one to understand how he perceived and described the operation of musical forces. In line with the basic tenets of Schenkerian analysis, Larson believes that tones are constructed according to hierarchies, and that some tones embellish other – more important – tones. Musical forces are thus not necessarily present between two adjacent tones but can operate between tones that are separated by embellishment (Larson, 1997-98:44).

3. Developing a Theory of Musical Forces

In Diagram 2-3, I provide a summary of Steve Larson's publications on musical forces that are most relevant for this literature review. From this section onwards I will provide an overview of Larson's publications on musical forces and of his theory of musical forces developed in these publications.

3.1 Larson's earliest Perception and Observation of the Operation of Musical Forces

Larson's earliest published observation of musical forces can be found in the article *A Tonal Model of an "Atonal" Piece: Schönberg's Opus 15, Number 2* (Larson, 1987a:421). He writes: "This sound can have the quality of striving upward from the fifth, and – in rising only a half-step – the quality of being strongly pulled back to a nearby goal." The terms 'striving', 'pulled back' and 'nearby goal' refer to Larson's perception and observation of the operation of musical forces. The concept of 'musical forces' only appeared approximately five years later in Larson's publications, but the roots are clear.

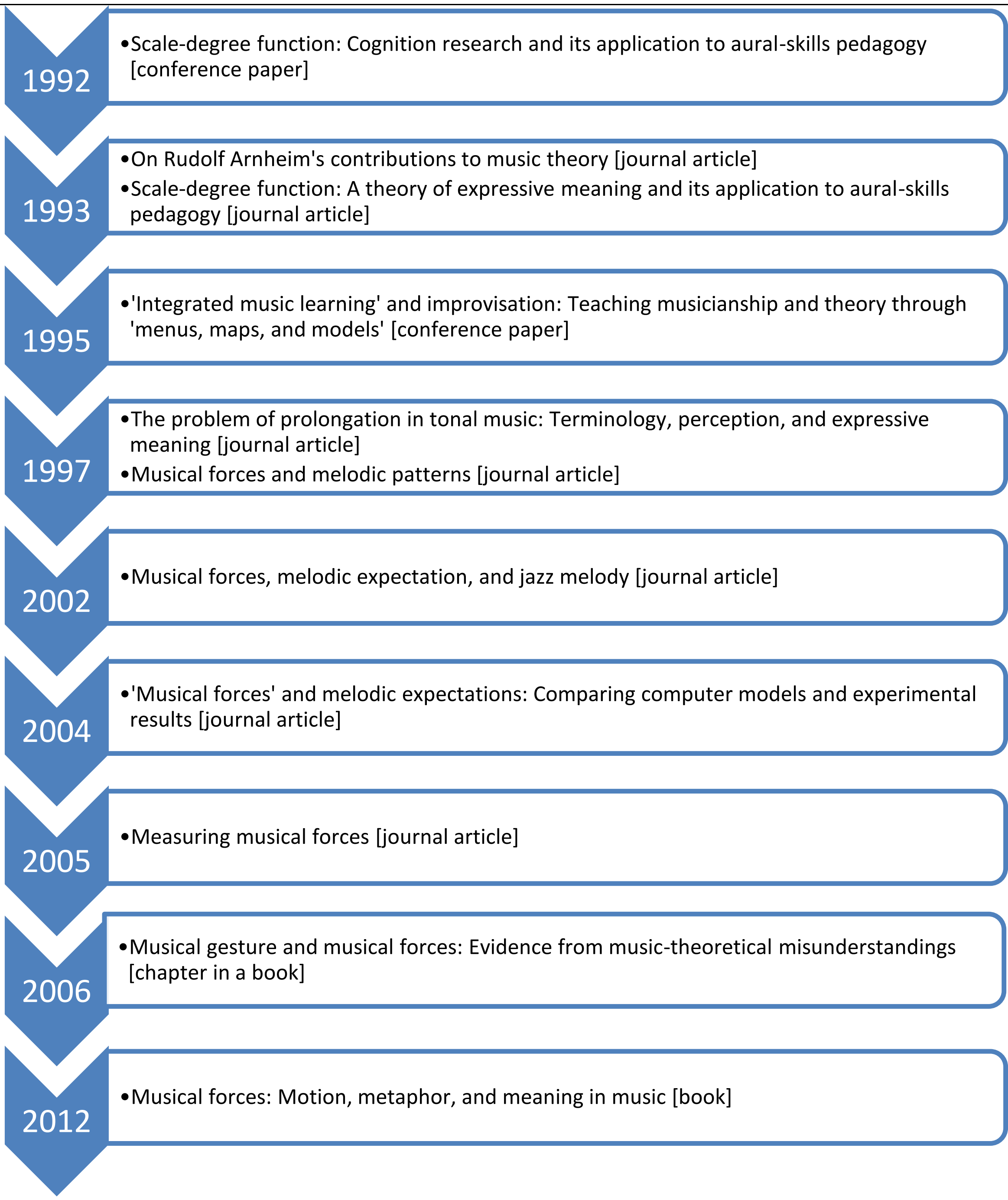


Diagram 2-3

A summary of relevant publications by Steve Larson

3.2 Larson's Presentation of his Theory of Musical Forces

In 1992, Larson presented a research paper titled *Scale-Degree Function: Cognition Research and Its Application to Aural-Skills Pedagogy* at the National Meeting of the Society for Music Theory in Kansas City, Missouri. A revised version of this research paper was later published as a technical report[1] of the Center for Research on Concepts and Cognition (CRCC) at the Indiana University.

Larson (1992:7) writes that "[w]hen we listen to tonal music, we experience certain 'forces'. These forces include 'musical gravity', 'musical magnetism', 'musical inertia' (see §6, §7, and §8, respectively, for a discussion of these forces). The operation of these is governed by a principle of 'pattern completion'. Together, they are responsible for some of the dynamic tendencies we experience in listening to music." In this paper Larson (1992:1) cites research in music cognition, and applications of Gestalt psychology to the perception of art, but does not explain explicitly how it is related to his research.

In his article *On Rudolf Arnheim's Contribution to Music Theory* that was published in the *Journal of Aesthetic Education* in 1993, Larson clarified that his theory of musical forces is an analogy of Arnheim's writings on metaphors and visual forces.[2] Larson (1993a:97) starts this article by writing that the "work of Gestalt psychologist and art historian Rudolf Arnheim offers valuable ideas for teachers and scholars of music." He points out that he relied on two of Arnheim's publications as bases for his analogy: *Perceptual Dynamics and Musical Expression* (Arnheim, 1984), and a passage from Arnheim's book *Art and Visual Perception: A Psychology of the Creative Eye* (Arnheim, 1954). These two publications by Arnheim

[1] Technical report #67.

[2] Larson was also a student of Arnheim, and they often discussed Larson's ideas and research (Larson, 2012:xiii).

enabled Larson to explain the following about musical forces: the presence of a tonal centre, and the operation of musical gravity and musical magnetism. Larson (1993a:99) added a third force, called musical inertia.[3]

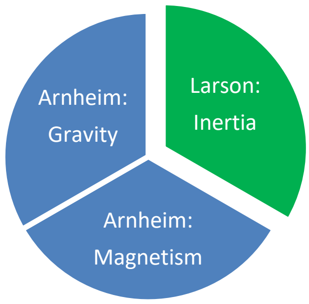


Diagram 2-4

Larson's theory of musical forces

The forces of 'gravity' and 'magnetism' were first identified by Arnheim, and Larson added the force 'inertia' and also interpreted 'gravity' and 'magnetism' in terms of music.

It is important to understand Larson's musical gravity, musical magnetism, and musical inertia as metaphors of the physical forces, and not as the physical forces acting on the music. Before I discuss the individual musical forces, I will briefly discuss the metaphoric interpretation of these musical forces.

[3] Larson and VanHandel (2005:123) and Larson (2012:91) later acknowledged that these terms are not Larson's own and that Ernst Toch (1948) presented research on 'shaping forces', using the terms 'gravity', 'magnetism', and 'inertia'. However, Toch merely uses these terms but he does not define these terms or offer a quantitative model of the interaction of these forces.

4. Metaphor of Musical Forces

Larson (2012:61-81) devotes an entire chapter in his book, *Musical Forces*, to the metaphor of musical motion. The inclusion of metaphors of motions in Larson's work was inspired by the writings of George Lakoff and Mark Johnson (1980), and Larson's collaboration with Mark Johnson in writing the journal article *Something in the way she moves* (Johnson & Larson, 2003). Larson (2012:61) claims that "our understanding of musical motion rests on metaphors, and that the key metaphors are grounded in these basic bodily experiences of physical motion." The 'basic bodily experiences' which Larson refers to are, according to Larson (2012:66-67), the four most important ways in which we experience and learn about motion in music:

1) moving your body;
2) feeling your body being moved by forces;
3) using your body to set other objects in motion; and
4) seeing objects move.

Larson (2012:69) continues to explain the metaphor of musical motion in terms of physical motion, and deals with three problems regarding these metaphors: 1) "physical motion requires an *object* that moves." This statement led Larson to the question of "what is it that 'moves' in music?"; 2) "moving objects trace out an imaginary *path* of motion". According to Larson, the term 'passages' refers to segments of a musical path; 3) Larson states that "physical motion will have a *manner*", for example quickly or slowly, abruptly or smoothly, forcefully or gently.

Larson (2006a:64-65) acknowledges that an analogy between physical forces and musical forces is not completely unique because such an analogy was pursued by various analysts, including Jérôme-Jacques Momigny (1806) and Leonard Meyer (1956; 1973). Larson (2006a:64-65) specifically mentions these two theorists because they misunderstood physical forces[4] and consequently applied their misunderstood knowledge of physical forces in musical forces (see Larson, 2006a:64-65).

Explanations of the metaphor of musical motion were added to Larson's theory of musical forces over time in order to support his initial claims that motions are shaped by forces (Larson, 1994:44; Larson, 1997-98:44; Larson, 1999:56; Larson, 2002:352; Larson, 2012:1).[5] Larson (2012:73) explains that "[w]hether we are experiencing the physical motion of our bodies or of other objects, we learn that the motion is influenced by physical forces such as gravity, magnetism, and inertia."[6] Larson's central claim is that musical motion is shaped by metaphorical musical forces. Larson (2012:22) writes that "[i]t is important to remember that these forces are metaphorical. They are not literally a property of sounds the way pitch and duration are. They are tendencies that our minds attribute to the sounds we hear." Although Larson uses aspects of physical forces to explain the metaphorical musical forces, he avoids stretching the cross-domain mapping further than would be sensible. I follow this aspect of Larson's approach in that I also pay attention in my aural analyses to the tendencies that listeners can attribute to sound patterns. The tendencies that I investigate are those that

---

[4] Larson (2006a:64, 73) makes it clear that he is not criticising Momigny or Meyer, but merely showing how they understood some physical forces incorrectly, and providing a solution for their misunderstandings in order to avoid inconsistent literature on the analogy between physical forces and musical forces.

[5] Rothfarb (2001) provides a review of literature that was discussed in terms of the metaphors of motion and forces.

[6] Theories regarding physical gravity date back to the 16th and 17th centuries when Galileo Galilei (1564)-1642) did an experiment by dropping balls from the tower of Pisa, investigating Aristotle's (345-322BC) belief that heavier objects accelerate faster. This research was expanded in 1687 by Sir Isaac Newton (1642-1727) in his inverse-square law of universal gravitation, and in 1915 by Albert Einstein (1879-1955) in his theory of general relativity. Early Chinese writings mention magnetism, the best-known by the Chinese scientist Shen Kuo (1031-1095) who wrote about a magnetic needle compass. Various other writings, speculations, and research on magnetism followed later.

Larson refers to as melodic forces. In order to understand how melodic forces operate, it is important to understand tonal stability, which will be discussed in the next section.

5. **Stability**

In Larson's writings, discussions of stability follow discussions of gravity, magnetism, and inertia. However, I consider an understanding of stability as a prerequisite for understanding the operation of musical forces. Larson (2012:100) writes that "[s]tability plays an important role in the theory of musical forces." I consider this statement an understatement because musical forces cannot exist without a sense of stability or instability. I will thus start my discussions of musical forces with a discussion of stability.

5.1 Arnheim's Norm Base

Arnheim (1984:216) writes that there is a norm base in perceptual dynamics, with minimal tension at the base: "Every obliqueness[7] is perceived as a deviation from these fundamental directions and derives tension from it. Like all perceptual vectors, such deviation operates in two opposite directions: an obliquely oriented object, for example the leaning tower of Pisa, is seen either as striving away from the norm base or as trying to approach it. Furthermore, both these tendencies can be read as generated either by the deviant object itself or by the norm base; that is, the deviant object is seen either as pushing toward or pulling away from the base by its own active power or as being passively attracted or repelled by the energy center [sic] in the base." Larson (1993a:98) clarifies that Arnheim's 'norm base' can be interpreted as the 'tonal centre' in tonal music that governs the operation of musical forces, and he mentions that individual notes exert attractive powers on one another (Larson, 1993a:98).

[7] Arnheim uses the term 'obliqueness' in a metaphorical sense to refer to deviation.

5.2 Larson's Tonal Centre

Larson (1993a:98) describes how attractive powers in music are exerted by the tonal centre and individual notes: "In a passage of tonal music, individual notes have varying degrees of stability. These varying degrees of stability arise from what may be called the 'embellishment relationships' that exist between those notes." He also explains the embellishment relationships: "One note (or group of notes) may embellish a second note. This second note (at a more abstract level of structure) may embellish a third. And this third note may embellish yet a fourth note (at an even more remote level of structure) – and so on. Any note that embellishes another will feel less stable than the note it embellishes. If all the notes in a passage serve in this hierarchical way to embellish a single note, then that single note will be heard as the tonal centre [sic]." (Larson, 1993a:98.) The foundation of Schenkerian theory becomes even clearer when one starts a discussion of Larson's theory with a discussion of stability.

5.3 Stability and Instability

Larson (1997b) deals more comprehensively with stability in his article *The Problem of Prolongation in "Tonal" Music: Terminology, Perception, and Expressive Meaning*, a response to an article by Joseph N. Straus (1987) entitled *The Problem of Prolongation in Post-Tonal Music*. Here, Larson claims that we can distinguish between 'stable' and 'unstable' pitches and he writes that we need to understand the terms 'auralize', 'trace', and 'displace' in order to understand his operational definition of stability. Larson (1997b:104) defines 'auralize' as hearing sounds internally that are not physically present; a 'trace' is an internal representation of a melodically active note; and 'displacement' as the distinction between 'steps' and 'leaps'.

Larson (1997b:104-105) understands a 'step' as an interval of a semitone or a whole tone, and a 'leap' as any interval larger than a whole tone. Larson's (1997b:106) operational definition of 'stability' is made up of these terms and he provides the following operational definition for stability: "To hear a note as unstable means to auralize a more stable pitch to which it tends to move and a path (usually involving stepwise motion) that would take it there, displacing its trace."[8] Larson's (2012:100) final definition of 'stability' is that it is a "comparative quality that we attribute to a note" and that we "hear a note as unstable to the degree that it leads us to auralize another (more stable) pitch – and a path that will take the melody to that pitch." Even though this does not conclude the debate on the meaning of the term 'stability', this definition of stability is sufficient to be used in this thesis for observations regarding pitch material.

5.4 Contextual Stability and Inherent Stability

Larson (1997b:107) distinguishes between contextual stability and inherent stability[9], and summarises these two concepts as shown below in Table 2-1.

Table 2-1

A comparison between contextual stability and inherent stability (Larson, 1997b:107)

Contextual Stability	Inherent Stability
An attribute of a note	An attribute of an interval
Determined by context	Determined in isolation
Comparative	Absolute

[8] In his article *Scale-Degree Function: Cognition Research and Its Application to Aural-Skills Pedagogy*, Larson (1992:1) gives a similar definition of stability. However, Larson (1992) here used the term 'audiate' instead of 'auralize', and he refers to 'note' instead of 'pitch'. Changes in terminology will be discussed in §10.

[9] See Addendum H, §1.4 for a discussion of Lee's (2014) local gravity and global gravity versus Larson's contextual stability and inherent stability.

Larson (1997b:107) provides the example, shown as Example 2-1, to describe the difference between 'contextual stability' and 'inherent stability'.[10] He provides the following explanation for this example: "we may hear the melody of the sixth measure as a prolongation of the F. That F is embellished by a G that resolves back to the F.[11] Thus, in this example, the (inherently less stable) interval of a seventh is heard as contextually more stable than the (inherently more stable) interval of an octave." (Larson, 1997b:107.)[12]

Example 2-1

An example to illustrate the difference between inherent and contextual stability (Larson, 1997b:107)

Although Larson does not state this explicitly, his approach to understanding stability is in terms of contextual stability, because he works with larger parts of the music that he analyses, and does not see intervals as absolute or in isolation. Larson's (1997b:112) argument regarding prolongation and stability led him to develop a refined definition of stability: "To hear a note as unstable also means to hear it as embellishing a more stable pitch – that is, to hear it as embellishing a pitch at a more remote level of pitch structure." Lerdahl (1997:153)

[10] Lerdahl (1997:151) comments on Larson's use of the terms 'inherent stability' and 'contextual stability', writing that psychoacousticians distinguish between 'sensory consonance' and 'musical consonance'. Larson thus uses other terms to refer to familiar concepts in psychoacoustics.

[11] It is important to note here that specific pitches are mentioned, and not pitch classes. Larson (1997b:123) writes that "[l]inking prolongation and musical forces does not support the idea of a prolonged pitch class. Hearing a passage as a prolongation of something else means hearing it as an embellishment governed by musical forces. Musical forces involve distance and direction: gravity pulls *down*, magnetism draws toward the *closest* stable pitch, and inertia continues in the *same direction*. These distances and directions exist within the world of pitches, not in the world of pitch classes."

[12] Larson (1997b:107) comments that a Schenkerian analyst will see the G as the prolongation of the F, and thus claim that there is no interval of an octave in the sixth measure.

writes that "Larson's attempt to reduce inherent stability to contextual stability leads to a circular stance: contextual stability causes prolongational structure yet prolongational structure defines contextual stability." Lerdahl thus focuses on the co-emergence of contextual stability and prolongation, but Larson (1997b:108) suggests – as a result of his discussion – that the terms 'stable' and 'unstable' should be used to describe contextual stability, and the terms 'consonance' and 'dissonance' should be used to describe inherent stability.

Larson (1997b:106; 1992:1) asserts that one should not confuse the terms stable/unstable with consonant/dissonant because the terms 'consonant' and 'dissonant' depend on – according to him – notation and interval names, whereas the terms 'stable' and 'unstable' depend on experience and how we perceive tendencies of individual notes or harmonies in context. The terms stability/instability can thus not be used interchangeably with the terms consonant or dissonant. The scope of this research project does not allow for a repetition of the extensive arguments on this topic by Larson (1997b; 2012:59-60) and Lerdahl (1997). Instead, I will discuss how links can be made between stability, instability, consonance, dissonance, vertical dimensions, and horizontal dimensions.

5.5 Horizontal and Vertical Dimensions: Consonance and Stability

5.5.1 The Vertical Dimension of Chords

Cox (2013) mentions in his review that Larson (2012) neglected to discuss the vertical dimension of the theory of musical forces. I concur with Cox and, more specifically, my understanding is that Larson neglected to clearly distinguish between vertical and horizontal dimensions of chords, and to discuss how musical forces operate in those dimensions. In this section, I will discuss links between the vertical and horizontal dimensions of chords, as well as consonance and stability. I will repeat some of the information that is found in standard harmony textbooks, aiming to draw the link with the theory of musical forces, and to show how Larson's thoughts can be clarified.

5.5.2 The Link between Horizontal and Vertical Dimensions

Consonance and Stability; Dissonance and Instability

Larson (2006:61-62) used the traditional melody, *Happy Birthday*, to explain some of his ideas about the theory of musical forces and musical gestures. Although Larson's use of such simple melodies was criticised, they were adequate examples to introduce and explain concepts. Similarly, *Happy Birthday* is an adequate example to discuss my views on the operation of musical forces in vertical and horizontal dimensions of chords.

The four-part tonic chord, used to harmonise the tonic at the end of Example 2-2, is not heard as a chord with vertical tendencies between the individual tones that comprise the chord or as horizontal tendencies towards resolution – tendencies such as those described by Spies (1988:28).[13] Thus, from the lens of musical forces, listeners will describe this chord as stable and agree that the chord marks the end of the melody. The listener will not hear any forces operating: gravity has run its course, magnetism has evened out, and inertia does not force a continuation.

[13] Spies (1988:28) writes that the character of chords determines their behaviours and she describes the differences in the functions of consonant and dissonant triads. I elaborate more on this topic below.

Example 2-2

Happy Birthday *with the final chord harmonised*

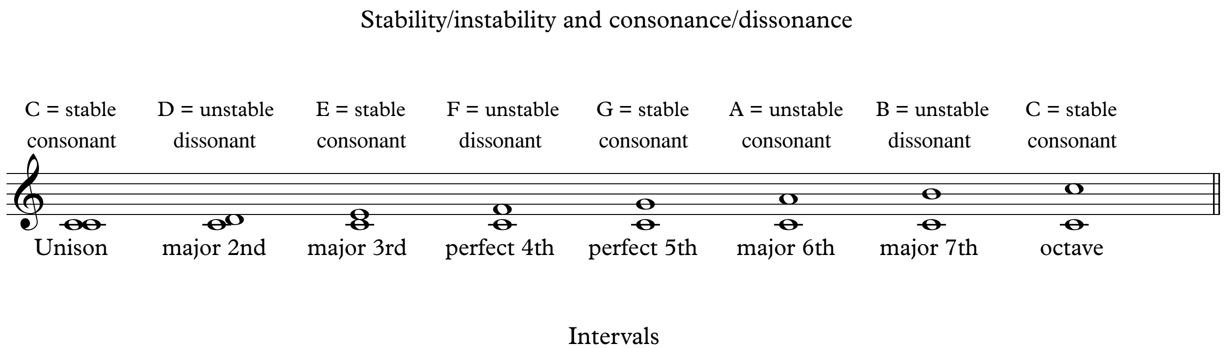
This interpretation in terms of musical forces aligns with standard harmonic theory. For example, Bertha Spies, Extraordinary Research Emeritus Professor at the University of Pretoria, writes that "[c]onsonant triads (major and minor) function far more freely than dissonant triads (diminished and augmented), since they are not charged with the same harmonic tension which characterizes the dissonant triads. This harmonic tension is caused by the dissonant interval within the chord". (Spies, 1988:28.) It is clear that Spies considers both the vertical and horizontal dimensions of chords and, although she specifically mentions diminished and augmented chords, the statement that chords with dissonant tones (vertical) have harmonic tendencies (horizontal) is true for many other chords. Her views are, of course, echoed in most harmony textbooks. However, it is not clear how the almost universally accepted phenomenon of harmonic tension can be linked with Larson's theory.

Drawing explicit links between standard knowledge of harmony and Larson's ideas might help us to clarify matters. Spies's writings, and writings by other theorists, about the vertical and horizontal dimensions of chords and how they interact, enabled me to make links between consonance, dissonance, stability, and instability. Larson did not link these concepts, but differentiated between them. His differentiation between consonance and stability – discussed above – merely cautions readers to not confuse stability with consonance and instability with dissonance. However, this is not enough to enable one to situate these important phenomena in Larson's theory. I searched further, but then found that the matter can become even less clear. For example, Jamshed Bharucha, President Emeritus at The Cooper Union, writes about the relationship between tonal expectations, consonance, stability, and memory in his article *Tonality and Expectation* (Bharucha, 1994:213-239), and his conclusion is that "[e]xpected events are heard as more consonant and more stable than unexpected events" and that "expectation, consonance, and stability covary with the musical context." (Bharucha, 1994:216-217.) It is clear that Bharucha's work in this regard is not the same as what I aim to do in this section. It will also become progressively clearer in my literature review that pinpointing commonly discussed phenomena and situating them into Larson's theory is not a simple undertaking. Nevertheless, it is important in order to situate the theory in the field of music theory.

One needs to return to simpler concepts than those discussed by Bharucha. Spies (1988:30) and Morris (1966:3), like many other theorists, distinguish between consonant intervals[14] and dissonant intervals[15]. These intervals determine the behaviour, or tendencies, of chords according to Spies (1988:28-30) and most other theorists who published harmony textbooks. Although intervals can be heard as both vertical and horizontal sound phenomena, I will only focus on the vertical dimension, because I speculate that consonance or dissonance of intervals can only be heard – or at least heard most clearly in complex textures – when tones are heard simultaneously. I further speculate that, when tones are heard as consecutive tones, they are not heard as consonant or dissonant, but, for example, as a stable tone that moves to an unstable tone that has a tendency to resolve – or contrariwise. Thus, the dissonance between tones in a chord in the vertical dimension can be described as tones repelled by other tones, but musical forces are not involved in this mutual repelling of tones.

[14] Major and minor third, major and minor sixth, perfect fifth, unison, and octave.
[15] Major and minor second, major and minor seventh, perfect fourth, augmented fourth, diminished fifth.

If my speculation is a veracious one, dissonance is directly linked with instability. Firstly, because tones that form dissonant intervals with the tonic, for example, are unstable tones and tones that form consonant intervals with the tonic are stable tones – see Example 2-3. I simplify the observation here, well aware of the suggestion made by Paul Hindemith (1940:107-113) and others of a degree of dissonance of intervals. Secondly, because the unstable tones in a dissonant chord exert tendencies to resolve horizontally, such a chord can be described as dissonant and unstable. Similarly, the tonic chord at the end of *Happy Birthday* can be heard as consonant and stable, because of the operation of forces – as discussed above – and because of the nature of the phenomenon of consonance-dissonance.



Example 2-3

Stability and consonance in terms of intervals

Consonance and Instability; Dissonance and Stability

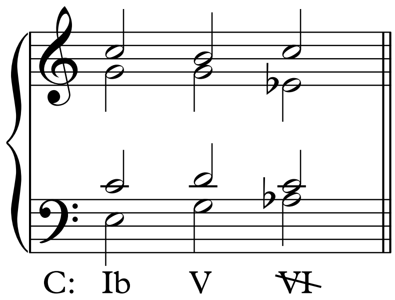
In my discussion above I argue that there is a link between consonance and stability, and dissonance and instability. This link between consonance and stability can be expanded even more when consonance is brought into relation with instability and dissonance in relation with stability. If we harmonise *Happy Birthday* (see Example 2-4 below) with a cadential 6-4 at the end in the penultimate measure, we find that further inquiry highlights possibilities of some stable tones being heard as unstable and some unstable tones as stable.

Example 2-4

Happy Birthday *with a cadential 6-4 at the end*

The second inversion of the tonic chord in Example 2-4 consists of stable tones only (C, E, and G), but the way in which these stable tones are spread in the chord causes listeners to hear the chord as dissonant and unstable. Spies (1988:130) explains this: "the dissonant quality of the fourth [interval] is transmitted to the chord in which it appears, with the result that the second inversion contains dissonant characteristics which do not occur in the root position of the same triad". We find an instance of this description in Example 2-4 above: the C, E, and G are all stable tones, but with the Gs in the tenor and bass voices, the Cs and Es in the soprano and alto voices sound unstable.

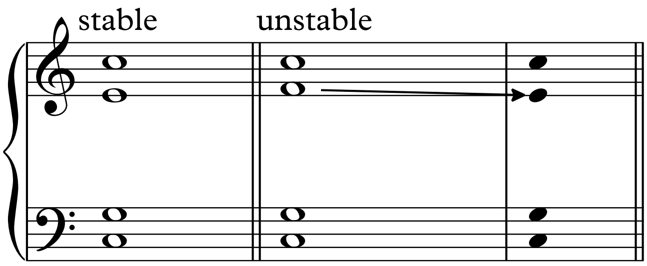
Similarly, it is also possible that unstable tones can make up a consonant chord. Spies (1988:145) presents a major triad on a lowered sixth degree in the major as an instance − see Example 2-5. She writes that "[a]lthough this triad may have tonic as well as subdominant function (because its diatonic equivalent can act as substitute for both these primary triads), it is more often considered as substitute for the tonic chord, especially in the interrupted (or deceptive) cadence." (Spies, 1988:145.) This instance, described by Spies, confirms that unstable tones can make up a consonant chord, but Spies already states that the chord can have two functions, depending on its context. This topic is discussed in the section below.



Example 2-5

The major triad on the lowered sixth degree in the major (Spies, 1988:145)

In Example 2-6, I attempt to show how a change of a single tone can influence the consonance and stability of a chord. When we replace the E in Example 2-6 with an F, merely a semitone difference, we find that the change of that one tone causes the chord to be heard as dissonant because of the dissonant intervals between voices, and unstable because of the strong horizontal tendency of the unstable F to resolve to a stable E. This causes listeners to hear the entire chord as unstable.



Example 2-6

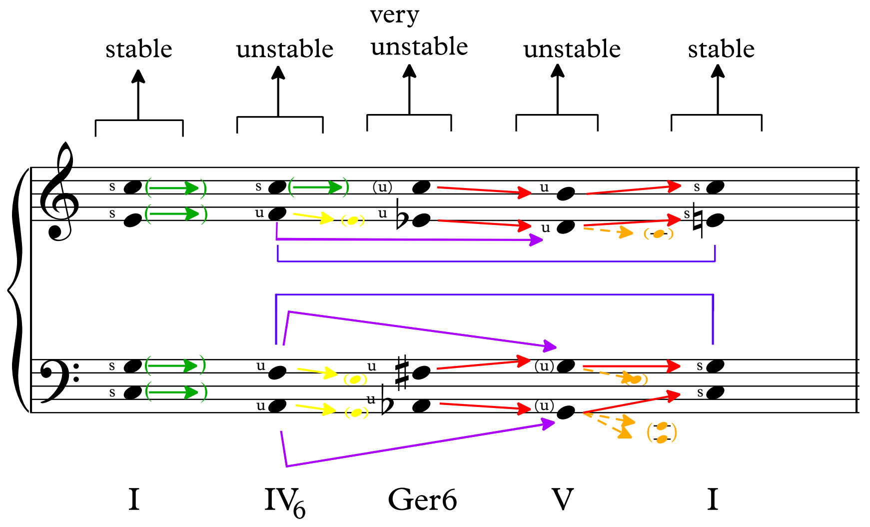
Tones that cause instability have a horizontal tendency to resolve

Another instance of the interaction between consonance and stability occurs when unstable chords are prepared by preceding chords, and the resolution of the one unstable chord to the next is heard as a stable resolution, but the chord that is resolved to retains its dissonance and instability. An example is augmented sixth chords. The harmonic progression I–IV–Ger6–V–I in C major is illustrated in Example 2-7, and in this example I indicate the stable and unstable chords[16] and tones (s = stable; u = unstable).[17] The stable tones do not have any tendencies to resolve, and this stability is indicated with green arrows.[18] The tendency of the unstable tones in the subdominant chord is indicated with yellow arrows and the notes in brackets are the tones to which these unstable tones are most likely to resolve, and their tendencies to resolve are strengthened by their falling together in the German augmented sixth chord. The tendencies and their resolutions of the tones in this chord and in the dominant chord are indicated with red arrows, and other possibilities of tones that the unstable tones could resolve to are indicated with orange arrows. The purple arrows show how the unstable tendency grows, and the blue brackets indicate how the very first unstable tones eventually resolve in the tonic chord.

[16] I indicated that the German augmented sixth chord is 'very unstable' because it is heard as such when compared with surrounding chords.

[17] The degree of stability of tones was indicated in the context of C major.

[18] I put the green arrows in brackets because their tones do not have a tendency to resolve to any other tone because they are stable.



Example 2-7

Harmonic chord progression that shows the tendencies of unstable tones

It is clear from the example above that tendencies we hear in the horizontal dimension are related to the vertical dimension of chords. The quality of chords as stable or unstable (horizontal) is at least partly attributed to the vertical dimension of the entire chord. These vertical dimensions are defined by the consonant or dissonant vertical intervals in those chords.

Conclusion: Stability and Instability of a single Tone

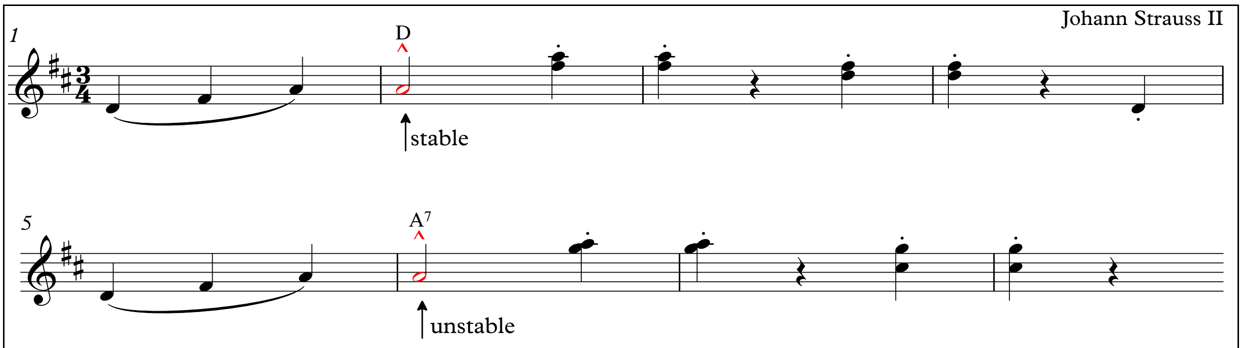
From the discussions above it is clear that the following combinations of consonance and stability can be heard in chords. This simple combination of possibilities allows one to situate the concepts into Larson's theory, and to explain a further notion of Larson, that of contextual stability and inherent stability.

- Stable tones can be used to construct a consonant chord;
- unstable tones can be used to construct a dissonant chord;
- stable tones can be used to construct a dissonant chord; and
- unstable tones can be used to construct a consonant chord.

If the notion of chords is narrowed down to a single tone, the stability or instability of that single tone can be explained in terms of contextual stability or inherent stability as described by Larson (1997b:107). Larson's discussions of contextual stability create the impression that he follows a combination of horizontal and vertical approaches, which means that the stability or instability of a tone depends on its surrounding tones, but a tone can also be contextualised in a vertical dimension. Although Larson did not exclude the vertical dimension in his discussion, he indeed does neglect it, as Cox argues. Larson did not explain the two dimensions clearly and he also does not mention that a tone can be contextualised vertically when it is viewed inherently or in isolation. The difference between a tonic chord in root position and a tonic chord in second inversion is an example of how a tone in isolation can be contextualised on a vertical dimension, as discussed above. The same tone can, however, also function as a member of different chords with different, and even opposing characteristics – something that has been known for centuries.

In Example 2-8 below, I show how a single tone (the A) can first be heard as stable (m. 2) and then as unstable (m. 6) when the surrounding horizontal material remains the same and only the harmonic accompaniment (vertical) change. [19]

[19] In order to make my argument clear, I did not use a G with the A in m. 6 as is conventionally done.



Example 2-8

A simplified arrangement of the opening bars of the melody of Johann Strauss's The Blue Danube Waltz

The A can be heard as a tone with a tonic function or a dominant function when the melody is performed without the accompanying chords, or when they are considered through the lens of inherent stability. When the melody – without the accompaniment – is considered through the lens of horizontal contextual stability, it can also be heard as stable or unstable. But when the melody with the accompaniment is considered through the lens of vertical contextual stability, the first A is heard as stable and the second A as unstable. The presence of a vertical dimension thus plays an important role in the stability of single tones, and the absence of a vertical dimension can be employed to contribute towards ambiguity of single tones. However, both the vertical and horizontal dimensions are important when stability is determined and described.

5.6 Quantification of Stability

Stability was quantified by Krumhansl and Kessler (1982), Lerdahl (1988), Lerdahl (1996), and Margulis (2003). These quantifications of stability will be discussed briefly because they give valuable insight into stability, and can be modelled in Table 2-2 (from Larson, 2012:101).

Table 2-2

Probe-tone profiles[20] for major- and minor-key contexts, quantified by Krumhansl & Kessler (1982), Lerdahl (1988), Lerdahl (1996), and Margulis (2003)

(Larson, 2012:101)

Major scale degree	**Krumhansl & Kessler (1982)**	**Lerdahl (1988)**	**Lerdahl (1996)**	**Margulis (2003)**
C	6.35	5	4	6
C#/Db	2.23	1	1	2
D	3.48	2	2	4
D#/Eb	2.33	1	1	2
E	4.38	3	3	5-6 [21]
F	4.09	2	2	4
F#/Gb	2.52	1	1	2
G	5.19	4	3	5
G#/Ab	2.39	1	1	2
A	3.66	2	2	4
A#/Bb	2.29	1	1	2
B	2.88	2	2	4

[20] In the experiments conducted by these theorists, participants were given a single tone, called the "probe tone" and they were asked to rate how it fit a specific key in terms of its stability. The values given by Krumhansl and Kessler (1982) were derived from calculations based on their experiments. Lerdahl (1988) uses a 5-point scale and later (Lerdahl, 1996) a 4-point scale. This difference is because he changed his algorithm: the 1988 algorithm distinguishes between the stability of the mediant and dominant, but the 1996 algorithm does not distinguish between them. Margulis (2003) uses a 6-point scale.

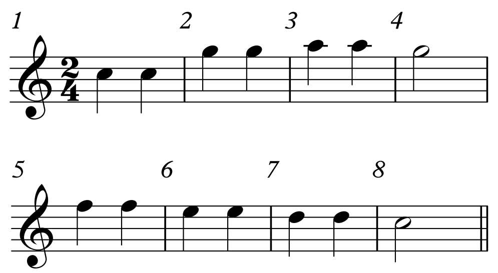
[21] In Margulis's model, the stability rating of the third of a chord is elevated from 5 to 6 if it is preceded by its dominant seventh

This model, which quantifies stability, supports Larson's (2012:100) hypothesis regarding stability values: that it "may correlate with judgments of the 'strength' of melodic pattern completion and the frequencies with which patterns appear and that their effect may be more relevant in explaining the experience of listeners in situations in which the tonic is unambiguously prolonged than in situations in which other chords exert control or the control of the tonic is less clear." Larson (2012:102-103) continues to explain models of stability, and highlights that Lerdahl (1988; 1996) and Margulis (2003) provide models of stability that favour downward resolutions, which relate to Larson's musical gravity or melodic gravity. See §10 for a discussion of Larson's change in terminology. Melodic gravity is the first of Larson's three melodic forces that will be discussed in the next section.

6. <u>Melodic Gravity</u>

Larson (2012:101) writes that the "theory of musical forces [...] regards [melodic] gravity not as a mere 'by-product' but as a fundamental force – as basic to musical experience and as viscerally real as [melodic] magnetism and [melodic] inertia." Larson's (1992:7) definition of melodic gravity reads as follows: "[T]he tendency of an unstable note to descend to a more stable note. Whether it is learned or innate, our perception of musical gravity is immediate, and it is central to expression in tonal music." Larson (1993a:99) acknowledges that his melodic gravity is a reinterpretation of Arnheim's 'gravitational vector'.

Larson (1993a:99) provides an example where two pitches, C and D, are present and explains how melodic gravity operates: if the pitch C is heard as a stable pitch, and D is heard as an unstable pitch above the C, melodic gravity will cause the unstable D to descend to the stable C. The definition of melodic gravity was slightly altered by Larson (2012:83) to "the tendency of a note (heard as 'above a stable position') to descend [to that platform]." See Example 2-9.



Example 2-9

The first phrase of Twinkle, Twinkle, Little Star (Larson, 2012:83)

The first note (C) of *Twinkle, Twinkle, Little Star* provides a basis for the melody and subsequent melodic action. The tones in mm. 2-7 are thus all heard as tones that are above the initial C, and we perceive them as being pulled down to that C because of the operation of melodic gravity. Larson (2012:83) writes that "if we pause on any of those other notes, we may feel the unfinished melody is 'up in the air'. In other words, melodic gravity pulls all those other notes down."

6.1 Physical Gravity and Gravitational Fields

Larson (2012:83) refers to 'gravitational fields' that musical passages possess. Such a gravitational field causes a melody to be perceived as unfinished unless it was pulled down by melodic gravity and a stable tone was reached. Larson (1997-98:58) clarifies his understanding of physical gravity and distance: "Physicists tell us that physical gravity varies (inversely) with distance, yet (since we do not regularly travel in space) we do not experience physical or musical gravity as varying with distance. And physicists tell us that physical gravity is unaffected by our position or stability, yet we experience musical and physical gravity differently when our position or stability changes." Larson and VanHandel (2005:123) write that we are not always aware of it, but physical gravity is constantly acting on us and all moving objects. Thus, we feel the impact of gravity less directly and less powerfully than other forces that have an impact on us. These statements led Larson and VanHandel (2005:123) to hypothesise the following about melodic gravity: "[it] affects the 'strength' of melodic pattern completion and the frequencies with which patterns appear, that its effect is weaker than that of other forces, that its effect is more significant for notes heard as above a stable platform, and that its effect is clearer in global than in local trajectories." Hatten defines and categorises sound patterns that can be interpreted as platforms by listeners. This aspect is discussed in §16.1.5.

Example 2-10

A reduction from Dido's Lament (*Larson 2012:5)*

Larson (2012:84) writes that "the overall shapes of the melody and the bass of 'Dido's Lament' reflect motion within a gravitational field in a way that helps to explain the expressive meaning of the 'lamento bass' in general and this specific melody in particular."

6.2 Literature on Melodic Gravity

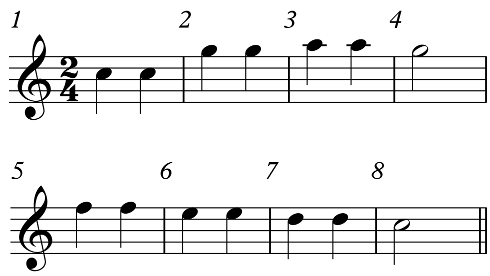
Larson (2012:85-88) also identified supporting and contrasting literature on melodic gravity. Some theorists made explicit connections between the tendency of pitches to descend and physical gravity, like Roth (1926), Hindemith (1945), Toch (1948), and Schachter (1995). Analysts like Densmore (1926), Sachs (1962), Ellis (1969), Vos and Troost (1989)[22], Mazo (1994), and Huron (2006)[23] deduced from their analyses that phrases typically begin with an ascending leap and continue with mostly descending steps, showing that descending steps are more common than ascending steps in music – a tendency in melodic material that can be attributed to the force of melodic gravity.

Theorists who conducted research in similar fields as Larson omit musical gravity from their own research, like Lerdahl (2001:191), who writes that "gravity appears to be dispensable", and Margulis (2003), who does not include gravity in her model of melodic expectation. Other researchers like Narmour (1990), Bharucha (1996), and Eitan (1997) believe that there is not a preference for a descending motion as suggested by Larson's melodic gravity. Thus, these researchers consider melodic gravity and melodic magnetism as equivalent forces that operate similarly. In my own study of Larson's ideas, I found that the two forces are indeed not easy to tell apart in real examples, and sometimes they coincide. Thus, the fact that these researchers fuse the two in their understanding is not to be understood as standing in a radical opposition to Larson's ideas.

[22] Vos and Troost (1989) studied Western folk music that includes Albanian, Bulgarian, Iberian, Irish, Macedonian, Norwegian, and African American folk songs (Larson, 2012:85).
[23] Huron's (2006) studies include Chinese folk songs, traditional Korean music, and Ojibway, Pondo, Venda, and Zulu songs. He also studied several thousand German folk songs in major keys (Larson, 2012:85).

7. <u>Melodic Magnetism</u>

Arnheim (1986) uses the term 'magnetism', but Arnheim's application of the term is criticised by Larson (2012:92): "[he] limits its application to attractions exerted by the tonic pitch. He does not suggest that the strength of magnetism depends upon distance nor does he quantify it in any way." Larson included the influence of distance in the strength of melodic magnetism as an integral part of the definition of melodic magnetism. Larson calls the attractive power that exists because of the hierarchical embellishment relationships[24] "musical magnetism", which he defines as "the tendency of an unstable note to move (up or down) to a more stable pitch" (Larson, 1993a:98; Larson & VanHandel, 2005:123). He continues by writing that musical magnetism is affected by distance and that attraction becomes stronger closer to the goal: "Magnetism is affected by distance – the closer we get to a goal, the more it attracts us." (Larson, 1992:7.)[25] This caused Larson to adapt his definition of musical magnetism as follows: "the tendency [of an unstable note] to move to the closest[26] stable pitch." (Larson, 2012:88.) See Example 2-11.



Example 2-11

The first phrase of Twinkle, Twinkle, Little Star

[24] See Larson's (1993a:98) description of embellishment relationships in §5.
[25] Margulis (2003) supports Larson's statement that magnetism is affected by distance.
[26] Larson (1993a:98) used the term 'nearest'.

Larson (2012:88) writes that the pitches C, E, and G – members of the tonic triad of C major – are stable pitches in *Twinkle, Twinkle, Little Star*, and that these three pitches pull all other pitches toward them. When the F in m. 5 moves to the E in m. 6, the melody can be heard as giving in to melodic magnetism because the E is the closest stable pitch to F.

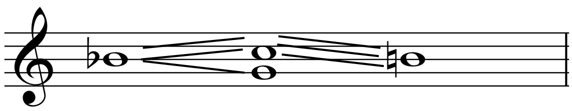
Larson (2012:88-89) elaborates on the operation of melodic magnetism: "In 'Twinkle, Twinkle, Little Star' the G [m. 2] is poised above the tonic; as a relatively stable pitch, the G provides a good starting point for a secure motion down to C. Instead of descending directly to the C, however, the G is first elaborated with its upper neighbor A [m. 3]. The motion from G to A [...] may be heard as implying continued ascent (that is, it could give in to inertia and go on to B and C), but when it returns to G [m. 4], it feels as though it gives in to gravity (by going *down* to G) and as though it gives in to magnetism (because G is closer than the C above)."

7.1 Melodic Magnetism is influenced by Distance

In his first research paper, Larson (1992) discusses the interaction of musical magnetism on three different levels of strength[27]: a magnetic pull, giving in to a magnetic pull[28] and magnetic pull at its strongest. Larson (1993a:98-99) provides an example where D and G are stable pitches. The pitch F is then perceived as unstable and has the tendency to ascend to G because of the force of musical magnetism. If the ascent of F towards G goes to $F^{\#}$, the magnetic pull towards G will intensify.[29] Larson and VanHandel (2005:124) write that the effect of melodic magnetism is stronger than the effect of melodic gravity, and that its effect

[27] Larson (1992) defines 'strength' as "the degree to which the final note is predicted".
[28] Larson (1993a:631) later explains that 'giving in' to a musical force "means moving (in the direction specified by the force) from an unstable pitch to a stable one."
[29] Larson (1992:9-12) presented a model of music expectation, and indicated 'magnetism!' when a three-note pattern gave in to magnetism by a half step, and 'magnetism?' when a three-note pattern gave in to magnetism by a whole step above or below the pattern.

is clearer in local than in global trajectories. Larson (2012:90) mentions that melodic magnetism "favors melodic motion by smaller intervals". See Example 2-12.



Example 2-12
Illustration of melodic magnetism that depends on distance

In the example provided by Larson (2012:89), the pitches C and G (middle) are heard as stable pitches. The B^b on the left is two semitones away from the C and three semitones away from the G. The B^b is thus attracted more strongly to the C that it is attracted to the G. The B-natural on the right, however, is attracted towards the C even more than the B^b because it is only one semitone away from the C.

Hatten (2012b) writes that "[t]he degree of closeness of pitches in a given alphabetized collection determines their degree of attraction. But attraction is not only attributable to closeness – it also is attributable to the degree of stability of one of the two pitches." Hatten (2012b) uses an example of the tone $F^\#$ in the context of C major: the $F^\#$ is equidistant[30] to F-natural and to G, but the $F^\#$ is magnetically pulled to the G and not the F-natural. He explains that the G is more stable than the F-natural and that the G is analogous to a body with more physical mass, therefore a greater attraction. Hatten (2012b) reiterates his claim with a further example where we hear a $C^\#$ moving between the tones C and D. In the key of C major, the C is more stable than the D, therefore the C "drags" on the $C^\#$ and the D "pulls" on the $C^\#$ and consequently the drag will be greater than the pull, moving to the C.

[30] When in equal-tempered tuning.

7.2 Observing the Operation of Melodic Magnetism in Performance

Musicians such as the cellist Pablo Casals (Blum, 1977), pianist Glenn Gould (Monsaingeon, 1980), and Jazz musician Jerry Coker (Coker, 1964) described attractions in music in terms of melodic magnetism (Larson, 2012:95). This tendency was also observed and researched by Ortmann (1926), Merriam, Whinery and Fred (1956), Dowling (1967), Deutsch (1978), Boomsliter and Creel (1979), and Aarden (2003).

Example 2-13

A reduction from Dido's Lament

When we consider the bass line of this example, we can attribute the descending semitones to melodic magnetism (Larson, 2012:89-90).

7.3 Melodic Magnetism in Literature

Melodic magnetism is described in existing literature and analyses but different terminology is used by different authors. Terms used to refer to melodic magnetism in research and analyses include 'proximity' (Narmour, 1990; Cuddy & Lunney, 1995; Krumhansl, 1995; Schellenberg, 1996, 1997), 'yearning vector' (Bharucha, 1996), 'attraction' (Lerdahl, 1996, 2001), and – more commonly used in music theory – 'leading note' or 'tendency tone'. These terms correspond with Larson's description of the operation of melodic magnetism. Larson also references analysts who used these terms, because it serves as evidence that the operation of melodic magnetism was observed before, but not yet theorised.

7.4 Quantification of Melodic Magnetism

Margulis (2003) offers a table of proximity values that reflect how melodic magnetism depends on distance in semitones. Although Larson (2012:93) considers Margulis's table similar to Lerdahl (1996; 2001) and his theory of melodic magnetism, Margulis's model is not limited to the closest stable tone like in the case of melodic magnetism. Margulis (2003) suggests, however, that the magnetic pull of an unstable tone is directly proportional to the stability of the tone that attracts the unstable tone.

Table 2-3

Margulis's (2003) Model of Melodic Expectation

Pitch distance in semitones	**Proximity rating**
1	36
2	32
3	25
4	20
5	16
6	12
7	9
8	6
9	4
10	2
11	1
12	0.25
13	0.02
=14	0.01

7.5 Melodic Gravity versus Melodic Magnetism

In some instances, it might be unclear whether musical motion was determined by melodic gravity, melodic magnetism, or both. Such unclear instances exist because melodic gravity and melodic magnetism often agree on a downwards motion. See §9.3 for an explanation of the agreement and disagreement of musical forces.

8. Musical Inertia

As stated already, Arnheim's (1986) work is limited to magnetism and gravity, but Larson (1993a:99) added a third musical force to his theory of musical forces. Larson calls this musical force "musical inertia". Although Toch (1948) also identified musical inertia as a musical force, Larson (1993a) does not cite Toch, but merely refers to the 'law of good continuation' in Gestalt psychology (Larson, 1992:7).[31] The metaphor of musical inertia as a musical force was not as well accepted as the metaphors of melodic gravity and melodic magnetism. Larson clarifies why the metaphor of musical inertia is more problematic than the metaphor of melodic gravity and melodic magnetism: "[a] physicist might object that inertia is not a force, but people tend to perceive it as such." (Larson, 1993a:99.)[32] Thus, Larson does not reject musical inertia because it is not considered as a physical force, but rather includes it because it is *perceived* as a force in music and cognition. To reiterate an important point: although gravity and magnetism are physical forces, they are *perceived* as forces in music and cognition, and the physical force itself is not acting on the music.

Larson defines musical inertia as "the tendency of musical motion to continue in the same fashion (where what is meant by 'same' depends upon how that musical pattern is represented in our internal hearing[33])." (Larson, 1993a:99; Larson and VanHandel, 2005:125.)[34] He (Larson, 1993a:99) provides an example of a musical pattern that starts with C-D-E, D-E-F and that the pattern will be expected to continue E-F-G and so on because of the operation of

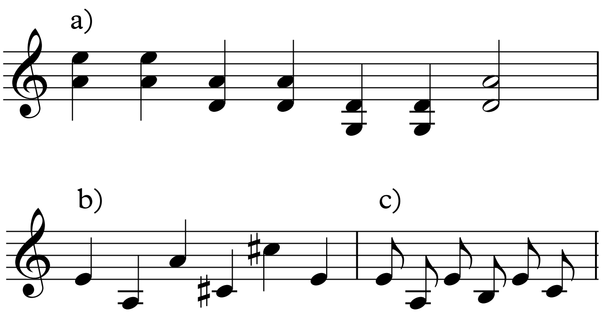
[31] Larson (1992:7) cites Koehler (1947), Bregman (1976), Deutsch (1982), Lerdahl and Jackendoff (1983), Sloboda (1985), Butler (1992), and Meyer (1956) here.

[32] Hatten (2012b) hypothesises that musical inertia might rather be "the result of the momentum achieved by an independent agent". See §16.1.2 for further discussion of Hatten's addition of momentum to Larson's theory of musical forces.

[33] Larson (2012:96) refers to "musical memory".

[34] A change can be observed in Larson's definitions between the 1992 and 1993 sources. In 1992, he defines musical inertia as "the tendency of a pattern of musical motion to continue in the same direction". In 1993, 'musical motion' is changed to 'musical pattern' and 'same direction' to 'same fashion' (Larson, 1993a).

musical inertia. Sequences are examples of patterns heard as giving in to musical inertia (Larson and VanHandel, 2005:125; Larson, 2012:96). See Example 2-14.



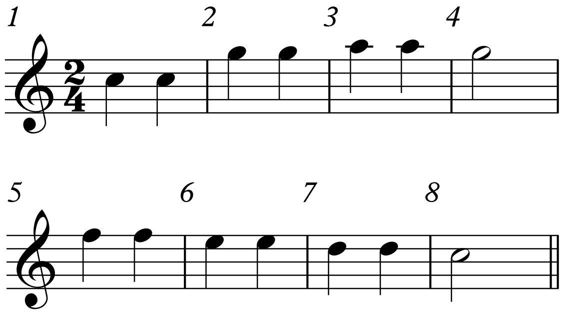
Example 2-14

Three instances labeled a, b, and c, that can be used to explain the operation of musical inertia (Larson, 2012:99)

a) When we hear the tones A and E being played on the open strings of a violin, and they descend to A and D, a perfect fifth interval lower on the open strings of the violin, it will induce the expectation of a further descending perfect fifth. For this discussion to be clear, it is best to ignore the minim D and A at the end.

b) The tonic chord of A major is used here as an example. When the E-A is heard as a motion within this chord, it will induce the expectation that the movement will continue in the chord.

c) If the E-A is perceived as part of a larger pattern where the E repeats and every second note ascends one scale-degree, it will induce the expectation to continue like it started.



Example 2-15

The first phrase of Twinkle, Twinkle, Little Star

The first phrase of *Twinkle, Twinkle, Little Star* can also be used to explain the operation of musical inertia. Mm. 5-8 can be seen as giving in to musical inertia because it continues in the same rhythm as mm. 1-4. Mm. 5-6 can also be heard as a descending diatonic scale, of which m. 7 gave in to musical inertia in order to continue the descending diatonic scale.

Larson and VanHandel (2005:125) note that "inertia is *both* the tendency of an object in motion to remain in motion *and* the tendency of an object at rest to remain at rest, that inertia has an impact that is stronger than gravity and more pervasive than magnetism, that inertia tends to carry motion beyond the points of stability to which other forces draw objects, that inertia may act in concert with other forces, and that in so doing it tends toward a state in which those forces are in equilibrium." While Larson and VanHandel place musical inertia on a level with melodic gravity and melodic magnetism in terms of strength and pervasiveness, Hatten gives a lesser view of inertia as a musical force. It seems that Hatten (2012b) does not consider musical inertia a musical force, but rather a result of momentum achieved by the operation of an independent agent. Finding a solution to this disagreement between Larson and VanHandel and Hatten will be approached in my work through analyses, rather than through reflections on physical forces and the metaphorical nature of musical inertia.

9. **Melodic Gravity, Melodic Magnetism, and Musical Inertia**

9.1 Two Assertions that stem from the Definitions of Melodic Gravity, Melodic Magnetism, and Musical Inertia

Larson (1993a:630) writes that the definitions of the three melodic forces lead to two assertions:

- "The first assertion is that melodic expectations in tonal music depend on the iterated operation of these forces on various hierarchical levels of musical structure."[35] (Larson, 1993a:630.) He explains 'iterated operation' of the forces as follows: "(1) take a simple (but in some sense incomplete) melodic pattern, (2) follow the implications of one of the musical forces until a certain degree of stability is achieved, (3) take the resultant patterns, and (4) follow the implications of another of the musical forces until an even greater degree of stability is achieved." (Larson, 1993a:630.)
- "The second basic assertion is that goal-direction is a very important aspect of tonal music, and thus that the patterns of musical motion in which the final note is most strongly predicted by the musical forces are the most fundamental melodic patterns." (Larson, 1993a:630.)

9.2 Pattern Completion

Larson (1992:7) includes 'pattern completion' when he writes about melodic gravity, melodic magnetism, and musical inertia: "Each of the above-mentioned forces may be understood as suggesting that the dynamic tendencies of a note are shaped by its participation in patterns. Another Gestalt tendency is the drive toward closure. Anytime we can imagine a more

[35] 'Hierarchical levels of musical structure', in Larson's (1993a:630) terms are "underlying pitch patterns of a melody".

complete or more stable pattern than the one we are hearing, we hear what we perceive in terms of that pattern and experience a desire to hear it completed or made more stable." Larson's insistence on hearing specific tones as part of a pattern in order to hear the operation of musical forces is in contrast with other theorists who write on musical forces. My work follows Larson in this aspect, and therefore a complete exposition of the disagreement between the various authors is not necessary.

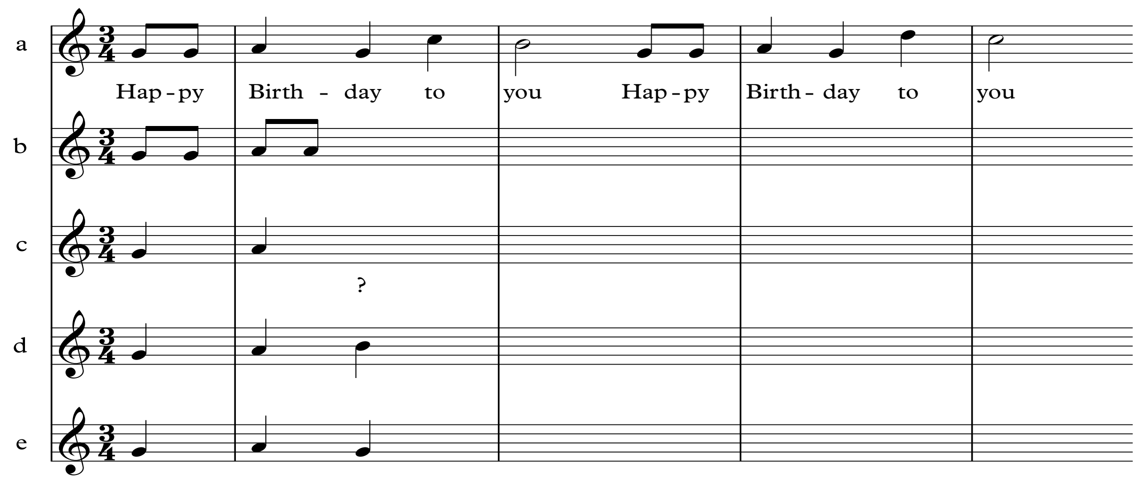
9.3 Agreement and Disagreement of Melodic Forces

Larson (2006a:63) writes that some musicians, and physicists, make the mistake of explaining motions as if a single force was acting on it, rather than thinking that multiple forces can act on a single motion at once. When multiple forces act upon a musical motion, some forces may agree or disagree:

- **When melodic forces agree:** Larson (2004:462) writes that in certain contexts where melodies move within the major scale and members of the tonic triad are considered as the stable pitches, melodic gravity will cause a melodic beginning of 5-4-? to descend and result in 5-4-3; melodic magnetism suggests that the melodic beginning 5-4-? will result in 5-4-3 because 3 is the nearest stable pitch. Musical inertia suggests that the pattern will continue by going in the same direction with which it started with and thus also result in 5-4-3. It is evident that all three melodic forces agree upon a pattern completion of 5-4-3.
- **When melodic forces disagree:** Larson (2004:462) writes that, in certain contexts, when melodies move within the major scale and members of the tonic triad are considered as the stable pitches, melodic gravity and melodic magnetism cause a melodic pattern 5-6-? to result in 5-6-5. Melodic magnetism will cause the pattern to result in 5-6-5 because it will continue by moving down to the nearest stable pitch.

Musical inertia will cause the melodic pattern 5-6-? to result in 5-6-7-8 because the pattern will continue by going in the same direction in which it started. Thus, musical inertia does not agree with melodic gravity and/or melodic magnetism.

Because multiple forces can act on a passage of music, and melodic forces may agree or disagree, it is important to consider all three the melodic forces when describing the operation of melodic forces. In some instances, all three the melodic forces may be present, or two musical forces, or only one melodic force. However, Larson's research does not provide for the possibility that no musical forces may be present at all.



Example 2-16

Happy Birthday (Larson, 2006a:62)

First we hear the two Gs of the upbeat (a), and when we hear the A in m. 1 we expect musical inertia to operate and that the two quaver Gs will be followed by two quaver A's and so on, as shown in (b). Musical inertia also leads us to expect a melodic continuation to a crotchet A when we hear the Gs in the upbeat as an elaboration of the simple crotchet-note melody as shown in (c). Musical inertia might furthermore lead us to hear the melody as an ascending scale, continuing from the two quaver Gs to A and B, as shown in (d). However, the melody returns to G, shown in (e), and that can be ascribed to the operation of melodic gravity and melodic magnetism. Melodic gravity pulls the unstable A down to the stable G, and melodic magnetism attracts the unstable A to the closest stable tone, which is G.

Melodic gravity and melodic magnetism are often confused, and these two concepts need to be clarified. In case of a descending motion of an unstable tone towards a stable tone, that motion may be ascribed to the interaction of melodic gravity and melodic magnetism, or melodic gravity only:

- If the descent is to the closest stable tone, the motion can be ascribed to both melodic gravity and melodic magnetism.
- If the descent is to a stable tone that is not the closest stable tone, the motion can be ascribed to melodic gravity only.

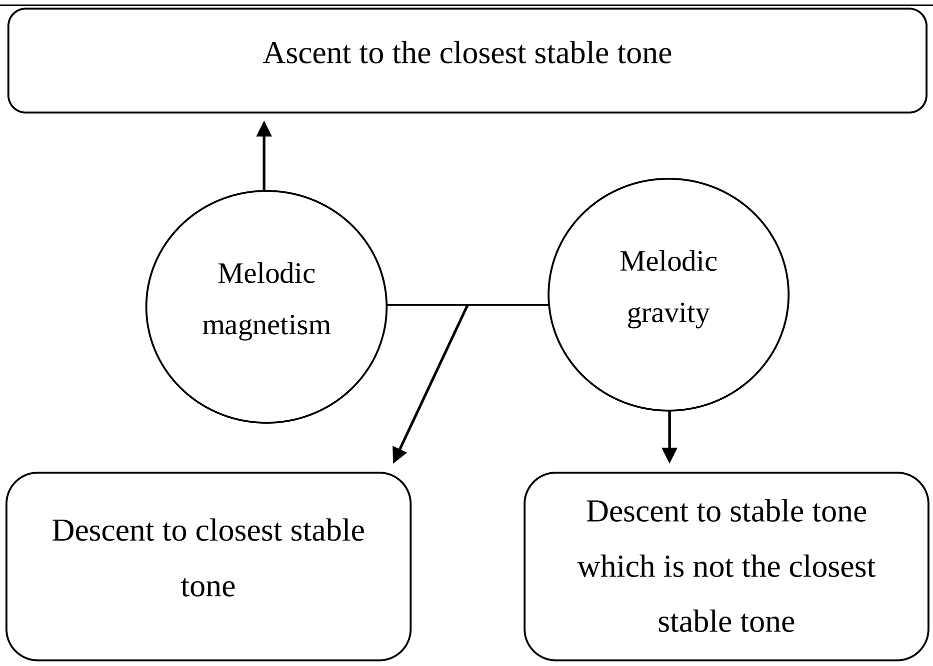


Diagram 2-5

Melodic gravity versus melodic magnetism

10. Change of Terminology

In Larson's first publications on musical forces in academic journals – 1992 to 2006 – he used the terms 'musical forces', 'musical gravity', 'musical magnetism', and 'musical inertia' to describe the 'melodic forces' of 'melodic gravity', 'melodic magnetism', and 'musical inertia' that were discussed in §6, §7, and §8. However, when his book *Musical Forces* appeared in 2012, a change in terminology was evident: Larson retained the term 'musical forces' to refer to his theory in general but started to refer to 'melodic forces' that include 'melodic gravity', 'melodic magnetism', and 'musical inertia'. The use of the terms 'musical gravity' and 'musical magnetism' have thus been discontinued since 2012.

Larson's terminology pre-2012	**Larson's terminology since 2012**
Musical gravity	Melodic gravity
Musical magnetism	Melodic magnetism
Musical inertia	

Diagram 2-6

Larson's change of terminology

Reasons that can serve as a motivation for Larson's change in terminology are 1) the comprehensiveness of the terms and 2) the addition of rhythmic forces to his theory of musical forces.

10.1 Comprehensiveness of the Initial Terms

In Larson's theory of musical forces, the initial use of the terms 'musical gravity' and 'musical magnetism' neglect musical elements such as duration, rhythm, metre, dynamics, register, timbre, harmony, and texture – he mainly focuses on pitch and the operation of musical forces between different pitches. This means that he was, in fact, describing melodic forces, but using the term 'musical forces'. Terms like 'musical gravity' and 'musical magnetism' create the expectation that they involve multiple elements that defines 'music(al)'. The terms 'musical gravity' and 'musical magnetism' are thus comprehensive terms which are not in accordance with the focus of Larson's existing work. That explains his later use of more specific, narrowed-down terms such as 'melodic gravity' and 'melodic magnetism' – which are limited to melody.

However, Larson retained the use of the term 'musical inertia', and this can be motivated by the nature of his discussions of musical inertia that go beyond pitch. Nevertheless, terms like 'melodic gravity' and 'melodic magnetism' also include more elements than merely pitch, but Larson's melodic forces are understood as the operation of melodic gravity, melodic magnetism, and musical inertia between pitches.

Larson's use of simple melodies like *Twinkle, Twinkle, Little Star* and *Happy Birthday* indicate that he was aware of how duration and rhythm can change listeners' perception of how the musical forces operate, and therefore chose melodies where the duration of the pitches are similar. Larson does not omit other elements of music, but he explains that "the theory focuses primarily on melody (ignoring certain aspects of harmony and rhythm)." (Larson, 1993a:629.) It is evident in Larson's writings that he considers pitches in the context of other musical elements when he analyses and discusses them. If more attention was drawn to the influence of elements such as rhythm on the operation of one or more musical forces on pitch, a need will arise to quantify the influence of rhythm, or adapt the quantification of musical forces on pitch depending on other elements present. The probe-tone profiles for major- and minor-key contexts shown in Table 2-2 are thus subject to pitches of the same duration.[36]

[36] Nichols (2005:2) also criticised Larson's computer models because they only allowed for one note at a time, notes of the same duration, and rests that are not considered.

Arnie Cox's (2013) concern with the term 'musical forces' is that Larson (2012) does not pay much attention to the vertical dimension of the musical passages he analyses (something that I have already discussed), but mostly focuses on the horizontal dimension. Cox also argues that 'musical forces' are limited in Larson's work to tonal music, but that considerations of these forces should also include pre-tonal, post-tonal and atonal music. Because of the fact that Larson refers to 'musical forces' while discussing only some music, Cox (2013) believes that Larson's theory is "arguably too ambitious and ought instead to have reflected the restriction to tonal musical forces." Cox (2013) made a valid statement because Larson's (2012) research is indeed limited to tonal music only. However, Cox (2013) writes that Larson "missed [the] opportunity to demonstrate how [his theory] might apply, or not apply, to the music of, say, Palestrina and Byrd in one direction, and Bartók, Oliveros, or Feldman in another direction" and that "[i]t would not have taken more than a few pages to at least indicate some of the issues involved in applying the theory; and whether it applies well or less well, this would tell us something about meaning construction in various practices". Although Larson did not include this music in his research, I believe that his theory has the potential to be expanded and made applicable to all music.

10.2 The Addition of Rhythmic Forces

Larson (2012:136-179) expanded his theory of musical forces for the first time in his book, *Musical Forces*, by adding 'rhythmic forces', which he sees as analogous to melodic forces. Larson (2012:136) writes that the theory of musical forces[37] can "deeply enhance our ideas about metre and rhythm." Because he added rhythmic forces, it was necessary for Larson to change to more specific terminology in order to distinguish between 'melodic forces' and 'rhythmic forces'. These rhythmic forces will be discussed briefly in the section that follows.

[37] Larson's use of the term 'musical forces' refers here to musical metaphors of gravity, magnetism, and inertia – not specifically melodic forces.

11. Rhythmic Forces

The aspect of rhythmic forces was added for the first time to Larson's theory of musical forces in 2012. Larson (2012:136) presented rhythmic forces as an expansion of melodic forces and as analogous to melodic forces. Before I present Larson's rhythmic forces, I will discuss the difference between rhythm and metre briefly. Justin London, Andrew W. Mellon Professor of Music at Carleton College, is referenced by Larson (2012:138) who also deemed it important to distinguish between rhythm and metre. London (2004:4) defines rhythm as "patterns of duration that are phenomenally present in the music, and these patterns are referred to as *rhythmic groups*." It is important to note that these 'patterns of duration' are not based on the actual duration of each musical event – as a rhythmic pattern can be played legato or staccato, for example – but on the *interonset interval* ('IOI') between the attack points of successive events". He (London, 2004:4) writes about metre that it "involves our initial perception as well as subsequent anticipation of a series of beats that we abstract from the rhythmic surface of the music as it unfolds in time." Rhythm and metre are also compared as follows from a psychological perspective: "rhythm involves the structure of the temporal stimulus, while metre [sic] involves our perception and cognition of such stimuli". I rely mostly on London's definitions of 'metre' and 'rhythm' to distinguish between the two terms, especially because Larson only provides a definition for 'rhythm'.

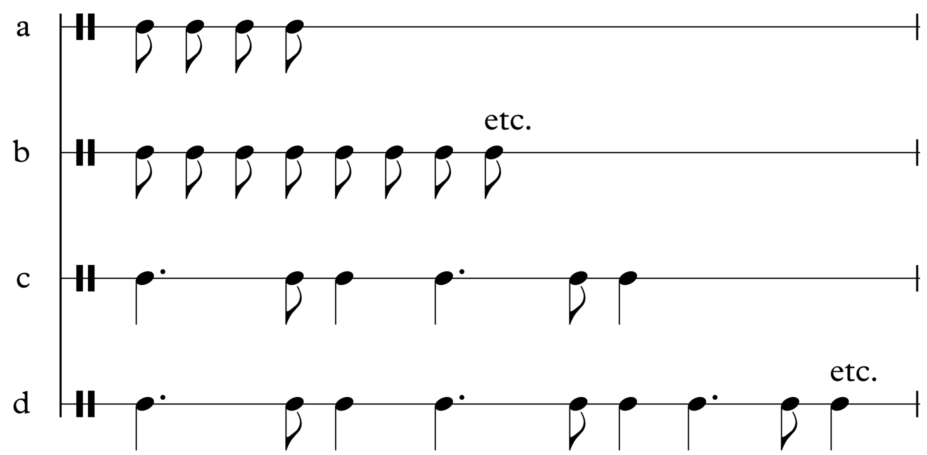
11.1 Larson's Definition of Rhythm

Larson (2012:136) writes that the concept of rhythmic forces "[explain] analogies between pitch and durational patterns, and shows how the same embodied knowledge of physical forces that informs our understanding of melodic expectation also shapes our experience of musical rhythm." At the start of his discussion he points out that authors of most studies in literature on rhythm agree that listeners will hear rhythms in groups: "a series of identical, equally spaced, un-pitched clicks (like the ticks of a clock or metronome, for example) tend to be heard in groups, usually twos or threes. Different listeners may hear different groupings, or they may hear the groups beginning and ending with different clicks. [...] Beginning with this observation allows theorists to start with what seem like the most basic rhythmic phenomena, allows them to introduce and define terms through an uncomplicated example, and allows them to remind us that rhythmic phenomena are mental." (Larson, 2012:136.) Although Larson suggests that starting with 'the most basic rhythmic phenomena' will allow the introduction and definitions of terms through an uncomplicated example, terms and their definitions are not introduced in a simple way in Larson's work.

For example, Larson (2012:139) defines rhythm of music as "the quality of motion we experience in it, a quality that is only partly dependent on its timing, and a quality that includes grouping and metre [sic]." He specifically refers to 'rhythm of music' because the term 'rhythm' does not restrict us to music, but can also refer to the rhythm of a poem or, more metaphorically, the rhythm of your day at the office (Larson, 2012:139). He also urges scholars to distinguish clearly between rhythm and duration (Larson, 2012:141-142). The difference between rhythm and duration – discussed in more detail with regards to musical forces in Larson (2012:140-143) – is already important when we discuss inertia and rhythm, discussed below. Rather than trying to illuminate this aspect of the literature, I will critically engage with Larson's ideas on metre and rhythm in my analyses.

11.2 Inertia and Rhythm

Larson (2012:143) considers musical inertia central to musical rhythm, and writes that "[i]f we hear a pattern of durations, then inertia leads us to expect that pattern to continue." Larson (2012:143) provided an example of undifferentiated clicks (shown in Example 2-17) to illustrate the operation of musical inertia on rhythm: if we hear a rhythm that only consists of quavers (Example 2-17a), then we will expect the pattern to continue as shown in Example 2-17b. If we hear a repeated pattern like the one shown in Example 2-17c, we will expect it to continue as shown in Example 2-17d.



Example 2-17

The operation of inertia in patterns of durations (Larson, 2012:143)

Listeners' experience of rhythmic forces is different when pitches are added to the rhythms – see Example 2-18 (Larson, 2012:144). The melodic material, shown in Example 2-18a, is used to explore possibilities of melodic and rhythmic continuations. If the pattern is independent from pitch material, listeners would only expect the pattern of durations to continue, as shown in Example 2-18b. Example 2-18c shows how listeners can hear the melodic material as giving in to inertia when independent from the pitch material. However, if we expect the pattern of the pitches to continue independently from the rhythmic pattern, shown in Example 2-18d, we will hear Example 2-18e and Example 2-18f as giving in to inertia, but not Example 2-18c. Larson (2012:144) writes that this example illustrates the 'retrospection of anticipation' because a listener that hears any of the continuations that Larson suggests in the example might get a sense of having predicted the continuation.

Example 2-18

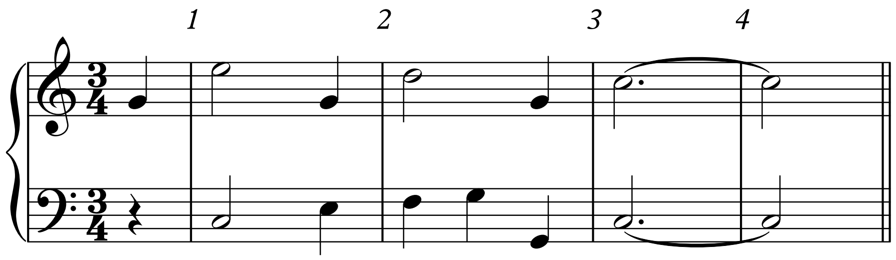
Inertial expectations are dependent on the way in which patterns are represented internally by listeners (Larson, 2012:144)

Larson's discussion of rhythmic forces is followed by a discussion of metric stability[38], because the rhythmic patterns discussed above – just like physical movements – start and end in stable positions.

[38] Although Larson mainly uses the term 'metric stability', he sometimes uses the term 'rhythmic stability' interchangeably. I use the term 'metric stability'.

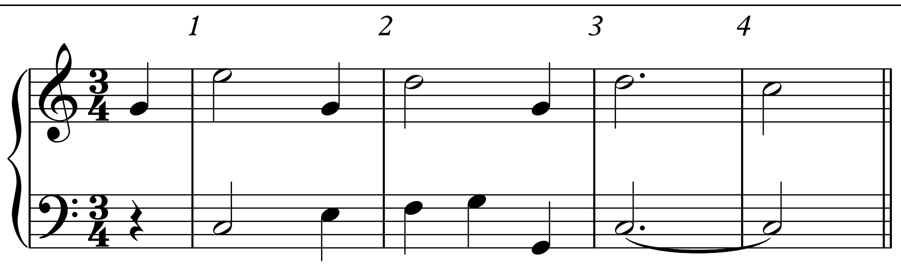
11.3 Metric Stability

Larson (2012:147) defines metric stability as "a quality that listeners attribute to points in time and, as a result, also to the notes that articulate those points in time." Metric stability is relative because no moment possesses absolute rhythmical stability when heard in isolation. We will hear one beat rhythmically more stable than another and stability can be ordered hierarchically. It is clear from Larson (2012:148) that upbeats are heard as unstable, because they need to resolve, and downbeats are heard as stable, because they do not have any tendencies. Stronger and weaker beats generate hierarchical levels. It is important to distinguish between metric stability and tonal stability. Larson (2012:147) uses two examples to explain this difference – see Example 2-19 and Example 2-20.



Example 2-19

Metric and tonal stability (Larson, 2012:147)



Example 2-20

Metric stability and tonal instability (Larson, 2012:147)

In Example 2-19, the C in m. 3 is tonally stable in the context of C major and does not need to resolve. It is also metrically stable, because it is on a downbeat. If we refer to Example 2-20 on the other hand, we find that the stable C in m. 3 is replaced by a tonally unstable D. The D has the tendency to resolve to the stable C due to the operation of melodic gravity and melodic magnetism. Although the D is metrically stable, because it is on a downbeat, it is not heard as stable due to the tendency of the unstable D to resolve to the stable C. This example links with Example 2-18, and it is clear from both examples that melodic material has a greater impact on listeners' experience of stability than rhythmic material.

11.4 Rhythmic Magnetism

Larson does not write exhaustively about rhythmic magnetism – he discusses it as the final part of his discussion of metric stability, and not on its own like in the case of inertia and rhythmic gravity. He states that metric stability provides for the quality of a goal. Listeners then develop a desire to reach the goal the closer we get to that goal. This experience is seen as parallel to our experience of melodic magnetism (Larson, 2012:148). Lerdahl (2001:285-297) made a similar analogy which he calls 'metrical attractions'. My understanding of rhythmic magnetism is that it is not as concerned about moving to the point of stability – like melodic magnetism – but that it has more similarities with melodic magnetism with regard to the tendency that grows stronger as it moves to a stable point.

11.5 Rhythmic Gravity

Larson (2012:148) writes that "[r]hythmic stability maps onto physical stability, and our most stable physical positions involve rest on a stable platform or base." This statement is clear when one thinks of downbeats and upbeats in terms of physical movements: upbeats will be shown in a physical gesture as an upward movement and downbeats will be shown as a downward movement. He therefore defines 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." An example that Larson (2012:149) presents is an upbeat that 'falls' to a downbeat because it was pulled 'down' by rhythmic gravity. Larson (2012:149) concludes by writing that "[t]he result is that 'up and down' map onto musical motion in two very different ways. In the domain of musical pitch, 'down' means pitches with 'lower' frequencies. In the domain of metre, 'down' beats are movements of greater metric stability. The two need not agree, and they can interact in interesting ways." In this explanation Larson uses aspects of physical motion to describe musical motion.

11.6 Conclusion: Rhythmic Forces

More aspects of rhythmic forces are discussed in Larson (2012:149-179) and these aspects are elided patterns of durations, rhythmic flow in pitch patterns, the rhythm of combining physical motions, combining musical patterns, metre as rhythm and metre as expectation, metric dissonance, and cognitive isomorphisms. These aspects were not discussed here because they are not within the scope of this research project. The discussion above gives us an overview of Larson's rhythmic forces. Although he does not omit pitch from his discussions, Larson does not place his views on rhythmic forces clearly in his theory of musical forces, and their relationship with melodic forces is unclear. I will deal with these shortcomings later.

12. Central Features of Larson's Work on Musical Forces

Based on feedback on his ideas and developments of his theory, Larson had to clarify the central features of his work on musical forces. Larson and VanHandel (2005:119) identified five features that are central to the theory of musical forces. These five features are as follows:

a) Larson identified and defined three musical forces: gravity, magnetism, and inertia.

b) The theory of musical forces is based on a metaphorical understanding of physical forces, and the theory explains discourse about music and our experience and perception of music.

c) The operation of the musical forces is grounded in aspects of Schenkerian theory.[39]

d) The theory of musical forces shows that motion and various musical behaviours can be explained by the operation of these musical forces.

e) Evidence is given for the cognitive reality of musical forces in various practical and experimental sources.[40]

[39] See §2.

[40] MacAyeal (2013:126-127) argues that Larson "cannot demonstrate proof of his theory, but he shows how research in cognition supports his claims." However, the results from Larson's experiments on the perception of musical forces indicate that these forces are experienced when they operate, and that they can only be experienced if they exist.

13. Integrating Larson's Theory of Musical Forces with Other Fields of Music Study

Larson was keen to integrate his theory of musical forces with various other fields of study in music and to collaborate in an interdisciplinary way. This integration and collaboration enabled Larson to investigate the perception of how musical forces operate when they are approached from the lens of other fields of music study. It also enabled Larson to substantially support the claims of his theory of musical forces, and to develop his theory of musical forces further.

Robert Hatten (2012b) writes that Larson's work is "some of the most original and thought-provoking work in the interdisciplinary reaches of music theory." Larson's theory of musical forces was integrated with the following fields of research in music.

Diagram 2-7

The integration of Larson's theory of musical forces with other fields of music study

13.1 Melodic Expectation and Computer Models

Larson (1999; 2004) theorises about the expectations listeners have when they listen to a passage of music, and how these expectations are governed and influenced by musical forces. Larson (2004:457) writes that "[e]xperienced listeners of tonal music expect completions in which the musical forces of gravity, magnetism, and inertia control operations on alphabets in hierarchies of embellishment whose stepwise [sic] displacement of auralized traces create simple closed shapes." Larson (2004) and Larson and VanHandel (2005) compared predictions of melodic expectation by means of algorithms and computer models against experimental results of human participants. Larson and VanHandel (2004:133) write that their experiment "provides clear evidence that musical inertia and musical gravity shape listener judgments of the strength of pattern completions. It also suggests that musical magnetism may be a factor in such judgments." These computer models thus illustrate that listeners' expectations are influenced by the operation of musical forces.

Restrictions in Larson's microdomain *Seek Well*[41], which was developed to study melodic expectation, were pointed out by Nichols (2005:2): only one note sounds at a time; all notes are of the same duration; pitch is the only element that changes; and rests are not allowed. These restrictions are not only criticism for the microdomain, but also a general concern in Larson's theory of musical forces.

[41] This computer model generates different continuations for beginnings, using the theory of musical forces in order to predict the continuations. For example, if C is the tonic and the notes G-A-? are given, melodic gravity and melodic magnetism will operate in such a way that the most likely continuation will be G-A-G. This computer model was compared to experimental research on participants by William Lake (1987) at the University of Michigan.

13.2 Aural-Skills Training

Larson (1992, 1993c) writes that scale-degree functions are governed by melodic forces, and scale-degree functions can be used to teach basic aural skills. He provides various suggestions, activities, and exercises on aural-skills, based on his discussions of the operation of melodic forces and how melodic expectations are influenced by the operation of these musical forces. Larson explains that "[e]ach of the musical forces acts on notes at all times. The less stable a note, the more that note will convey to the listener the effects of these forces. The distinctive combination of these effects in a given context contributes to the expressive quality of that note in its context. This combination of felt tendencies also contributes to what we call 'scale-degree function'." (Larson, 1992:8.) The aural-skills exercises involve incomplete note patterns that students have to complete, in order to become more aware of the operation of musical forces. These exercises can be employed in the teaching of basic aural-skills (see Larson, 1992).

13.3 Music Perception

Larson (1997b) wrote a response to Joseph Straus (1987) regarding prolongation and perception. Larson (1997b:131) argued the following: 1) prolongation and embellishment is the same thing; 2) prolongation is based on limited types of transformation based on similarity and successorship; 3) debates are refocused in useful ways when we distinguish between the abstract relationship of prolongation and the perception of prolongation; 4) prolongation and the perception of prolongation are theoretical and experimental prior to them; 5) there is a connection between prolongation, the perception of prolongation, contextual stability, musical forces, melodic continuation, and key determination which ties them together in ways that are mutually reinforcing. Straus (1997) responded to Larson's (1997b) article, and highlights that Larson argued the opposite from him (Straus, 1987): "He says that prolongation is a necessary pre-condition for distinguishing between consonance and dissonance: you cannot tell what is consonant, or stable, until you see what is being prolonged..." (Straus, 1997:137). Although they have different views, Larson and Straus agree that prolongation is important to contextualise material in order to determine its consonance and dissonance.

Straus (1997:137) realised that neither was correct: Straus (1987) by suggesting an *a priori* distinction between consonance and dissonance, and Larson (1997b) by providing examples in his argument that are dependent on "special rhythmic conditions". Straus (1997:138) also argues that Larson's (1997b) belief is wrong when he asserts that consonance and dissonance, or stability and instability, are dependent on prolongation. Straus finds a balance between his own arguments and Larson's (1997b) arguments: "Stable elements are the ones most likely to be prolonged, and we can tell that they are stable because they are, in fact, prolonged." (Straus, 1997:138.) The notion of prolongation will not feature in this thesis and therefore this important aspect of the literature will not be discussed in more detail.

13.4 Learning Music Theory[42] and Composition

Larson (1994:45) suggests that an understanding of the operation of musical forces enables us to explain the rules of species counterpoint as suggested by Heinrich Schenker (1987). For example, Schenker (1987) writes that suspensions of fourth species must resolve downwards,

[42] Larson (1995) believes that musical forces play an important role in learning music. He suggests that "[m]usic learning is best when it is 'integrated' – when it combines different ways of understanding musical relationships." (Larson, 1995:76.) Larson proposes eight ways in which musical relationships can become known to us: 1) ears; 2) voice; 3) mind; 4) eyes; 5) fingers; 6) feet; 7) heart; and 8) other (Larson, 1995:76-77). Larson (1995:76) explains these ways of knowing musical relationships as follows: "Consider the structure of the major scale. One may know intellectually (mind) that the major scale has half steps between its third and fourth and between its seventh and eighth scale degrees. One may be able to recognize visually (eyes) the locations of these scale degrees in music notation. One may recognize aurally (ears) the differences between third and fourth or seventh and eighth scale degrees. One may know vocally (voice) how to sing given scale degrees on command. One may know digitally (fingers) how to play a scale or a given scale degree on the piano. And upon hearing the fourth and seventh scale degrees resolve respectively to the third and eighth, one may feel the resolution emotionally (heart). We can also know things kinesthetically (feet)."

rather than upwards, and Larson (1994:45) claims that melodic gravity helps to explain this requirement by Schenker.

Larson (1994) argues that all musical forces can be employed to explain counterpoint. He advises the following: "While I would not rule out doing reductions, I would urge teachers of strict counterpoint to find other ways of showing how examples of free composition (whether or not they obey the explicit rules of strict counterpoint) embody the musical forces of gravity, magnetism, and inertia that underlie those rules and how they exemplify ideas about expressive meaning that are implicit in Schenker's *Counterpoint*." (Larson, 1994:52.) This statement links with Larson's (1995:79) argument that it is more important to understand concepts than to learn rules. He suggests that if we understand the operation of musical forces, we will also be able to understand harmony, without memorising the rules of harmony, because he describes harmony as an "emergent property of the interaction of the musical forces generated by the individual melodic patterns that make up a musical texture." (Larson, 1995:82.) However, given the fact that Larson's discussions neglect the vertical dimension – as argued above – one cannot take this assertion as true. The learning of harmony and counterpoint is likely much too complex to be a simple outcome of the understanding of musical forces.

13.5 Jazz Music

The operation of musical forces and musical expectation were analysed in Jazz melodies (Larson, 2002) of Bill Evans, Toshiko Akiyoshi, and Charlie Parker. Larson (1999) also used his theory of musical forces to explain the concept of swing in Jazz music, and explain meaning in Jazz compositions.

13.6 Musical Gestures

The theory of musical forces was used to explain the shaping of musical gestures. Larson (2006a:62) writes that "[j]ust as every physical gesture derives its character in part from the ways in which it moves with respect to physical forces, so every musical gesture derives its character in part from the ways in which it moves with respect to musical forces." Larson (2006a) does not clarify his understanding of 'musical gestures', a term used in a vast array of contexts (Hatten, 2004:93) and fields of research in music (see Gritten & King, 2006 and Gritten & King, 2011). It is, however, clear that Larson does not refer to physical gestures but to salient sound patterns that are shaped by the operation of musical forces. Larson (2012:145) writes that his conditions for considering a motion as a gesture are that a motion should have a beginning, a middle, and an end that are shaped by the operation of musical forces.

13.7 Meaning in Music

Larson (2012) employs the theory of melodic forces in order to define meaning in the music that he discusses. Larson does not devote a chapter in *Musical Forces* to discussions of meaning in music, but he discusses how the metaphorical understanding of the operation of the musical forces enhances and supports our understanding of the meaning of the music. BaileyShea (2012) also employed the theory of musical forces in order to define meaning in Mahler's *Nun will die Sonn' so hell aufgeh'n*. Oliveira (2013) employed Larson's theory of musical forces to create a musical system for emotional expression.

14. Larson's Theory of Musical Forces in Music Analysis

Larson (2012:180) argues that "[b]ecause the theory of musical forces illuminates such fundamental aspects of music, it offers a powerful tool for music analysis."[43] Larson makes a valid claim by stating that his theory of musical forces offers a powerful tool for music analysis. However, he uses analyses only to illustrate his theory of musical forces and not as an analytical tool for musical analysis (Larson, 2012:180). He does acknowledge that in order to "show the real value of such an analytic approach would require another book" – a sequel Larson intended to follow *Musical Forces*. Hatten (2012b) writes that Larson's "metaphorical application of physical forces to explain continuities in melodic and rhythmic patterning is one of his signature contributions to the field of music theory" and BaileyShea (2012) writes that "Steve Larson's theory of musical forces offers a powerful framework for analyzing music". However, the only substantial analyses that I am aware of where Larson's theory of musical forces is employed as an analytic tool are Van der Merwe (2010), Meyer (2012a, 2012b; 2014), BaileyShea (2012), Holmquest (2014), Roy (2015), Keesecker (2016), and Marshall (2016). Hatten (2015) also analysed music by Johann Sebastian Bach, Joseph Haydn, Wolfgang Amadeus Mozart, Ludwig van Beethoven, and Frédéric Chopin using an integrative approach of Larson's melodic forces and his own theory of agential energies. However, Hatten's analyses rest on a vaster foundation than the one provided by Larson's ideas, and cannot be considered applications or illustrations of Larson's ideas.

[43] Larson (2012:180) mentions that it might be better to say that motion, meaning, and metaphor can be illuminated when Schenkerian analysis is supported by the theory of musical forces.

Although references to musical forces are found in various existing analyses, the theory of musical forces has not yet found a significant place in mainstream music analysis for the following reasons.

- Larson's theory of musical forces was presented at conferences and published in articles as work in progress and was continuously developing.
- Larson challenged his theory and was continuously seeking for evidence of the operation of musical forces in order to substantiate his theory.
- Analysis was only done on simple melodies in order to illustrate the theory of musical forces, and not presented as analyses of substantial compositions.
- The operation of musical forces is limited to isolated musical elements such as pitches of similar duration, and does not reflect the integration of multiple musical elements.
- Misunderstandings of physical forces, disagreements on Larson's metaphors of musical forces, and debates regarding terminology to describe musical forces and their operation were evident among researchers.

Elizabeth Margulis (2013:427) highlights in her review of *Musical Forces* that Larson limits the scope of his theory to melody, but that melody is important − also for analysis − because it deals with listeners' perception: "His account focuses on the dimension of music that is perhaps least commonly investigated by theorists but most saliently engaged with by listeners: melody." Margulis's comment is important for an integrated approach of perceptual music analysis, but it remains clear that other musical elements cannot be omitted completely. This argument becomes clear when one understands that melodies are not simply patterns of pitches, nor are they simply patterns of pitches and rhythms.

15. Criticism of Larson's Theory of Musical Forces (2012)

Musical Forces was reviewed by Graybill (2012), Cox (2013), MacAyeal (2013), and Margulis (2013). The majority of the reviews of *Musical Forces* are summaries of the book, but Cox (2013) provided constructive and detailed criticism in his review that is valuable for this study. Therefore, I will focus on Cox's review and highlight some of his criticism here.

15.1 Review by Cox (2013)

Arnie Cox (2013), a prominent researcher in music perception and musical gestures, wrote a critical review of Steve Larson's book *Musical Forces*. Cox (2013) writes that he has two fundamental concerns with Larson's writings, which form the basis of his review: "I do have a fundamental concern with the overall approach to metaphoric reasoning and the role of embodiment in the construction of meaning. I also have more specific concerns with the notion of musical magnetism and the repertoire to which Larson applies the theory of musical forces." I will discuss Cox's concerns with Larson's metaphoric understanding of melodic magnetism and Larson's choice of repertoire below.

15.2 The Metaphoric Understanding of Melodic Magnetism

Cox's (2013) comments on the metaphoric understanding of melodic magnetism and Larson's bipartite definition of musical magnetism. Regarding the first part of Larson's definition of musical magnetism – "...the tendency of an unstable note to move to the closest stable pitch" – Cox (2013) asserts that "[i]n everyday life we do not experience literal magnetism at the same level that we experience gravity and inertia". Cox is of the opinion that magnetism is an apt analogy for the behaviour of tones because we rarely experience objects behaving under the force of magnetism. He is of the opinion that we experience gravity and inertia "first-hand and at a more salient level in the source domain of actual motion". (Cox, 2013.)

Regarding Larson's second part of the definition of musical magnetism – "a tendency that grows stronger as we get closer to [a] goal" – Cox (2013) perceives it as "an attempt to align magnetism with the other forces". He writes that 'magnetism' is already metaphoric in the source domain and that melodic magnetism is thus not metaphoric. This issue also arose in cross-domain mappings of the three forces.

Cox (2013) concludes this part of his review by writing: "Because the logic of musical 'magnetism' is only partly analyzed, this component of the theory raises the question of what it adds to our understanding beyond what others have written previously and what many listeners already intuit." Cox's statement about magnetism relates to various other aspects of Larson's theory of musical forces that are intuited by listeners, described earlier as the aura of invisibility. Although it is true that listeners intuit aspects of Larson's theory of musical forces, Larson's theory enables us to think critically about the phenomena we hear by means of a clear theoretical framework.

15.3 Larson's Choice of Repertoire

Larson's choice of repertoire is also discussed in Cox's review. Cox (2013) is concerned about the fact that Larson applies his theory of musical forces only to tonal music and that no examples of pre-tonal or post-tonal music are used.[44] Although he mentions that Larson wrote about his intentions to write another book on analysis, Cox (2013) holds the opinion that Larson "missed the opportunity to demonstrate how it might apply, or not apply, to the music of, say Palestrina and Byrd in one direction, and Bartók, Oliveros, or Feldman in another direction. It would not have taken more than a few pages to at least indicate some of the issues involved in applying the theory; and whether it applies well or less well, this would tell us something about meaning construction in the various practices." Although Larson did not demonstrate how his theory of musical forces can be applied to Renaissance music, as suggested by Cox (2013), the use of his theory in early Renaissance music was demonstrated by Heather Holmquest (2015) in her doctoral dissertation *Structure, musical forces, and musica ficta in fourtheenth-century monophonic songs*.

This short discussion by Cox (2013) is an important motivation for my study because it highlights one of the central issues of the research problem of this project: the "limited scope" of Larson's theory of musical forces. However, the limited scope that I refer to is not only the use of pre-tonal, post-tonal, or atonal music, but also the simplicity of the repertoire of the music that Larson uses to illustrated his theory of musical forces.

[44] Larson (2012:180) writes that his chapter on musical analyses "is not intended as a thorough introduction to [Schenkerian] analysis [supported by the theory of musical forces]. To show the real value of such an analytic approach would require another book (and, in fact, I plan a sequel to this volume with that purpose)." Cox (2013) also mentions this and writes that "in that project perhaps he might have included some examples of pre-tonal and post-tonal music."

16. **Expansions of Larson's Theory of Musical Forces**

Larson (2012:316) wrote "I do not claim that musical forces have the same universality or 'natural' status that physical forces do, nor do I claim that these metaphors shape the music of all cultures or shape musical experience in the same way in every culture." He acknowledged that "musical forces do not completely explain musical experience" (Larson, 2012:315) and he provides further avenues for research in the field of musical forces (Larson, 2012:311-322). Larson was thus aware that expansions of and additions to his theory of musical forces are possible. He wrote: "I have been working with the idea of musical forces for more than twenty years and keep running into new ideas" (Larson, 2012:320). In those more than twenty years, Larson made significant additions to his theory of musical forces, but in that amount of time it was not possible to cover every aspect of his theory. The theory of musical forces, as presented by Larson in his last work, offered an impetus for other theorists to continue where he left off.

Notable theorists who expanded on Larson's theory of musical forces are Robert Hatten (2012b), Matthew BaileyShea (2012), John Peterson (2014) and Elizabeth Lee (2014). Of these four theorists, I consider the work by Robert Hatten (2012b) as the most applicable expansion for this study. I will thus explain and discuss Hatten's expansion of Larson's theory of musical forces in detail and provide a brief overview of the other theorists' work.

16.1 Robert Hatten's Expansion of Larson's Theory of Musical Forces

Robert Hatten was a friend and collaborative associate of Steve Larson. Hatten conjectured relationships between his own theory of gestural agencies and Larson's theory of musical forces. Hatten presented these speculations as an expansion of Larson's theory to honour Larson and his work (Hatten, 2012b).

Hatten's expansion of Larson's theory of musical forces includes the addition of energy, momentum, friction, repulsion, and impact. This will be discussed below. Graybill (2012:116) criticised Larson's theory of musical forces and mentions that "[An] aspect of Larson's model that lends itself to further exploration is the role of musical agency." This indicates that Hatten was not the only theorist to see the potential in expanding Larson's ideas.

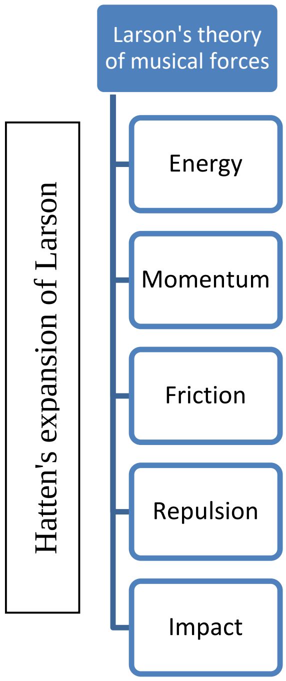
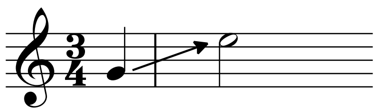


Diagram 2-8

Hatten's expansion of Larson's theory of musical forces

16.1.1 Energy

Hatten (2012b) observed that "[m]elodies exhibit at least some degree of freedom" and that it is possible that a melody does not give in to any of Larson's musical forces. He uses an example of an upward leap at the beginning of a tonal melody, where all three musical forces are counteracted.[45] In this case the leap requires additional energy and that energy is not provided by Larson's three musical forces.



Example 2-21
An upward leap at the beginning of a melody

Hatten (2012b) suggests that energy is provided by an agent that can counteract the musical forces of musical gravity, musical magnetism, and musical inertia: "[W]e are invited to infer an agent – not only embodied but able-bodied, and capable of generating what might be called initiatory energy – the hitherto-unaccounted force necessary to overcome the inertial stasis of the first pitch, the gravitational pull that would press that pitch downward, and the magnetism that would exert it to move instead by step (not by leap) in whichever direction was closest or most stable." (Hatten, 2012b.) When energy is provided by an agent, as Hatten (2012b) suggests, the energy counteracts the musical forces, but can also subsequently yield to them.

[45] Larson (2012:315) agrees when he writes that he does not "claim that music always gives in to musical forces" and then refers to Hatten's theory of musical gestures and agential energies.

16.1.2 Momentum

Hatten (2012b) writes that musical momentum implies a source of energy − not provided by Larson's musical forces − that can overcome inertial stasis. He asserts that "[i]t is only after having achieved momentum that an unimpeded continuation of consistent motion (by step or arpeggiation) can reflect an analogue to the physical law of inertia, which is simply the tendency of a given state (whether moving or stationary) to persist." (Hatten, 2012b.) Hatten (2012b) refers back to the physical understanding of inertia and states that inertia does not generate its own energy, and thus the energy that creates momentum should be supplied by an agent. He uses the term 'implicative momentum' when continuous energy is supplied for pattern continuation, but also observes that momentum can be attenuated or lost when less or no energy is supplied (Hatten, 2012b).

Example 2-22

Segment from Beethoven String Quartet in B-flat major, Op. 130, Third Movement (Hatten, 2012b)

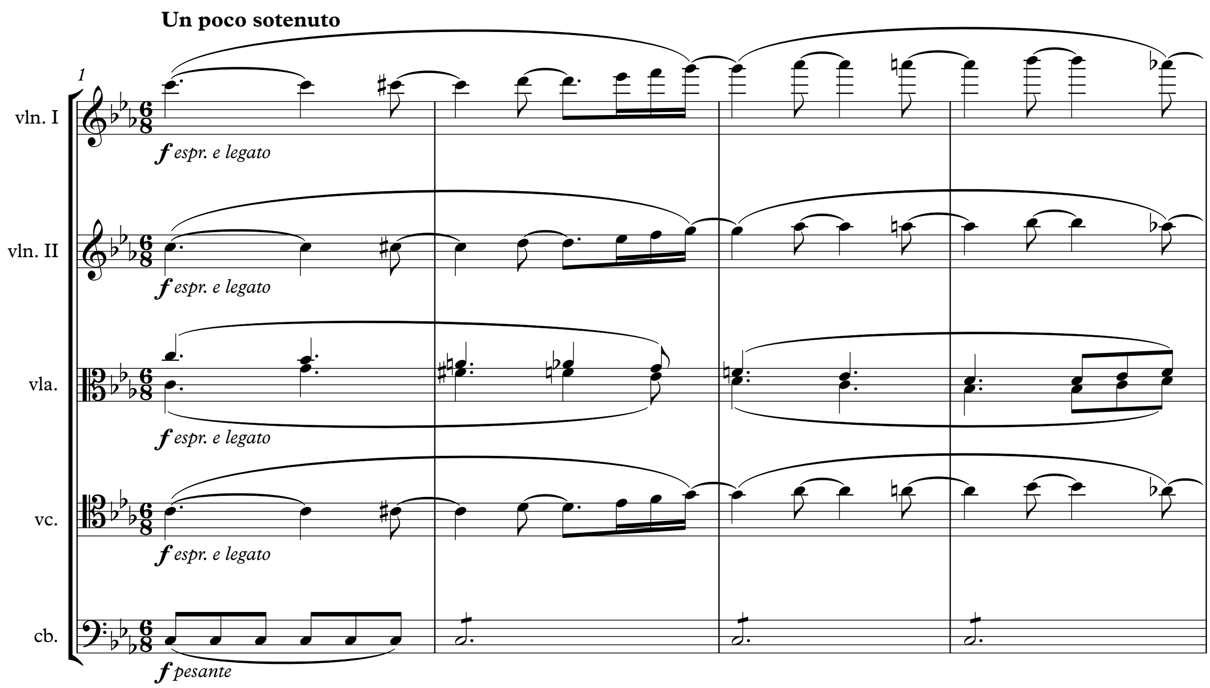
Hatten (2012b) uses this segment from Beethoven's String Quartet in B-flat major, Op. 130, to illustrate a "winding down" of energy.

16.1.3 Friction

In order to illustrate friction in music, Hatten (2012b) uses an example of a melody that moves away from a stable tone like the tonic.[46] The tonic does not cause friction between itself and the unstable tone to constrain the movement of the melody. However, if the stable tone is heard as a pedal point or a drone, friction will exist between the stable tone and the unstable tone that can impede the motion of the music.

Hatten (2012b) writes that such "ongoing stasis might be interpreted as creating a drag anchor effect on the rising melodic line, which must invest extra agential energy in order not only to climb, but now to *struggle* upward." He also believes that friction and gravity can be overcome when additional energy is provided by means of increased dynamics (Hatten, 2012b). A pedal point or drone can also be perceived as an agent with an "opposing agential force", because it continues to pull tones down.

[46] Larson (2012:320) writes the he "never thought about 'musical friction' before William Rothstein's (2005) recent and elegant essay on a Chopin Prélude discussed tempo rubato in terms of motions such as slipping off a log or travelling through viscous fluids and Robert Hatten (2004:116) suggested its addition to the other forces I describe." Friction is also discussed in visual perception (Hubbard, 1995; 1998).



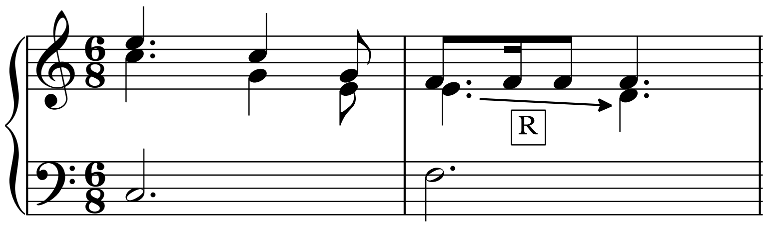
Example 2-23

Segment from opening theme of Brahms's First Symphony

Hatten (2012b) uses the opening theme of Brahms's First Symphony to illustrate how friction operates as an opposing agential force. In this example the rising theme plays off against a pedal point.

16.1.4 Repulsion

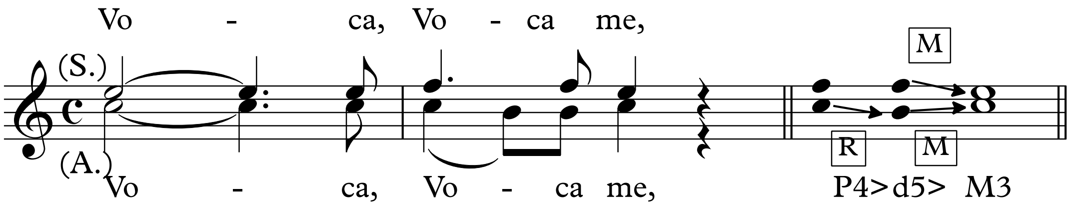
Larson (2012:95) writes that "[m]agnets (if you reverse the poles) can also repel each other". Hatten (2012b) accepts musical magnetism as a musical force and states that attraction exists because of a magnetic pull, but when repulsion is considered you require two magnets to repel each other. Two agents are thus present. Hatten (2012b) also observed that, unlike attracting magnetism, repulsion is not affected by distance.



Example 2-24

Hatten's (2012b) example of repulsion as contra-magnetic force

In this example repulsion is generated by a contrapuntal dissonance: the E in the second voice is repelled downwards to a D (indicated with 'R' in the example).



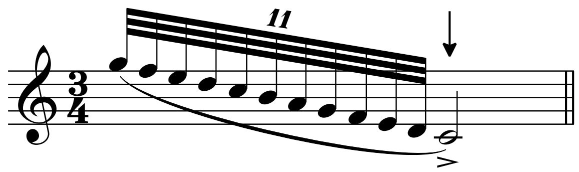
Example 2-25

Confutatis *from Mozart's* Requiem *(Hatten, 2012b)*

A short segment from Mozart's *Requiem*, *Confutatis* movement, is shown here and followed by a reduction of the soprano (S.) and the alto (A.) voices. In this example repulsion exists in a perfect 4th interval (indicated 'P4' in the example) because of the voice leading and the harmonic implication because of the D in the bass, and consequently resolves to a diminished 5th interval (indicated 'd5' in the example). Repulsion is indicated with 'R' in the example. The diminished 5th interval has further magnetic tendencies to resolve to a major 3rd interval (indicated 'M3' in the example).

16.1.5 Impact

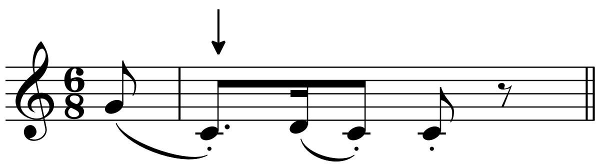
Hatten (2012b) considered a descending motion, governed by musical gravity and sustained agential momentum, and writes that such a motion will result in an impact on the stable platform. Hatten identified three relative rigidities of platforms: a hardened platform that will result in a 'bounce' or a 'splat' (see Example 2-26); a soft platform that will result in a 'rebound' or 'reverberation' (see Example 2-27); or a permeable platform (see Example 2-28).



Example 2-26

A hardened platform (Hatten, 2012b)

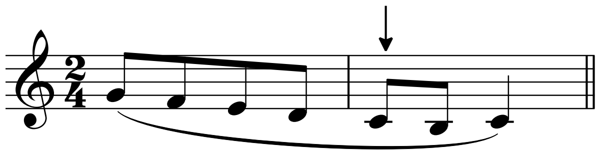
A hardened platform will result in a hard 'bounce' or 'splat' which is the case in this example. The 'splat' on the hardened platform is indicated with an arrow.



Example 2-27

A soft platform (Hatten, 2012b)

A soft platform will result in a gentle 'reverberation' or 'rebound' which is the case in this example. The 'rebound' on the soft platform starts at the arrow sign.

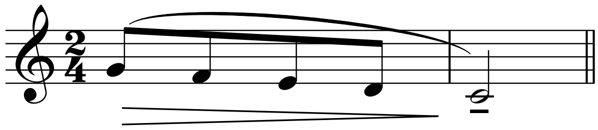


Example 2-28

A permeable platform (Hatten, 2012b)

A permeable platform will result in a descent that can pass through the platform and return to the platform again. The arrival on the platform is indicated by the arrow sign, after which the platform is 'penetrated'.

Hatten (2012b) also suggests that agential intervention is possible to brake momentum and include decrescendo (see Example 2-29), ritardando (see Example 2-30), a durational expansion (see Example 2-31), motivic liquidation (see Example 2-32), ornaments[47] (see Example 2-33), and hemiolas.

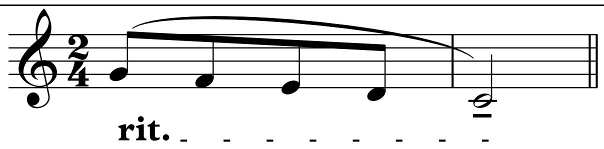


Example 2-29

Breaking momentum by means of decrescendo (Hatten, 2012b)

The momentum of the descent is braked by the agential intervention of a decrescendo. The arrival on the C is thus not a 'bounce' or a 'splat' on the hardened platform, because it approaches the platform softly.

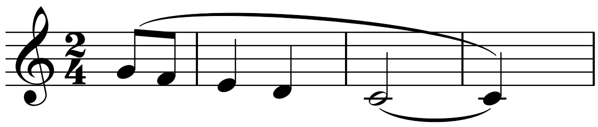
[47] Hatten (2012b) specifically mentions anticipation.



Example 2-30

Breaking momentum by means of ritardando (Hatten, 2012b)

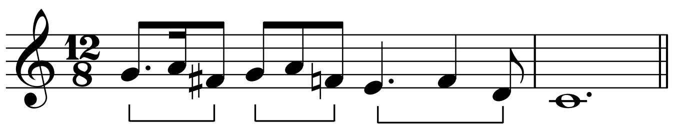
The momentum of the descent is braked by the agential intervention of a ritardando. The arrival on the C is again thus not a 'bounce' or a 'splat' on the hardened platform, because it approaches the platform slowly.



Example 2-31

Breaking momentum by means of durational expansion or written-out ritardando (Hatten, 2012b)

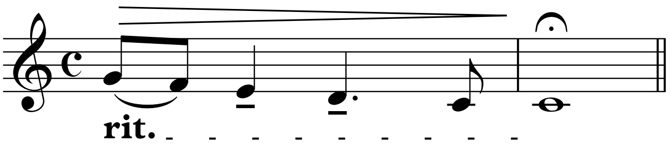
The momentum of the descent is braked by the agential intervention of a written-out ritardando. Once again, the arrival on the C is thus not a 'bounce' or a 'splat' on the hardened platform, because it approaches the platform slowly.



Example 2-32

Breaking momentum by means of motivic liquidation (Hatten, 2012b)

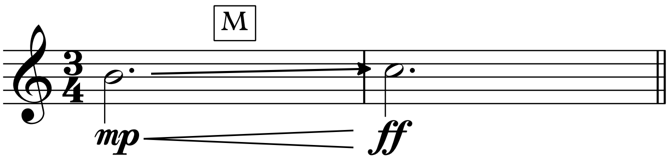
The motifs are indicated with a bracket in this example; each motif liquidated or slowed down to approach the platform slowly because it lost momentum in each statement of the motif.



Example 2-33

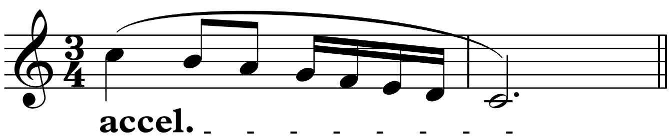
Breaking momentum by means of anticipation (Hatten, 2012b)

Hatten (2012b) writes that environmental forces can also be intensified or enhanced by agents. He provides two examples where environmental forces can be intensified or enhanced: crescendo supporting a strong magnetic pull (see Example 2-34) and accelerando to increase momentum (see Example 2-35).



Example 2-34

Crescendo as an agential intensification of magnetism (Hatten, 2012b)



Example 2-35

Accelerando as an agential intensification of momentum (Hatten, 2012b)

Although Hatten's work provides insight into the after-effect of impact, his view on platforms are debatable because the impact is not only determined by the platform but also by the object. A soft object, for example, can have a soft landing on a hard platform. In spite of this, I will keep Hatten's terms and ideas to expand my work on Larson's theory in the remainder of this thesis.

16.1.6 Conclusion

Hatten contributed significantly to music theory with his theories of musical gestures and agential energies. In his later works, Hatten often cited Larson and made valuable connections between his own research and Larson's theory of musical forces.

Hatten's (2012b) expansion – and in some cases merely elucidation – of Larson's theory of musical forces enables scholars of musical forces to explain movement in music that cannot be explained by Larson's musical forces. His expansion also created various opportunities for further research in the field of musical forces. In my own research, Hatten's ideas played a progressively more important role, as will become clearer in the rest of this thesis.

16.2 Matthew BaileyShea's Expansion of Larson's Theory of Musical Forces

Matthew BaileyShea (2012) shed new light on musical forces and interpretation, using Gustav Mahler's *Nun will die Sonn' so hell aufgeh'n* as exemplar. He builds his arguments on Hatten's expansion of Larson's musical forces, discussed above, and includes agential energies in his discussions. BaileyShea's expansion of Larson's theory of musical forces is not as theoretically grounded as that of Hatten, and can be seen as a reflection of aspects that are unclear when the theory is applied in music analysis.

BaileyShea emphasizes two binaries, namely passive motion in music versus active motion in music and the metaphorical experience of push versus pull in music.

16.2.1 Passive and Active Approaches to Motion in Music

BaileyShea (2012) identified a dichotomy between passive motion and active motion in music of which Larson's and Hatten's positions are in opposition:

- Larson has a **passive** approach to musical motion through his understanding of musical motion as determined by gravity, magnetism, and inertia. BaileyShea (2012) explains passive motion as "music [that] moves without volition, unfolding as a chain reaction of physical forces like dominoes set in action."
- Hatten has an **active** approach to musical motion through his understanding of musical motion as determined by musical agents that are affected by gravity, magnetism, and inertia. BaileyShea (2012) explains active motion as music with "musical agents operating intentionally in an unfolding drama" and that the music is "unpredictable, fully dependent on an agent's actions".

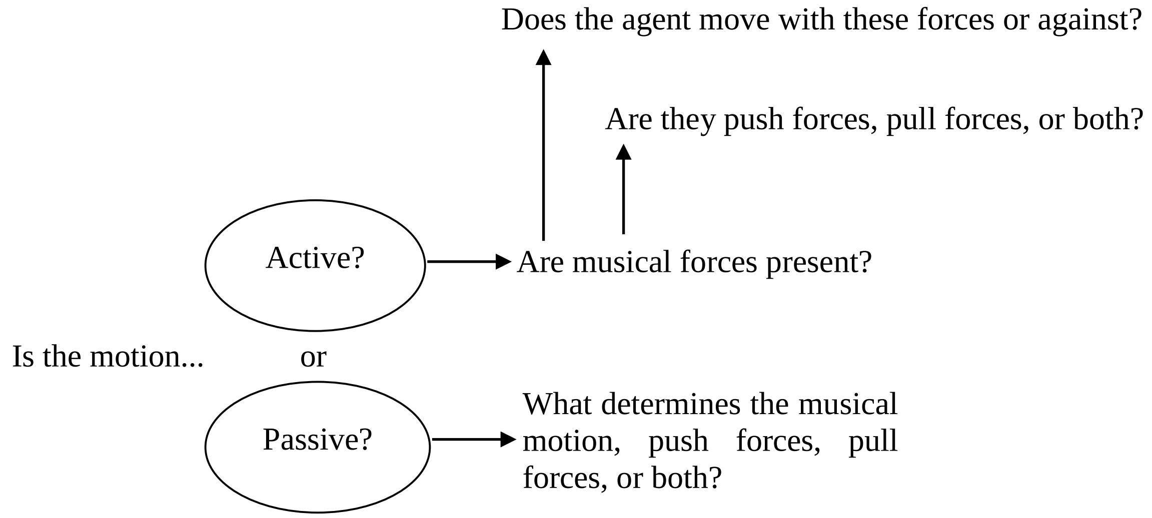


Diagram 2-9

BaileyShea's (2012) approach to motion in music

BaileyShea stresses that it is important to note that the theory of musical forces allows for both a passive and an active approach to musical motion.

16.2.2 Three Categories of Musical Forces

BaileyShea (2012) identified three categories of musical forces that he believes "help to explain the scope and potential of musical forces in analysis". He summarizes these three categories of musical forces as follows:

- Field forces: Examples of field forces include gravity and magnetism (BaileyShea, 2012).[48]
- Agential forces: These can be ascribed to pieces, themes, and pitches, among others. BaileyShea (2012) mentions that a variety of musical parameters like tempo, timbre, dynamics, and range affect agential forces.
- Elemental forces: Examples of elemental forces include wind and waves. BaileyShea (2012) sees this category as a combination of field forces and agential forces, therefore this category "combines the unpredictable movement of agential forces, but it attributes such movement to non-sentient aspects of the environment".

BaileyShea (2012) acknowledges that these categories complicate the virtual environments of music that consists of various moving parts, and they offer further metaphorical possibilities in musical motion.

[48] BaileyShea (2012) observed that listeners first perceive push and pull in music, before more descriptive metaphors are ascribed to motion in music. He also notes that the push and pull binary can also arise in other categories.

16.2.3 BaileyShea's Analysis of Mahler

BaileyShea's (2012) analysis of Mahler's *Nun will die Sonn' so hell aufgeh'n* entails a mixed approach of passive and active motion, and he uses both musical forces and agential energies to explain the motion and the meaning of the music. Using short segments of Mahler's composition, BaileyShea (2012) demonstrates an analytical approach to music when working from the perspective of musical forces and found that "Larson's theory of musical forces offers a crucial starting point, especially when interpreted in conjunction with agency". In this statement, BaileyShea hints at an integrative approach between Larson's theory of musical forces and Hatten's agency in order to analyse and discuss music. In the course of my research, BaileyShea's contention became an integral part of my work on musical forces.

16.2.4 Conclusion

BaileyShea (2012) made important contributions to the field of musical forces and agential energies by means of clarifications, challenging existing theories, categorising forces, and analysis of music using musical forces and agential energies. The distinctions that he makes between active and passive forces and between the three categories of forces clarify some aspects of the literature. In his conclusion he reiterates Larson's (1997:57) suggestion to not only think about music, but to think in music. BaileyShea (2012) considers this to be the core of Larson's theory and an enduring insight.

16.3 John Peterson's Expansion of Larson's Theory of Musical Forces

John Peterson (2014) further expanded Hatten's research on musical agency in his thesis *Intentional Actions: A Theory of Musical Agency*. A valuable contribution by Peterson in terms of Larson's theory of musical forces is that he positioned musical forces in his work on musical agency, suggesting that musical agencies operate in musical forces, among others. Peterson (2014) aimed to answer the following research questions:

- How do virtual agents emerge in music?
- What is the relationship between agency and narrative?
- Can virtual agents influence music at levels deeper than the surface?

Although Peterson (2014) expands on Hatten's research, he implies Larson's theory of musical forces also. Peterson's analyses, using Larson's theory of musical forces and Hatten's theory of agential energies, are the most substantial analyses that I am aware of in this field. He analyses music of Ludwig van Beethoven, Felix Mendelssohn, Wolfgang Amadeus Mozart and Franz Schubert.

16.3.1 Peterson's six Categories of Intentionality

Peterson (2014:49-99, 241) states that he identified six categories of intentionality where agents influence music: gesture, contradiction of musical forces, unexpected event, change of state, conflict, and repetition or restatement. In instances where musical forces are contradicted, the musical motion is determined by agents. This is an important insight that progressively played a larger role in my own understanding of Larson's ideas.

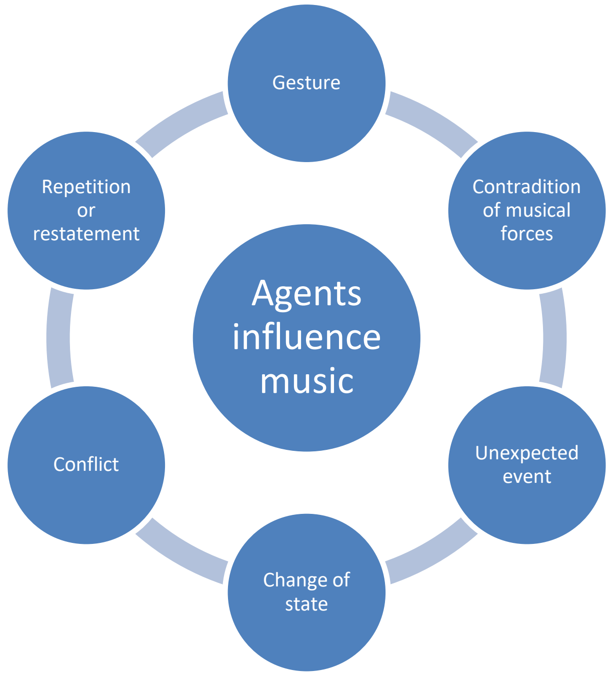


Diagram 2-10

Peterson's (2014) categories of intentionality where agents influence music

16.3.2 Conclusion

Peterson (2014) does not expand Larson's theory of musical forces as such, but his work makes an important contribution to the field of musical agency and he considers musical forces as a fundamental part for the operation of musical agents. In my own work, the notion of agency provided a way to structure interpretations of my observations, as I will show in later chapters.

16.4 Elizabeth Lee's Expansion of Larson's Theory of Musical Forces

Elizabeth Lee worked with Larson's theory of musical forces for her PhD study on patterns, containment and meaning in the *Mörike-Lieder* by Hugo Wolf. Lee (2014:59) realised the potential of expanding Larson's theory of musical forces and aimed to expand his theory in her dissertation. However, Lee (2014) is similar to Hatten (2012b) and does not add any new insights on the theory of musical forces. For reference purposes I include a summary of Lee's (2014) expansion of Larson's theory of musical forces in Addendum H.

17. Conclusion

In this section I will discuss Hatten's integrative approach to music analysis and highlight the areas where I will expand the theory of musical forces.

17.1 Hatten's Integrative Approach to Music Analysis

Larson's theory of musical forces was not only ground breaking research in various fields of music research, but also led in expansions of his ideas and still provides a vast array of possibilities for further research in music semiotics, music perception, music cognition, music analysis, music performance, and music composition, among others. Hatten (2012b) is the most prominent researcher and theorist of those who expanded Larson's theory of musical forces. Later Hatten (2015) suggested an integrative approach of Larson's theory of musical forces and his own research of agential energies (Hatten, 2004).

Although Hatten (2015) only applies his integrative approach in his article without giving it in a systematic way, the theoretical basis for this approach can be deducted from his expansion of Larson's theory of musical forces (Hatten, 2012b). I will summarise my interpretation of such an integrative approach of both Larson and Hatten in Diagram 2-11.

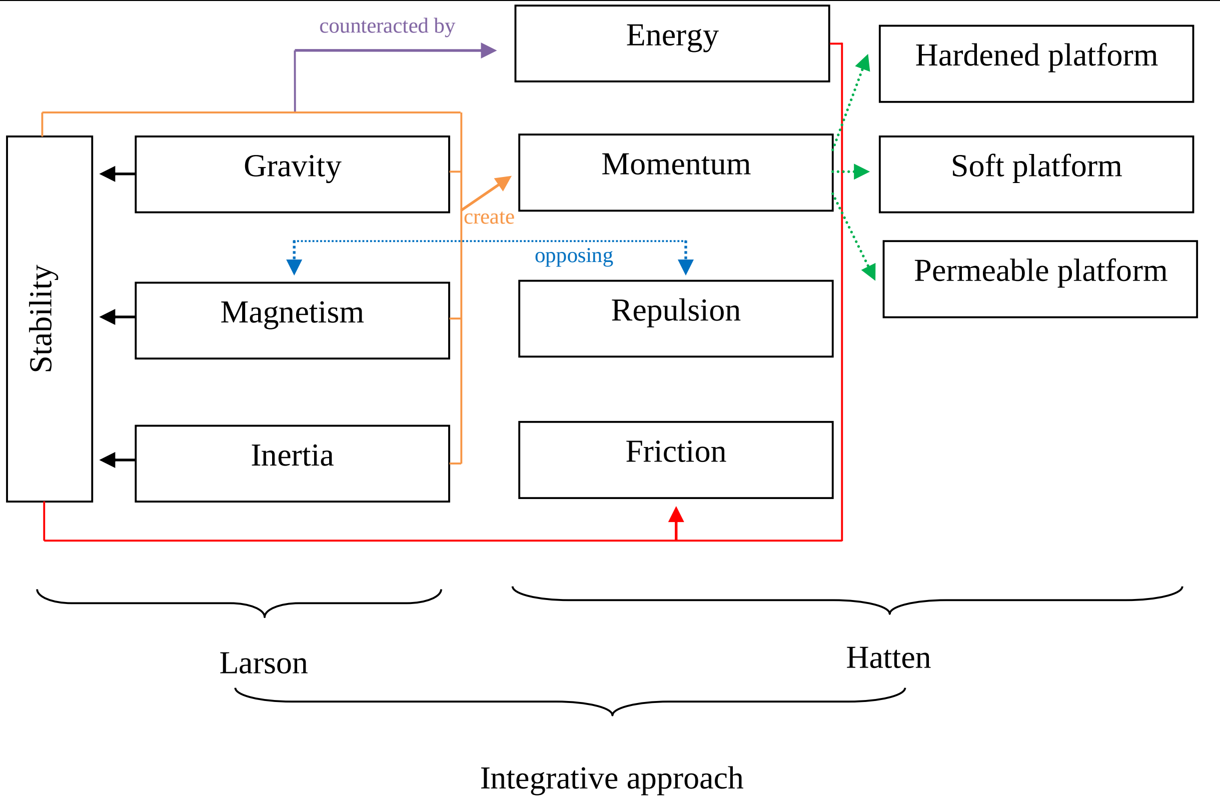


Diagram 2-11

An integrative approach that includes Larson and Hatten

The left-hand side of the diagram shows Larson's theory of musical forces: stability, gravity, magnetism, and inertia. The right-hand side of the diagram shows Hatten's expansion of Larson's theory of musical forces by means of his theory of agential energies: energy, momentum, repulsion, and friction. Larson and Hatten's theories are connected with coloured arrows. It is important to note that these arrows are merely for illustrative purposes and do not indicate relationships, processes or the operation of these forces and agents.

Larson's theory of musical forces includes stability, gravity, magnetism, and inertia. Magnetism is the only one of these three musical forces that is directly in contrast with one of Hatten's agents: repulsion. Larson's theory of musical forces states that magnetism forces an unstable tone to resolve to a stable tone. Hatten, on the other hand, added the possibility that a tone can be repelled by a stable platform.

In an instance where musical motion cannot be explained by any of Larson's musical forces, because all the forces are counteracted, that musical motion might be explained by Hatten's agential energy. This agential energy provides the tone with the energy to counteract all Larson's musical forces and to have a free will, rather than being governed by Larson's musical forces.

Each of Larson's musical forces, or any combination thereof, can create momentum as it moves towards the stable platform. This momentum, added by Hatten, supports the movement of the music towards the stable platform and can then reach a hardened platform, a soft platform or a permeable platform as suggested by Hatten.

If the music moves away from the stable platform, its movement is likely to be ascribed to Hatten's agential energy because the movement is not governed by Larson's musical forces. Hatten asserts that such movement creates friction.

The integrative approach that includes both Larson and Hatten can be a valuable tool for music analysis and research in musical motion. Although my focus in this thesis will be on the expansion of Larson, I will not exclude Hatten, but focus more on Larson.

17.2 Expansion of Larson's Theory of Musical Forces: Amplification of Musical Forces

My expansion of Larson's theory of musical forces will show how Larson's three melodic forces – melodic gravity, melodic magnetism, and musical inertia – can be amplified when orchestrated. In order to expand Larson's theory of musical forces, I will analyse Wim Henderickx's *Raga I* and *Raga III* and compare these analyses to show how musical forces are amplified when orchestrated. My research procedures will be discussed in the next chapter of this thesis.

CHAPTER 3

Research Procedures

This research project is a multiple instrumental case study. In this chapter I discuss how the different versions of Wim Henderickx's *Raga I* and *Raga III* were divided into three cases for the purpose of this research project and I describe the analytical procedures that were followed when the different versions were analysed and compared.

1. <u>Introduction</u>

My motivations for the research design and research approach of this project are presented in Chapter 1, §4.1. Although I motivate there why a case study is suitable for this research project, it might still seem an unconventional choice when music analytical procedures are employed. In spite of possible objections, a case study was deemed suitable for this research project, as is motivated in Chapter 1. In addition to these reasons, I can also motivate my use of a case study approach by referring to aspects of the research process. Firstly, some versions of *Raga I* and *Raga III* could be grouped together meaningfully to form the three cases. Secondly, proceeding with my research as a case study enabled me to discuss other factors – that are not strictly music-analytical – in order to improve the depth of this research project. It is clear from literature on research methodology that a case study is one of the approaches that allows the researcher to integrate different kinds of information coming from a variety of sources.

2. Demarcation of Cases

In order to group the different versions of the two compositions into three cases, a process of categorising the versions in different ways had to be followed. The different versions of Wim Henderickx's *Raga I* (percussion and two pianos; percussion and orchestra; percussion solo; and percussion and concert band) and *Raga III* (viola and large orchestra; viola solo; viola solo and electronics; viola and smaller orchestra) were arranged into groups according to the compositional approach followed to create each version. From this arrangement into groups, four classes were identified in which each version of each composition, except the original versions, could be placed as a token of a class. In this way, these versions were classified in terms of their relation to the original version. The four classes are as follows:

- Expanded for orchestra
- Reduced for solo instrument
- Reduced for orchestra
- Rewritten or adapted for other instrumentation

The different classes and the placement of the different versions in these classes are shown in Diagram 3-1. *Raga I* for percussion and two pianos (original version) was expanded for orchestra, reduced for solo instrument, and orchestrated for other instrumentation. *Raga III* for viola and large orchestra (original version) was reduced for smaller orchestra, reduced for viola solo, and also for viola solo and electronics.

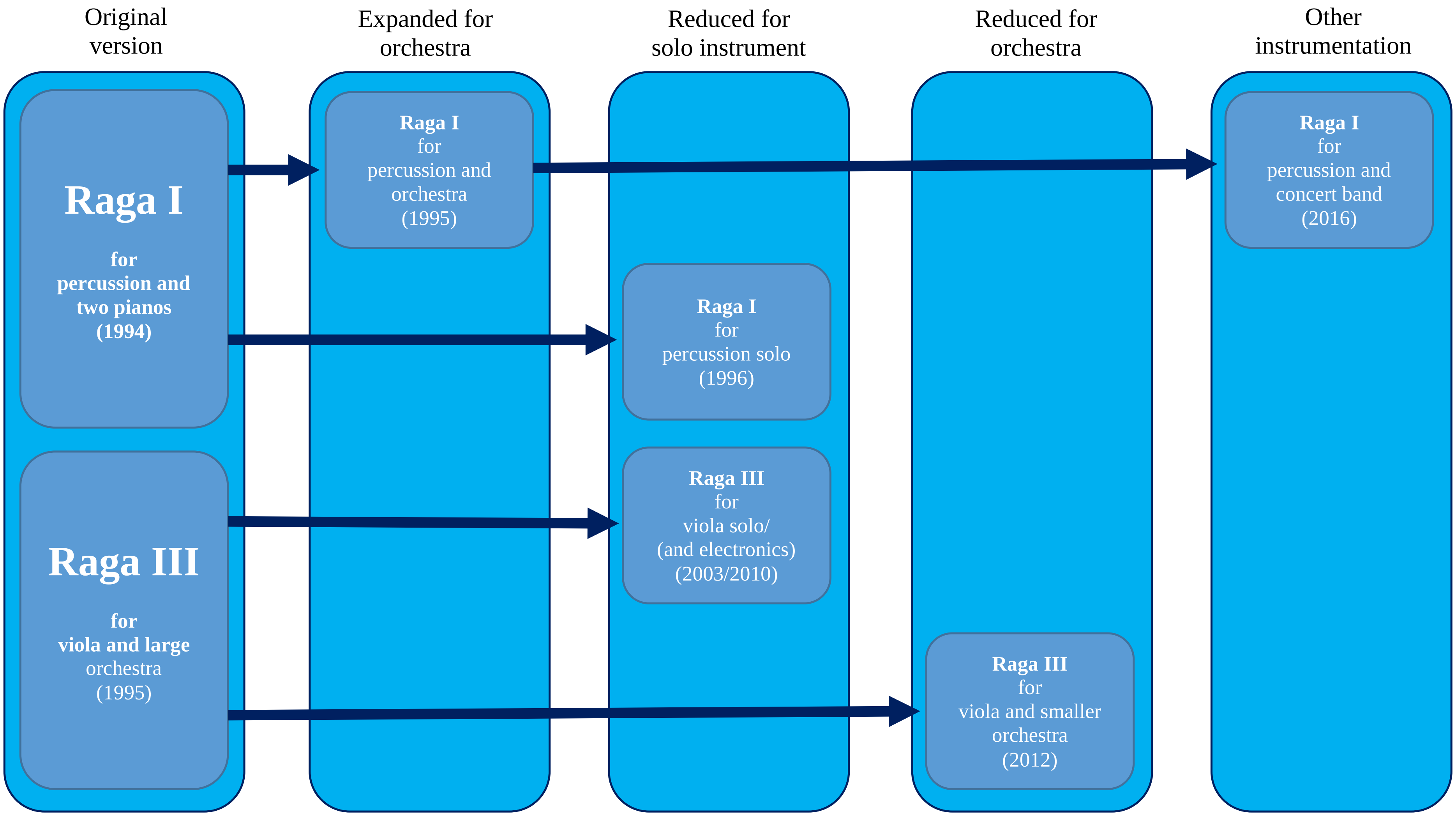


Diagram 3-1

The compositional processes followed to create the different versions of Wim Henderickx's Raga I *and* Raga III

This diagram provides an overview of the compositional processes followed to create the different versions of Wim Henderickx's *Raga I* and *Raga III*. The classification in terms of compositional process enabled me to group the different versions into three cases according to similarities in the compositional processes followed. I chose to investigate all three of these cases for this research.

The different versions of Wim Henderickx's *Raga I* and *Raga III* can be divided into three cases. Two cases are key cases and one case is a local knowledge case. Key cases are cases that are an inherent part of the research project. Local knowledge cases are cases that deal with aspects of which parts are already known to some scholars, and do not need to be investigated in the same way as the key cases (Thomas & Myers, 2015:56-57).

- Case 1 (key case): *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra. These two works are the only two works in which the compositional approach from the original to another version is expansion: the original version is a chamber music composition that was then orchestrated for an orchestra.
- Case 2 (local knowledge case, bridge between the two key cases): *Raga I* for percussion and orchestra; *Raga I* for percussion and concert band; *Raga III* for viola solo and large orchestra; and *Raga III* for viola solo and smaller orchestra: to create the newer versions, changes in instrumentation were made. Slight compositional changes are found between *Raga I* for percussion and orchestra and *Raga I* for percussion and concert band, and *Raga III* for viola solo and large orchestra and *Raga III* for viola solo and smaller orchestra. *Raga I* for percussion and concert band is an instrumentation of *Raga I* for percussion and orchestra, and *Raga III* for viola and small orchestra is an orchestral reduction of *Raga III* for viola and large orchestra.

- Case 3 (key case): *Raga I* for percussion and two pianos; *Raga I* for percussion solo; *Raga III* for viola and large orchestra; *Raga III* for viola solo; and *Raga III* for viola solo and electronics. In grouping the versions into this case, I focus on the reductive compositional approaches we find in *Raga I* for percussion and two pianos to create *Raga I* for percussion solo, and *Raga III* for viola and large orchestra to create *Raga III* for viola solo. *Raga III* for viola solo is considered an intermediary version to create *Raga III* for viola solo and electronics, which can also be considered a reduction of *Raga III* for viola and large orchestra.

The first case will be discussed in Chapter 4, the second case in Chapter 5, and the third case in Chapter 6. Each case incorporates scores, audio and audio-visual media, documents, and interviews as data sources. The methods for collecting data are discussed in Chapter 1, §4.5. In the sections that follow I discuss the analysis of the collected data.

3. Score and Aural Analysis of Media Sources

In this section I discuss my analysis of scores and media sources. I discuss my analyses of these two sources concurrently because they were used in conjunction with each other during my analyses.

3.1 Scores

The scores that were collected for this research project are summarised in Table 1-1. Although I collected both the CeBeDeM and Norsk Musikforlag versions of the versions available from both publishers, I primarily used the editions by Norsk Musikforlag in this thesis. My preference to Norsk Musikforlag can be motivated as follows.

- Norsk Musikforlag published all the different versions of *Raga I* and *Raga III*, while CeBeDeM published only some of the versions.
- Norsk Musikforlag is Wim Henderickx's preferred publisher (Henderickx, 2015a).
- *Raga I* for percussion and two pianos was digitally typeset by Norsk Musikforlag and the edition by CeBeDeM is handwritten.
- The editions by Norsk Musikforlag are available digitally.
- The different versions of *Raga I* and *Raga III* by Norsk Musikforlag were revised by Wim Henderickx and his composition assistant, Diederik Glorieux, with no changes or minor changes from the CeBeDeM to the Norsk Musikforlag editions. Notable differences between versions are specifically mentioned in my discussions where applicable.

The scores were collected in three formats:

- hard copy,[1]
- portable document format (PDF),[2] and
- digital format (for Sibelius 8).[3]

[1] Hard copies were obtained from the publishers.
[2] Portable document format (PDF) files were obtained with special permission from Wim Henderickx.
[3] Digital format files were obtained with special permission from Wim Henderickx and Diederik Glorieux.

I summarise the formats of the different versions of *Raga I* and *Raga III* that I employed in this study in Table 3-1 below.

Table 3-1

Formats of different versions of Raga I *and* Raga III *used in this research project*

		CeBeDeM hard copy	Norsk Musikforlag hard copy	Norsk Musikforlag PDF file	Norsk Musikforlag digital file
Raga I	for percussion and two pianos	X	X	X	X
	for percussion and orchestra	X		X	X
	for percussion solo	X		X	X
	for percussion and concert band		X	X	X
Raga III	for viola and large orchestra			X	X
	for viola solo		X	X	X
	for viola solo and electronics		X	X	X
	for viola and small orchestra		X	X	X

The scores in PDF format, and printed copies thereof, were used for basic analyses and for recording observations. The scores in digital format were used to extract examples and to create simulated sound files. During my analysis of scores, preference was given to observations of aurally salient phenomena. My aural analyses of the compositions are discussed further in the sections below.

3.2 Segmentation of Scores

In this section I discuss 1) the importance of segmentation for music analysis and 2) how the different versions of *Raga I* and *Raga III* were divided into segments.

3.2.1 The Importance of Segmentation for Music Analysis

Segmentation is an important part of music analysis and interpretation Professor of Music Theory at the University of Rochester and President of the Society for Music Theory, Dora Hanninen (2001:345) cites Boretz (1995:115) who wrote "the non-trivial aspect of defining 'what music is' resides in the explication of *what it means to make music of* any slice of auditory experience, which consists of the demonstration of *how to make music of* any such slice" and Hanninen (2001:345) interprets Boretz's statement as follows: "the essence of music is not sounding events, but mental experience or 'thought' focused on sounding events that combines cognition with attentional disposition."

Hanninen (2001:345) contextualises her understanding of Boretz in the field of music analysis and argues that segments constitute the basis for analytic organisation and interpretation: " One makes music, then, not only through performance and composition, but also through listening and the pointedly inquisitive, contemplative, and often outwardly silent activity called music analysis. Music analysis might be described as the conceptualization and representation of musical relationships; alternately, one might say that the conceptualization and representation of musical relationships is a music analyst's (or the music-analytical) way of 'making music.' Essential to this endeavour is the identification of significant musical units or 'segments'; these constitute the basis for subsequent analytic organization and interpretation."

Given the nature of the music that I analyse, and the aims of this research project, I agree with Hanninen that the identification of segments constitute the basis for analytic organisation and interpretation. Therefore, the first step in my analyses was to divide the compositions into different segments.

3.2.2 Determining Factors for Segmentation

Three sets of factors influenced my choices regarding the segmentation of the different versions of *Raga I* and *Raga III*. The sets created after careful consideration of the factors that influenced the segmentation, and were applied as follows:

a) first set: *Raga I* for percussion and two pianos, *Raga I* for percussion and orchestra, *Raga I* for percussion and concert band, *Raga III* for viola and large orchestra, and *Raga III* for viola and smaller orchestra.

b) second set: *Raga I* for percussion solo.

c) third set: *Raga III* for viola solo and *Raga III* for viola solo and electronics.

The sets of factors are discussed in each section below where the specific versions are discussed in detail. My association of the various groups of versions of compositions with sets of factors for segmentation were done to support a clear discussion of my segmentation choices, and should not be confused with my division of the different versions in cases.

3.2.3 Conjunction of Time-Fields

I incorporated Lasse Thoresen's (2017) conceptualisation of the conjunction of time-fields[4] in aural sonology to indicate how segments are connected. I used this conceptualisation here because

- it provides for systematic description of the conjunction of segments.
- it is suitable for use in aural analysis and in music score analysis.
- of the nature of segments in *Raga I* and *Raga III* that contain different types of conjunctions, and these different types are important in my observations and especially in my interpretations.
- the beginnings and ends of segments are important structural parts in both *Raga I* and *Raga III*.
- phenomena that determine the beginning and end of segments can be perceived clearly and play important roles in the concepts that form the foundation for my interpretations.
- segmentation is more descriptive than interpretative, and it can thus function as a foundation for my interpretations.
- the conjunctions of all segments can be described in terms of aural sonology as Thoresen has done in his study on time-fields. It will become clearer later in my report that an understanding of the ways in which segments are joined is important.

[4] Thoresen (2017) writes that "[c]onsecutive groupings (segmentation or units) in a musical discourse are what we call *time-fields*; thus time-fields are subdivisions of larger musical entities into smaller units or segments that are perceptible as such." His discussion of time-fields includes time-field levels, time-field conjunction, and time-field demarcation. For the purposes of this research project I will only work with time-field conjunction.

Thoresen (2017) suggests seven ways in which time-fields can be in conjunction:[5]

- Separate positioning: two time-fields are separated with a noticeable silence.
- Bridged positioning: two time-fields are joined by the help of a transitional passage or by an uninterrupted background.
- Joint positioning: the next time-field begins just after the first one is ended.
- Close positioning: the second time field takes over in a very tight succession.
- Hinged positioning: the end object of the previous time-field coincides with the beginning of the next.
- Overlapping positioning: the second time-field begins before the first is ended.
- Superimposed positioning: time-fields in layers are superimposed.

These time-field conjunctions will not be discussed in detail. However, they were employed in the diagrams that show my segmentations of the different versions of *Raga I* and *Raga III*.

[5] Thoresen (2017) also offers symbols that exactly correspond with the categories he uses in his conceptualisation to indicate time-field conjunction. However, the symbols that relate to his conceptualisation will not be used or discussed here.

3.2.4 Segmentation of *Raga I* and *Raga III*

In order to divide *Raga I* and *Raga III* into segments, I followed an approach that started with auditory analysis, which was followed by music score analysis.[6] The segmentations below are based on my personal perceptions and interpretations, and I am aware that other listeners and analysts can differ from me. However, I think that there will be intersubjective consensus about many of my choices of segmentations, in spite of the limits of auditory analyses.

The set of factors listed below were important in both my aural and music score analysis of

- *Raga I* for percussion and two pianos;
- *Raga I* for percussion and orchestra;
- *Raga I* for percussion and concert band;
- *Raga III* for viola and larger orchestra; and
- *Raga III* for viola and smaller orchestra.

The most salient factors in determining both my aural and music score segmentation were significant changes in the following:

- material: combinations of pitch classes and rhythms;
- texture and the distribution of the material in musical space and time;
- colour: musical instruments and the combination of musical instruments used; and
- instrument groups: most segments were composed for soloist with accompaniment, some segments were composed for accompanying instruments only, and other segments were composed for solo instrument(s) only.

[6] See Chapter 1 Table 1-2 for a list of the recordings that were used for auditory analysis and Chapter 1 Table 1-1 for a list of the scores that were used for music score analysis.

The following factors were used as guidelines to support my choices of segmentation:

- Pitch class series: the start and completion of pitch class series used in the compositions
- Dynamics: significant changes in dynamics, either sudden or gradual
- Attacks: changes in attacks and the intensity of attacks
- Tempo changes: tempo changes that are indicated at the beginning of some segments

Symbols in the scores that support an analyst in finding clear structures were:

- Beaming: unconventional beaming was used by the composer to highlight structural changes. Different series or segments are thus visually separated in terms of beaming, rather than following conventional rules of beaming.
- Rehearsal marks: many segments correspond with rehearsal marks, but not every segment has its own rehearsal mark.[7]

[7] Limitations by the music typesetting software prohibit the exact spacing of rehearsal marks. Thus, rehearsal marks do not correspond exactly with the start of segments and they are only placed at the beginning of bars where new segments start.

In the interviews conducted with Wim Henderickx (2015c) I posed questions regarding ambiguous interpretations of segments. More specifically I enquired about the first segments of each part of *Raga I* and *Raga III*, and whether these first segments should be considered as introductions or as first segments. Henderickx (2015c) clarified the matter as follows: "They are introductions, but an introduction in the alap is part of the structure of Indian music. It is an integral part of the first movement of the Indian rāga. So it is an introduction, but not in a Western sense. These bars should rather be called a segment than an introduction, because it is only a segment of a larger, introductory segment."

My segmentation of the relevant versions of *Raga I* is shown in Diagram 3-2 and my segmentation of the relevant versions of *Raga III* is shown in Diagram 3-3.

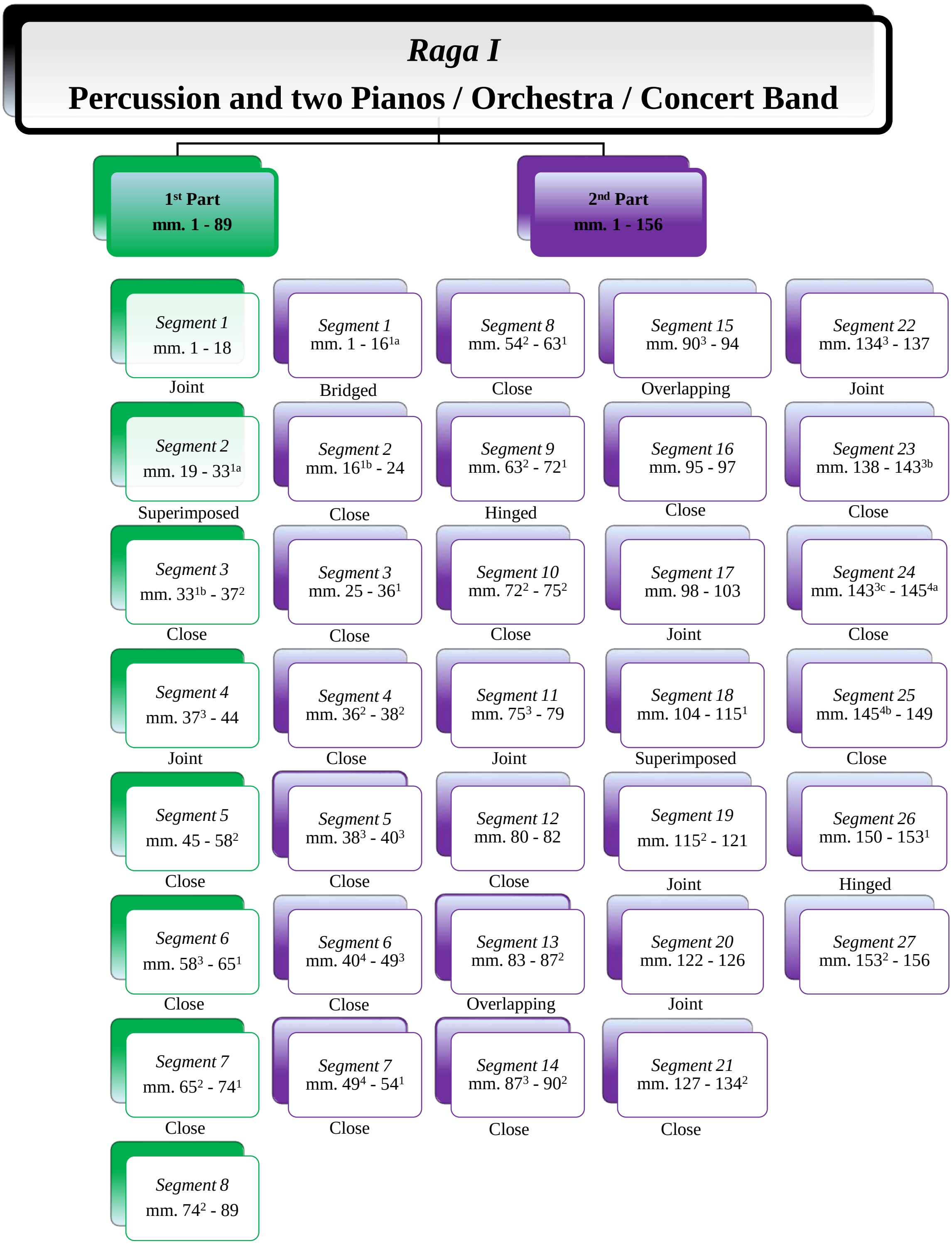


Diagram 3-2

Segmentation of Raga I *for percussion and two pianos / percussion and orchestra / percussion and concert band*

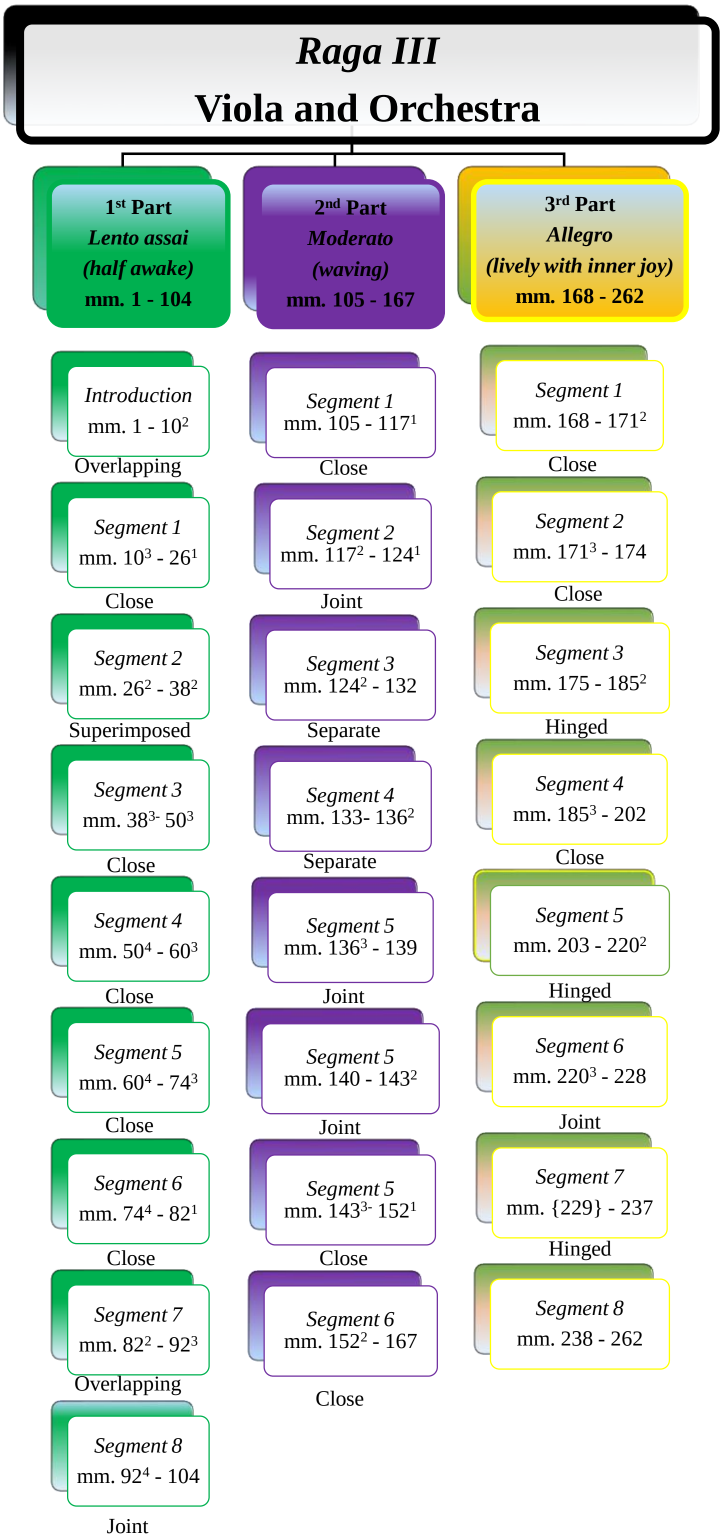


Diagram 3-3

Segmentation of Raga III *for viola and orchestra*

3.2.5 Segmentation of *Raga I* for Percussion Solo

The set of factors that was the most salient in my segmentation are:

- change of instruments: changes of instruments with significantly different timbres determine segments;
- change of material: significant changes in especially rhythmic patterns determine the start of new segments;
- rests: some segments are divided by rests; and
- dynamics: significant changes in dynamics, either sudden or gradual changes determine segments.
- Tempo changes: tempo changes indicated at the beginning of some segments determine segments.

Symbols in the scores that clarify segmentation are once again the rehearsal marks. Here again many segments correspond with rehearsal marks, but not every segment has its own rehearsal mark.

The bar numbers for *Raga I* for percussion solo are slightly different in the CeBeDeM edition when compared to the Norsk Musikforlag edition due to the removal of two bars in the Norsk Musikforlag edition. The bar numbers of the segmentation shown here correspond with the Norsk Musikforlag edition, the latest edition of this version.

My segmentation of *Raga I* for percussion solo is shown in Diagram 3-4 below.

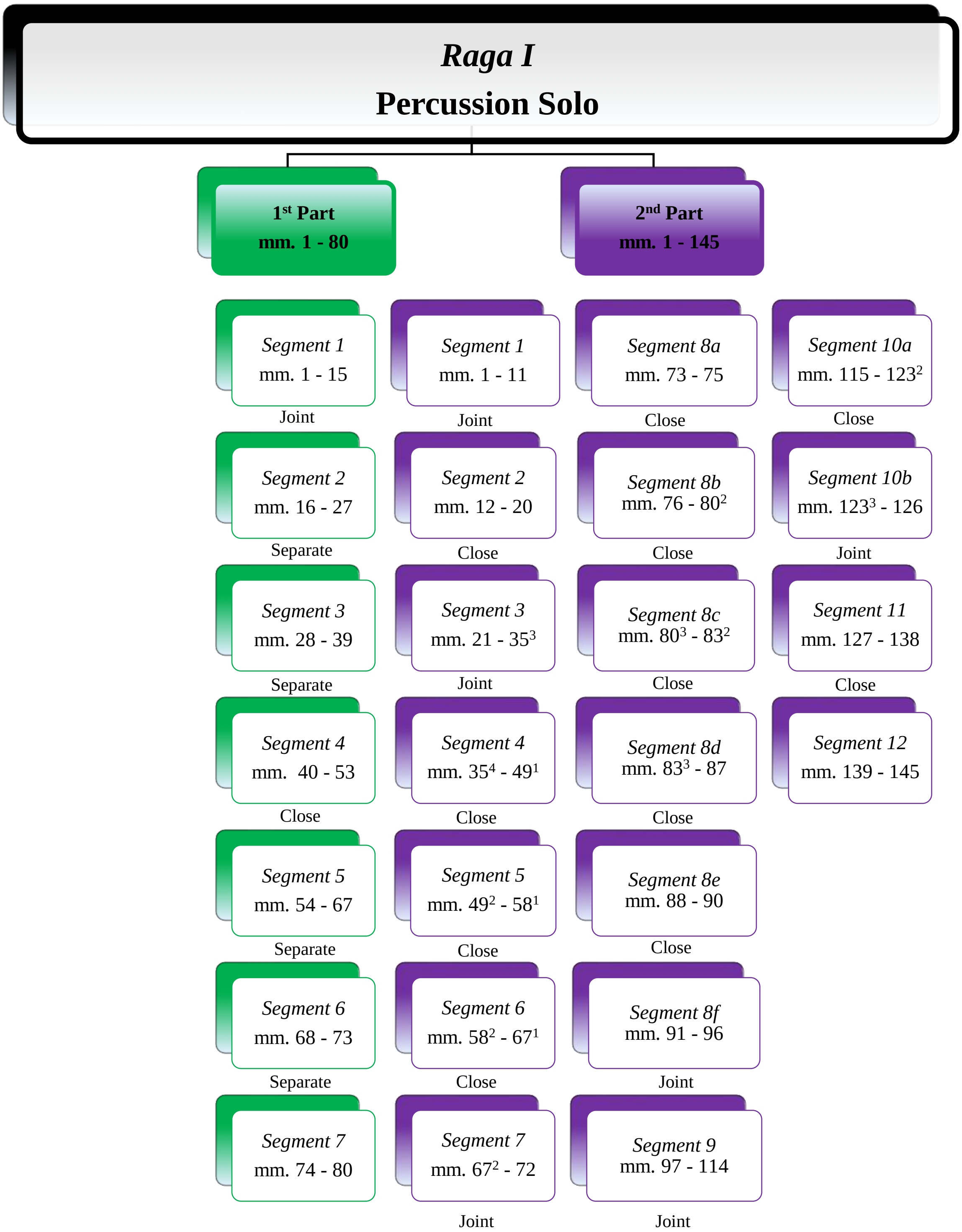


Diagram 3-4

Segmentation of Raga I *for percussion solo*

3.2.6 Segmentation of *Raga III* for Solo Viola and *Raga III* for Solo Viola and Electronics

The set of factors that was the most salient in both my aural and music score segmentation are:

- Change of material: significant changes in melodic material;
- Textures: the distribution of material in musical space;
- Dynamics: significant changes in dynamics, either sudden or gradual changes; and
- Tempo changes: tempo changes are indicated at the beginning of some segments.

Symbols in the scores that clarify segmentation are the following:

- Rehearsal marks: as mentioned already, some segments correspond with rehearsal marks, but not every segment has its own rehearsal mark.
- Double bar lines: some segments are divided with a double bar line.
- Beaming: unconventional use of beaming was used by the composer to highlight structural changes.

Raga III for solo viola and *Raga III* for solo viola and electronics have only dotted bar lines. I numbered the bars divided by the dotted bar lines and these bar numbers correspond with the bar numbers indicated in the diagram below.

My segmentation of *Raga III* for viola solo and *Raga III* for viola solo and electronics is shown in Diagram 3-5 below.

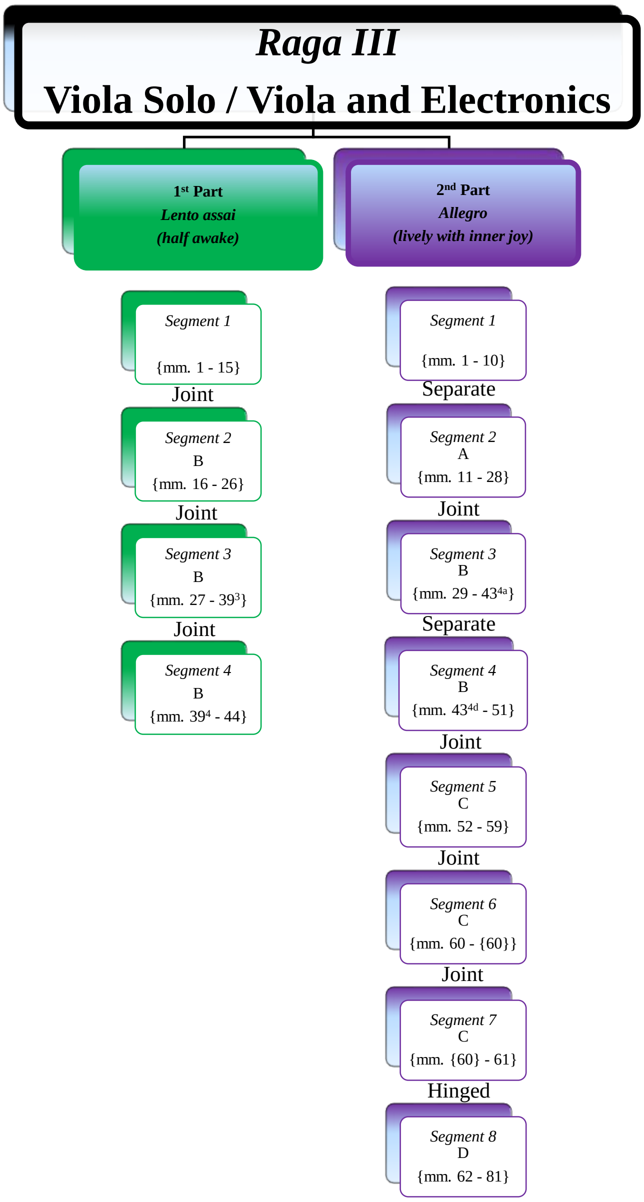


Diagram 3-5

Segmentation of Raga III *for viola solo, and viola and electronics*

3.3 Segmentation of Media Sources

Although scores and media sources were employed together to divide the different versions of *Raga I* and *Raga III* into segments, the first step was to divide the scores into segments. These segmentations of the scores were then employed to divide the media sources into segments. The media sources – which are unpublished audio recordings, published audio recordings, video recordings, and simulations – are summarised in Table 1-2. The audio and video tracks of *Raga I* and *Raga III* were divided into shorter tracks of which each is a segment that corresponds with the segmentation of the music score.

The video track segments were created with Nero Vision Xtra, version 7.4, and the soundtrack segments were created with Nero WaveEditor, version 5.1. These track files were renamed according to the names given to segments in the diagrams above in order to enable one to listen to or watch these tracks with or without the music score.

3.4 Analytical Approach

In my analyses I followed an approach where some phenomena are included and some excluded. It is clearly necessary in any analysis to select only some of the phenomena for a study. The included phenomena are referred to as 'significant phenomena' – I discuss my criteria for selecting significant phenomena in §3.4.1 below. In §3.4.2 below I motivate my preference for focusing on beginnings and ends of segments in my analyses.

3.4.1 Significant Phenomena

Motivation for Approach

When I compared my analyses of the different versions of *Raga I* and *Raga III*, I only included significant phenomena in my discussions. Phenomena that were not significant were thus excluded.[8] I followed an approach where some phenomena are included and some excluded for the reasons listed below.

- In this research project I work with audible phenomena that can be perceived by listeners, and significant phenomena are clearer to listeners than insignificant phenomena.
- Significant phenomena feature in foreground auditory streams – as described by Bregman and Campbell (1971:244), Bregman, Liao, and Levitan (1990:400), Bregman (1993:22-25), and Bregman and Woszczyk (2004:39-46) – that are more salient to listeners than background auditory streams.[9]
- Significant phenomena are clear exemplars of the phenomena that can be analysed and discussed in order to expand the theory of musical forces.
- When I discuss the significant phenomena, I am able to clearly order, group, and present them with exhaustive discussions of an exemplar of each type of phenomenon. An exhaustive presentation of all phenomena – significant and insignificant – would require contextualisation and differentiation of the significant phenomena from the insignificant phenomena, which would hinder my arguments and consequent expansions of the theory.

[8] The significance of phenomena was determined by means of aural analysis.
[9] Bregman and Woszczyk (2004:39) define auditory streams as follows: "The perceived sequences whose parts form a single perceptual entity are called 'auditory streams.' As new sounds arrive, they are either assigned to existing streams, or form a new stream. Each stream has its own global properties, such as melody and rhythm, derived from the patterning of the sounds assigned to that stream, but not from sounds assigned to other streams."

Aspects of Aural Analyses of Raga I *and* Raga III

Determining which phenomena are significant and which are not is of course a contentious step. However, other authors have already tackled this issue and discussed it enough so that I felt comfortable on starting my analysis at this contentious point. For example, Rita Aiello (1994:274), professor in music cognition at the New York University, writes that "little is known about the processes that take place while listening to a composition". She discusses the influence of psychoacoustics and psycholinguistics as reasons why music psychologists are reluctant to conduct research in how listeners hear actual pieces of repertoire. In this section I discuss specific aspects of listening to specifically *Raga I* and *Raga III*. I list prominent aspects of listening to these compositions and I situate myself within each aspect.

- Different listeners focus on different musical elements even during different listening sessions, or they listen according to aspects of a specific analytical lens. The listening experiences of a listener who focuses on pitch relations can thus not be compared with the listening experiences of a listener who focuses on dynamic continuums in performances. I state in Chapter 1, §4.4 and §6, that I focus on the operation of musical forces and my work is through the lens of the theory of musical forces.
- Some listeners are trained and more experienced than others and the way in which trained listeners experience music is different from the way in which untrained listeners experience music (Cook, 1994:67-68). I state in Chapter 1 §4.4 that I attempt to work in terms of the listening experiences of trained listeners.
- Listening experiences are subjective. As stated in Chapter 1 §4.4, the work presented in this thesis stems from my personal listening experiences, and from imagined listening of trained listeners. Even though objections have been raised against this strategy, it is common in published music analysis studies.

- Listening experiences are influenced by the context and environment of the listener and the music. Listeners do not have similar listening experiences in a laboratory and a concert hall (Aiello, 1994:276).[10] My listening experiences of *Raga I* and *Raga III* are limited to the recordings available, summarised in Table 1-2. My listening experiences were guided by my role as researcher, and I am therefore not a naïve listener, nor do I pretend to be one.
- Listening experiences are influenced by the cultural background of listeners. The listening experiences of a listener who listens with a Western music background cannot be compared with the listening experiences of a listener who listens with an Eastern music background.[11] I state in Chapter 1 §4.4 that I am listening as a listener with a Western music background.[12]

Solo Instruments in Aural Analyses

In order to identify significant phenomena for analysis and discussion, I omitted[13] the material of the solo instruments because it is identical in

- *Raga I* for percussion and two pianos, *Raga I* for percussion and orchestra, and *Raga I* for percussion and concert band.
- *Raga III* for viola and large orchestra and *Raga III* for viola and smaller orchestra.

---

[10] I am aware that other aspects such as acoustics and seating of concert goers can influence the way in which listeners experience live performances, or the placing of microphones can influence recordings. It is not within the scope of this thesis to discuss further aspects of this debate.
[11] The differences between listeners with a Western music background and listeners with an Eastern music background is particularly pertinent to this research project because *Raga I* and *Raga III* are Western compositions which were influenced and inspired by Eastern (more specifically, Indian) music.
[12] The term 'Western music' is used here in a broad sense.
[13] Omitting the material of the solo instruments in my comparisons of some versions of *Raga I* and *Raga III* enabled me to focus on compositional processes of orchestration in order to investigate the complex relationships between the operation of musical forces and orchestration.

Factors influencing Choices regarding Significance of Phenomena

Factors that influenced my categorisation of phenomena in the selected compositions by Wim Henderickx as significant are listed below. The identification of these factors were influenced by my reflections on the aspects of aural analysis of *Raga I* and *Raga III*.

- New material: material that exists in one version and not in another version.
- Salient musical gestures: musical gestures that become salient through conventional and unconventional ways of orchestration.
- Musical gestures that become salient: orchestrated musical gestures that become increasingly more salient as they unfold.
- Added energy: musical gestures that are orchestrated in such a way that they add energy to segments.
- Added density: musical gestures that are orchestrated in such a way that they add density to segments.
- Orchestration: musical gestures and segments that become salient when they are orchestrated.
- Tone colour: musical gestures become more salient when their tone colours are significantly different from surrounding material and there are more colouristic contrasts in the material.
- Stability and the operation of musical forces: musical gestures in which there are clearer points of stability or clearer operations of musical forces.

In some sections where some phenomena are included and others excluded, I highlight aspects of the phenomena that cause them to be significant and I motivate why other phenomena are excluded.

3.4.2 Beginnings and Ends of Segments

In some of my analyses I gave preference to the beginnings and ends of segments, and in some analyses I included only significant phenomena at the beginnings and ends of segments. The reasons for my preference of instances that occur at the beginnings and ends of segments – and not during segments – are listed below.

- Listeners can clearly distinguish between the different segments, especially the segments of *Raga I*, and they hear these distinct segments as parts that comprise an entire composition because the conjunctions of the segments are clearly audible. Because the beginnings and ends of segments are clear, they are heard as the 'pillars' that shape segments, and they are thus the most salient structural parts of each segment.
- The beginnings and ends of segments are structurally important. The beginnings of segments play an important role in determining listeners' perception of stability and cause listeners to hear the beginnings of segments as either stable or unstable. The material between the beginnings and ends of segments is either stable, unstable, or fluctuations between stability and instability, depending on the choices of the composer. The ends of segments play an important role in listeners' perception of how the operation of musical forces were satisfied in the segments and how listeners' expectations created by the operation of musical forces were met. This is true of the compositions I analysed, but not necessarily true in general about all compositions.
- The beginnings and ends of segments in compositions are very clear in terms of the degree of stability: they are heard as either stable or unstable. For the purposes of this research project, I considered a discussion of phenomena at the beginnings and ends of segments more important than a discussion of phenomena in entire segments where stability and instability are constantly fluctuating.

- My aural analyses of *Raga I* and *Raga III* were conducted by using audio and audio-visual recordings of the compositions. The temporal order of the compositions was reflected in my use of the recordings. In other words, beginnings were treated as beginnings, and ends were treated as ends. This was done because *Raga I* and *Raga III* are of a kind of music that has temporal frameworks. According to Cross (2012), as cited by Brandt, Gebrain, and Slevc (2012), we "do not require that music exist within a temporal frame, with a clear beginning and end. In many indigenous cultures, musical behaviour is woven into everyday life and not treated as a concert experience". Although I agree with this statement regarding certain kinds of music, it is not applicable to this research project where trained listeners listen attentively to music that was recorded in an audio or audio-visual format, or music that is performed live at a concert. These listeners will have a clear idea of the beginning and end of the composition and its segments. My aural analysis and use of recordings therefore had to take this into account.

3.5 Overview of Analytical Procedure

Diagram 3-6 below provides an overview of the different methods and processes employed in the cases of this research project.

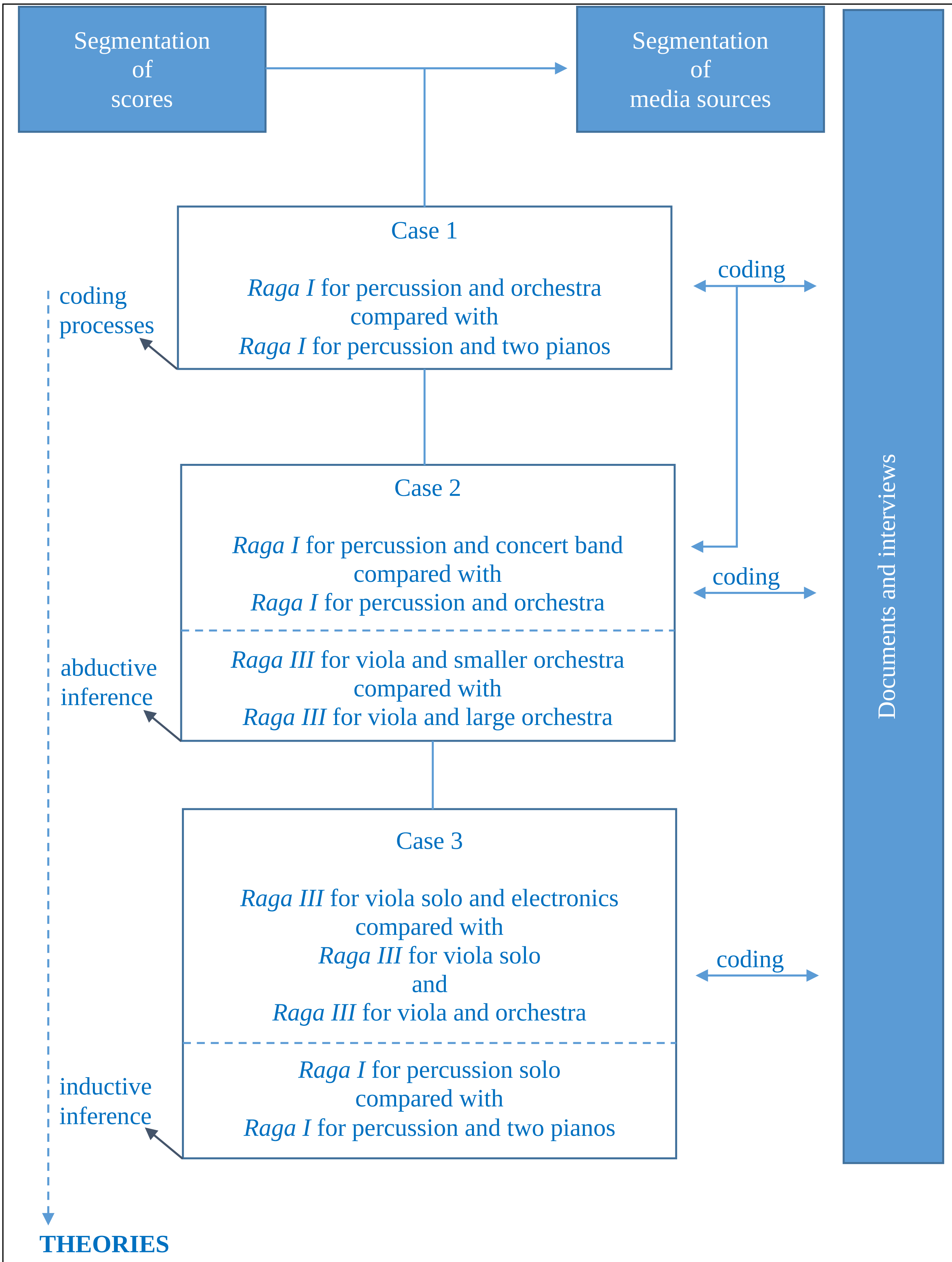


Diagram 3-6

Overview of the different methods and processes employed in the cases of this research project

3.6 Analysis of Case 1

Analysis of different Versions

My first steps in analysing Case 1 were as follows for *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra.

a) Divide each segment into smaller segments, and specifically mark musical gestures in segments.

b) Mark material as featuring in the foreground auditory stream or in the background auditory stream.

c) Determine and mark stability and instability in material, specifically in musical gestures and at the beginnings and ends of segments.

d) Determine and label the operation of melodic gravity, melodic magnetism, and musical inertia in material, specifically between points of stability.[14]

I compared the different segments of *Raga I* for percussion and two pianos with the segments of *Raga I* for percussion and orchestra. These segments of the two versions were compared by

- comparing scores only,
- comparing different media only, and
- comparing different media while following scores.

[14] I specifically employed melodic forces here because the operation of melodic forces is different in the two versions. The rhythm of the two versions is unchanged and therefore I do not discuss rhythmic forces here.

Comparisons of different Versions

All the significant phenomena that are present in *Raga I* for percussion and orchestra and not in *Raga I* for percussion and two pianos were recorded in a separate document. These phenomena were recorded with the following details:

- phenomena observed,
- movement and bar numbers,
- orchestral instruments involved,
- similarities and differences in media sources and scores, and
- notes on my listening experiences.[15]

Coding

Johnny Saldaña (2010:3), Professor Emeritus of Theatre from the Herberger Institute for Design and the Arts' School of Film, Dance, and Theatre at Arizona State University, defines coding as follows: "A code in qualitative inquiry is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data." First Cycle coding methods and Second Cycle coding methods, as suggested by Saldaña (2010:45-184), were employed to code phenomena in *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra. Saldaña (2010:45) defines First Cycle coding methods as "those processes that happen during the initial coding of data and are divided into seven subcategories: Grammatical, Elemental, Affective, Literary and Language, Exploratory, Procedural, and a final profile entitled Themeing the Data". Second Cycle coding methods are defined by Saldaña (2010:45) as follows: "Second Cycle methods [...] require such analytic skills as classifying, prioritizing, integrating, synthesizing, abstracting, conceptualizing, and theory building."

[15] Saldaña (2010:17) uses the term 'preliminary jottings'.

The document with the recorded phenomena were coded in order to determine recurring themes[16] in the data.[17] Although coding is not a standard practice in analysing music, it is a suitable method in order to analyse different sources of data and structure my observations, analyses, and comparisons because it incorporates aspects of analysis. The process that I followed in my analyses nevertheless resembles most work in music analysis. By presenting it as coding, I am placing analysis procedures within current views on research methodology. It is also a suitable method when working with case study research, and enables me to work with other non-music analytical aspects, such as some of my suggestions for further research in Chapter 8. Tehmina Basit (2003:145), Professor of Education at Staffordshire University, asserts that "[c]oding and analysis are not synonymous, though coding is a crucial aspect of analysis". Coding also follows a streamlined model of which the outcome is to develop a theory (Saldaña, 2010:11-12).

First Cycle Coding

I employed Initial Coding as a coding method from the possible Elemental Methods to conduct First Cycle coding.[18] Saldaña (2010:81) cites Corbin and Strauss (1998:102) and writes that "Initial Coding is breaking down qualitative data into discrete parts, closely examining them, and comparing them for similarities and differences". Saldaña (2010:81) also cites Glaser (1978:56) and writes that "Initial Coding is intended as a starting point to provide the researcher with analytic leads for further exploration and 'to see the direction in which to take [this] study'."

[16] Saldaña (2010:13) makes a distinction between codes and themes: "A theme is an *outcome* of coding, categorization, and analytic reflection, not something that is, in itself, coded".
[17] I am aware of the debate regarding manual and electronic coding procedures (Basit, 2003, Saldaña, 2010:21-23), and I chose to engage manually with my data. Saldaña is in favour of a manual approach: "There is something about manipulating qualitative data on paper and writing codes in pencil that give [sic] you more control and ownership of the work." (Saldaña, 2010:22.)
[18] Other coding methods under Elemental Methods are Structural Coding, Descriptive Coding, In Vivo Coding, and Process Coding.

I started my Initial Coding by decoding the recorded phenomena of my observations. According to Saldaña (2010:4) decoding entails reflecting on a passage of data to decipher its core meaning, while encoding entails determining the appropriate code of a passage of data and labelling it. Following the decoding, the data was encoded and labelled according to codes that relate to the phenomena. Lastly, the data was codified according to the codes. The data was lastly codified according to the codes.[19]

Second Cycle Coding

I employed Focused Coding for the Second Cycle coding to follow the Initial Coding of the First Cycle coding. Saldaña (2010:155) writes that "Focused Coding follows Initial Coding" and that "[t]he goal of this method is to develop categories without distracted attention at this time to their properties and dimensions."

During this cycle, the codes were classified into categories, subcategories, and themes. In order to present only significant phenomena, as discussed in §3.4.1 above, I had to apply filters to distinguish between significant and insignificant phenomena. Saldaña (2010:6) writes that "[t]he act of coding requires that you wear your researcher's analytic lens. But how you perceive and interpret what is happening in the data depends on what type of filter covers that lens". My analytic lens (the theory of musical forces) and the filter (significant differences between versions) enabled me to present and discuss data from *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra that are significant in terms of the theory of musical forces. This data further enabled me to expand Larson's theory of musical forces.

[19] Saldaña (2010:8) writes: "To codify is to arrange things in a systematic order, to make something part of a system or classification, to categorize."

Developing Theory

Saldaña (2010:11) writes that "[s]ome categories may contain clusters of coded data that merit further refinement into subcategories. And when the major categories are compared with each other and consolidated in various ways, you begin to transcend the 'reality' of your data and progress toward the thematic, conceptual, and theoretical." Corbin and Strauss (2008:55) express a similar idea when they write that when we show the systematic interrelationship of themes and concepts in coding, we are able to develop theory. Saldaña (2010:12) presents a model[20] to illustrate streamlined codes-to-theory – I present Saldaña's model in Diagram 3-7. Mason (2002) is cited by Saldaña (2010:11-12) who states that "[t]he development of an original theory is not always a necessary outcome for qualitative inquiry, but acknowledge that preexisting theories drive the entire research enterprise, whether you are aware of them or not." In this research project I employ a pre-existing theory and the outcome of this research project is original theories that expand Larson's theory of musical forces.

[20] Saldaña's model is a model for qualitative inquiry, but it is also applicable to this research project that follows a mixed-method inquiry. Creswell and Plano Clark (2007:145) writes that "information from codes could be used in the quantitative follow-up or for specific, significant statements or quotes from participants".

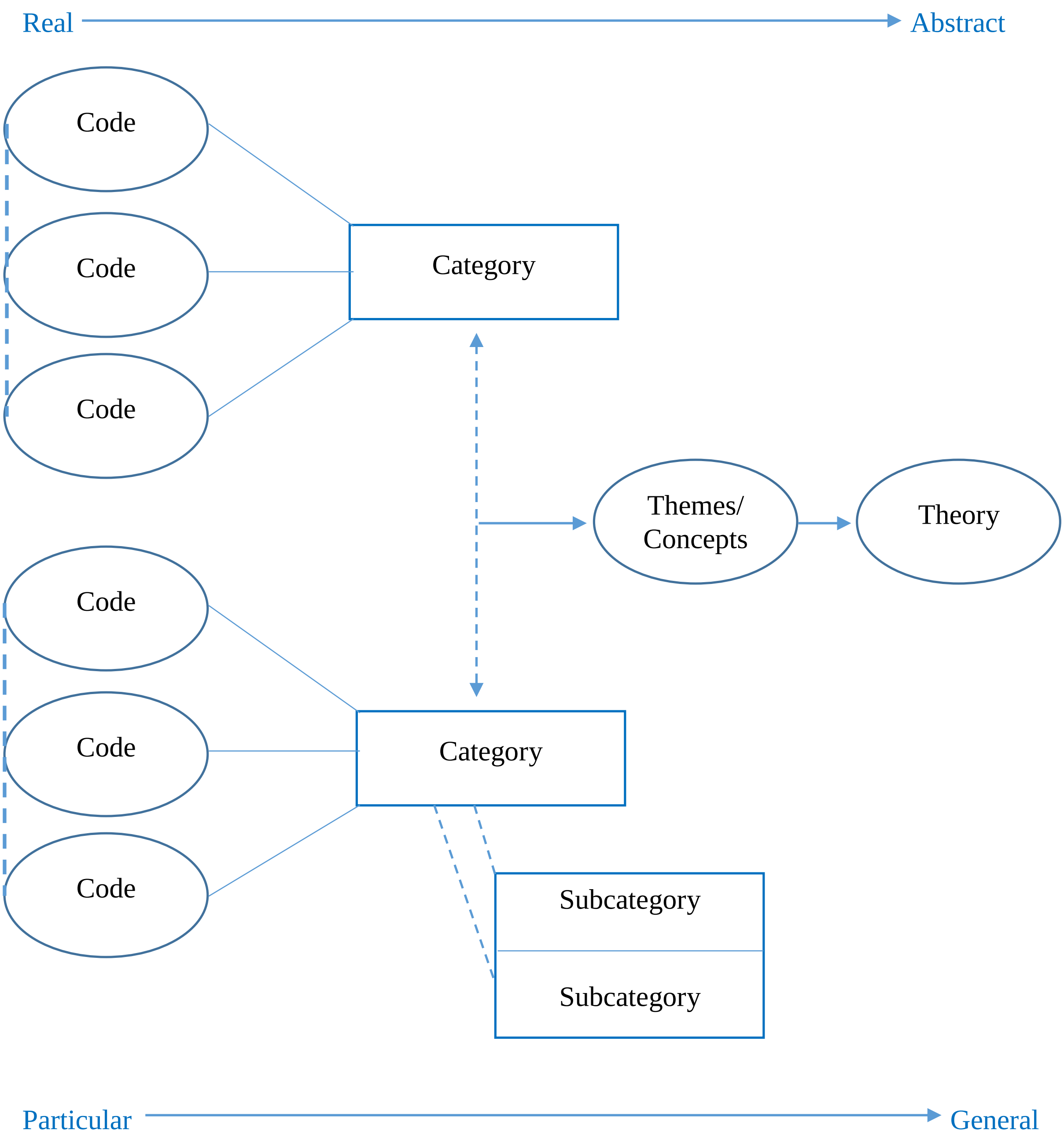


Diagram 3-7

A streamlined codes-to-theory model (Saldaña, 2010:12)

Presentation of Codes and Themes

Coding was used as a tool in this research project in order to analyse, compare, and present data. Thus, I do not explicitly show my coding processes in this research project but only present the results thereof. In order to present the results of my coding processes in Chapter 4, I reinterpreted each theme as a section of the chapter, and codes of categories as significant instances of categories. I start each section of Chapter 4 with a diagram that summarises the categories and instances, followed by a discussion of the instances, and a detailed discussion of an exemplar[21] of each category.

The following themes were identified from my analyses and comparisons of *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra and included as part of my discussions in Chapter 4.

- The addition of significant glissandi
- The addition of trills and tremolos
- The addition of instruments to existing material
- The addition of new material
- Changes in register
- Changes in dynamics

These themes, presented as sections in the next chapter, enabled me to create new theories about the operation of musical forces when material is orchestrated, and these theories serve as expansions of Larson's theory of musical forces.

[21] Exemplars were identified during the Second Cycle coding where codes were classified and prioritised.

3.7 Analysis of Case 2

In this case, presented in Chapter 5, I analysed and compared *Raga I* for percussion and orchestra with *Raga I* for percussion and concert band, as well as *Raga III* for large orchestra with *Raga III* for smaller orchestra. In order to avoid repetition of the work presented in Chapter 4 – with regards to *Raga I* – and to avoid digressing from my work on significant phenomena – with regards to *Raga III* – I had to follow a different approach in my analyses and comparisons of these compositions.

Approach for Raga I

The orchestration of *Raga I* for percussion and concert band is similar to *Raga I* for percussion and orchestra, and to code and compare all phenomena in the two versions would have been redundant. In order to avoid repetition of the work presented in Chapter 4, I approached *Raga I* for percussion and concert band as follows.

- Difference in musical instruments: Although the orchestration of *Raga I* for percussion and concert band is similar to the orchestration of *Raga I* for percussion and orchestra, material was orchestrated for different musical instruments. I compared the way in which musical forces operate in different musical instruments and discussed this aspect in terms of limitations of musical instruments, overtones, microtones, multiphonics, tempering, dynamic range, and pedalling and sustain.
- Addition of percussion instruments: Three percussion players were added to *Raga I* for percussion and concert band. I employed simultaneous coding – described by Saldaña (2010:62-65) and Miles and Huberman (1994) – to code the percussion

instrument parts, determine their functions, and theorise on their role in the operation of musical forces.[22]

My coding processes of *Raga I* for percussion and orchestra and the themes and categories presented in Chapter 4 enabled me to code specific segments of *Raga I* for percussion and concert band in the same way in which I coded *Raga I* for percussion and orchestra. I repeated the First Cycle methods and Second Cycle methods for these specific codes in order to identify significant instances in *Raga I* for percussion and concert band that amplify significant instances found in *Raga I* for percussion and orchestra in Chapter 4.

I compared the specific instances of significant phenomena found in *Raga I* for percussion and concert band with the specific instances of significant phenomena found in *Raga I* for percussion and orchestra. These instances of the two versions were compared by

- comparing scores only,
- comparing different media only, and
- comparing different media while following scores.

My discussions of *Raga I* for percussion and concert band are thus discussions of the most significant differences between *Raga I* for percussion and concert band and *Raga I* for percussion and orchestra.

[22] Saldaña (2010:62) defines simultaneous coding as "the application of two or more different codes to a single qualitative datum, or the overlapped occurrence of two or more codes applied to sequential units of qualitative data."

Approach for Raga III

Raga III for viola and smaller orchestra is an orchestral reduction of *Raga III* for viola and large orchestra (original version) and the version for smaller orchestra replaced the version for viola and large orchestra due to problematic aspects in terms of the balance between the soloist and the orchestra (Henderickx, 2015b). The score of *Raga III* for viola and large orchestra is thus a musicological document, but to discuss this version of *Raga III* is considered as valuable counterfactual data for my discussions of amplifying musical forces, presented in Chapter 4.

Because there exist only minor differences between *Raga III* for viola and large orchestra and *Raga III* for viola and smaller orchestra, I made a pragmatic choice to determine these differences between the two versions as a first step and to code these differences as a second step. This approach enabled me to focus on the differences between the two versions, code them, and determine their role in the operation of musical forces. The coding of these specific instances was conducted according to the coding procedures described in the section above.

Theorising

Berth Danermark[23], Mats Ekström[24], Liselotte Jakobsen[25], and Jan Karlsson[26] (2005:79) write that there are four methods of inference: deduction, induction, abduction, and retroduction. The two modes of inference that would be suitable for this research project are deduction and abduction.

[23] Professor of Sociology in the Department of Social Science at the Örebro University in Sweden.
[24] Professor of Sociology in the Department of Communication and Media Studies at the Örebro University in Sweden.
[25] Senior Researcher in Sociology and Gender Science at the Karlstad University in Sweden.
[26] Professor of Sociology in the Department of Working Life Science at the Karlstad University in Sweden.

I chose to employ abductive inference in this research project because of the potential that it offers for this project.[27] Danermark *et al.* (2005:89) write that "[d]eductive inference is analytical and [...] says nothing about reality". Abductive inference is defined by Danermark *et al.* (2005:91) as follows: "Abduction is to move from a conception of something to a different, possibly more developed or deeper conception of it. This happens through our placing and interpreting the original ideas about the phenomenon in the frame of a new set of ideas."[28] Danermark *et al.* (2005:94) qualifies the method of abductive inference further: "Abduction is more associated with a way of viewing the relation between science and reality, implying that there are no ultimately true theories, and therefore no rules either, for deciding what is the ultimate truth." Abduction is thus a suitable approach for this study, because it enabled me to analyse music in terms of the theory of musical forces in order to deepen ideas about the theory, build new theories, and expand the theory of musical forces.

Umberto Eco (1984:41-42), Italian novelist, philosopher, and semiotician, further differentiates between three types of abduction: overcoded abduction, undercoded abduction, and creative abduction.[29] I followed a creative type of abduction that is characterised by uniqueness and innovation, and my work can also be considered in part as undercoded abduction. The abductive research process is summarised by Gyöngyi Kovács and Karen Spens (2005:139), both professors at the Hanken School of Economics in Helsinki, and this research process is shown in Diagram 3-8.

[27] The concept of abduction was developed by the American philosopher, Charles S. Peirce (1932) and can be traced back to Aristotle.
[28] Abductive inference can also be expressed in terms of redescription or recontextualisation, as described by Jensen (1995:148).
[29] Eco's ideas about abduction relate to language, but were expanded by Danermark *et al.* (2005:93-94) in such a way that it can also be applied to other fields of research.

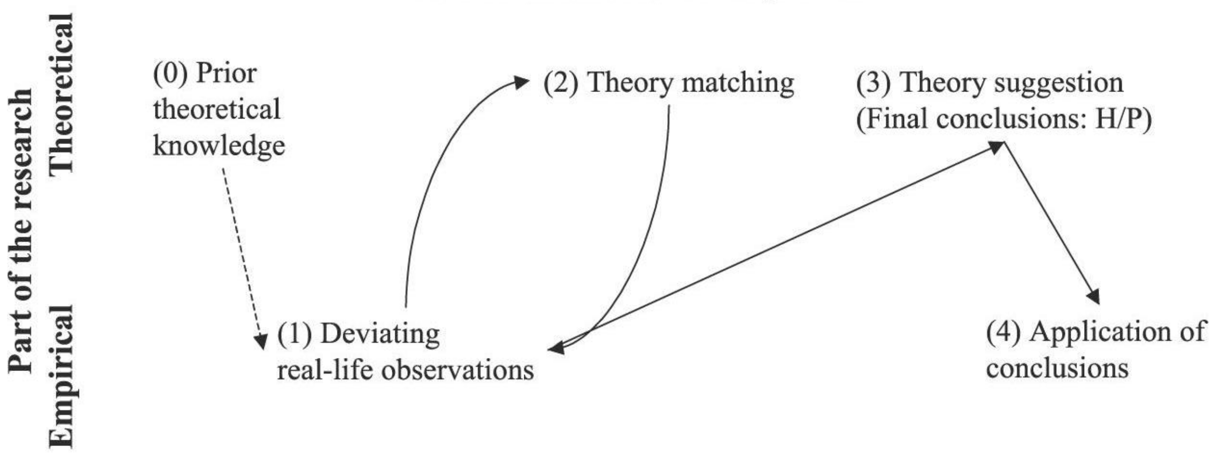


Diagram 3-8

The abductive research process (Kovács & Spens, 2005:139)

Because "[a]bductive reasoning emphasizes the search for suitable theories to an empirical observation" (Kovács & Spens, 2005:138), I considered this inference and its research process the most suitable approach in order to rigorously answer the research questions of this research project.

3.8 Analysis of Case 3

When I started to present my analyses and comparisons of the compositions of Case 3, I chose to employ the same coding methods as for Case 1, but I made a pragmatic choice to omit some final steps of my coding processes for reasons stated below.

- Diagrams of themes and instances – the results of my coding methods – were used in Case 1 to show categories of orchestrating material for orchestra. In order to streamline my arguments of Case 3, I chose to discuss specific topics (instead of categories). If I followed coding processes similar to those of Case 1, it would not have contributed to a better understanding of Case 3, and the information gathered in such a way would not have integrated into the cross-case analysis.

- To engage with data and theorise towards general principles, to conduct discussions that involve the relations between empirical data and theory with regards to the theory of musical forces, and employ inductive methods to follow my coding processes.
- Because significant differences between versions are in terms of entire versions, and not necessarily in terms of specific instances.

Due to the fact that significant differences between versions are in terms of entire versions and not only segments, I chose two main themes for the discussion of the compositions in this case that enable me to discuss the entire versions: the operation of musical forces in the presence of a drone (specifically differences between *Raga III* for viola solo and *Raga III* for viola solo and electronics), and the operation of musical forces in the absence of accompanying material (specifically differences between *Raga III* for viola and orchestra and *Raga III* for viola solo or *Raga III* for viola solo and electronics). A concurrent discussion of these two main themes enabled me to further identify subthemes that are aspects that were excluded in Larson's theory of musical forces or aspects that relate to the theory of musical forces but are not yet situated in the theory of musical forces. I presented exemplars from *Raga III* for my discussions and elaborate further with exemplars from *Raga I*.

I start my inquiry with an overview of problematic aspects in *Raga III* for viola solo (without electronics), followed by a discussion on how these problematic aspects were addressed by the composer (Wim Henderickx), and the effect of the composer addressing these problematic aspects on the operation of musical forces.

Notable themes discussed in this case are as follow.

- The operation of musical forces in the presence of a drone
- The collaboration of rhythmic forces and melodic forces
- The effect of a drone on structure and segmentation
- Fading sounds and the operation of musical forces

Discussions of the themes, subthemes, and other aspects of the theory of musical forces enabled me to build theories about the theory of musical forces when an inductive approach was followed. Danermark *et al.* (2005:130) define the inductive approach as an approach where "the researcher must start by thorough studies of empirical phenomena, and from them successively elaborate theories that are well grounded in data". An inductive approach is thus a suitable approach for this part of the research project because significant phenomena are analysed and employed to build theories.

4. Document and Interview Analysis

The following documents were collected for this research project: interviews with Wim Henderickx by other interviewers, reviews of Henderickx's music and concerts, album cover texts of recordings, and sketches of *Raga I* and *Raga III*. Interviews that were conducted is summarised in Table 1-3.

Although the interview questions were structured according to certain themes – described in Chapter 1 §4.5.3 – the transcribed responses of the research participants, as well as the documents, were coded according to procedures described in the section above. These codes were determined independently from the codes of the scores, but they were later connected and brought in relation with the codes of the scores. These coding processes of the different data sources enabled me to

- enhance my understanding and interpretation of some phenomena,
- substantiate some of my theoretical work, and
- test and validate some of my theoretical work.

5. Instances and presenting of Examples

Instances and Bar Numbers

Instances on diagrams and lists in this thesis are ordered according to their temporal occurrence in the composition as a whole. Subdivisions of bars into main beats are indicated with superscript numbers and subdivisions of beats are indicated with superscript letters. The letters that indicate subdivisions of beats are determined according to the smallest durational value in the beat of the instance discussed.[30] These subdivisions are employed to demarcate the exact beginning or ending of the phenomena that are being discussed.

[30] For instances where material does not start concurrently, the subdivisions of beats are omitted.

Presentation of Examples

The examples in this thesis represent scores published by Norsk Musikforlag, unless indicated otherwise. Some instances were edited in the following ways to improve their legibility:

- Empty staves were removed.
- The material of doubling instruments that was written on two staves was reduced to one stave.

CHAPTER 4

Case 1: Wim Henderickx's *Raga I*

1. Introduction

In this chapter I discuss the first key case of this research project, comparing significant differences between two versions of Wim Henderickx's *Raga I*: *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra.

The analyses and discussion presented in this chapter reflect only the significant differences between the two versions, and not the entire compositions. Criteria for identifying significant phenomena are discussed in Chapter 3 §3.4.1 and the coding procedures followed in order to categorise differences between the two versions are discussed in Chapter 3 §3.6. Themes of codes are presented in this chapter as six 'categories' and codes are presented as 'instances'. Each category is presented as a new section of this chapter. I start each section with an overview of a category, its subcategories (or classes), and instances. Specific aspects and functions of each category are discussed, and one instance is presented and discussed as an exemplar[1] of each subcategory or class. The sections in which I discuss the different categories are bounded in terms of the coding procedures and they are discussed as observations on the significant differences between the two versions of *Raga I*.

[1] Each exemplar has two examples, marked with an 'a' and a 'b'. Examples of *Raga I* for percussion and two pianos are marked with 'a' and examples of *Raga I* for percussion and orchestra are marked with 'b'.

The last sections of this chapter are discussions of the abductive inferences based on the observations of the different categories in order to build theories about how musical forces operate when material is orchestrated.

The six categories referred to above are discussed in this chapter.

- The addition of significant glissandi, discussed in §2
- The addition of new material, discussed in §3
- The addition of trills and tremolos, discussed in §4
- The addition of instruments to existing material, discussed in §5
- Change in dynamics, discussed in §6
- Changes in register, discussed in §7

2. **Glissandi**

I could have categorised the addition of glissandi under the category 'addition of instruments', but due to its salient sound functions and frequency of use I decided to put it in its own category. Two classes of glissandi in *Raga I* for percussion and orchestra are included in the observations, and they are discussed in the sections below – I refer to them as 'significant glissandi'. The significant glissandi can be divided into two classes in terms of the differences between the two versions of *Raga I* that are compared here:

- Glissandi that start at the end of segments and that are significant, specifically in terms of the energy they add to the end of segments (some instances are glissandi between stable tones and some instances are glissandi between unstable tones)
- Glissandi that start at the beginning of segments and that become more significant towards the end of segments because increasingly more energy is added towards the end of segments (some instances are glissandi that start with a colouristic function and then add increasingly more energy toward the end of the segment, and one instance is glissandi between stable tones with the primary function of increasing density)

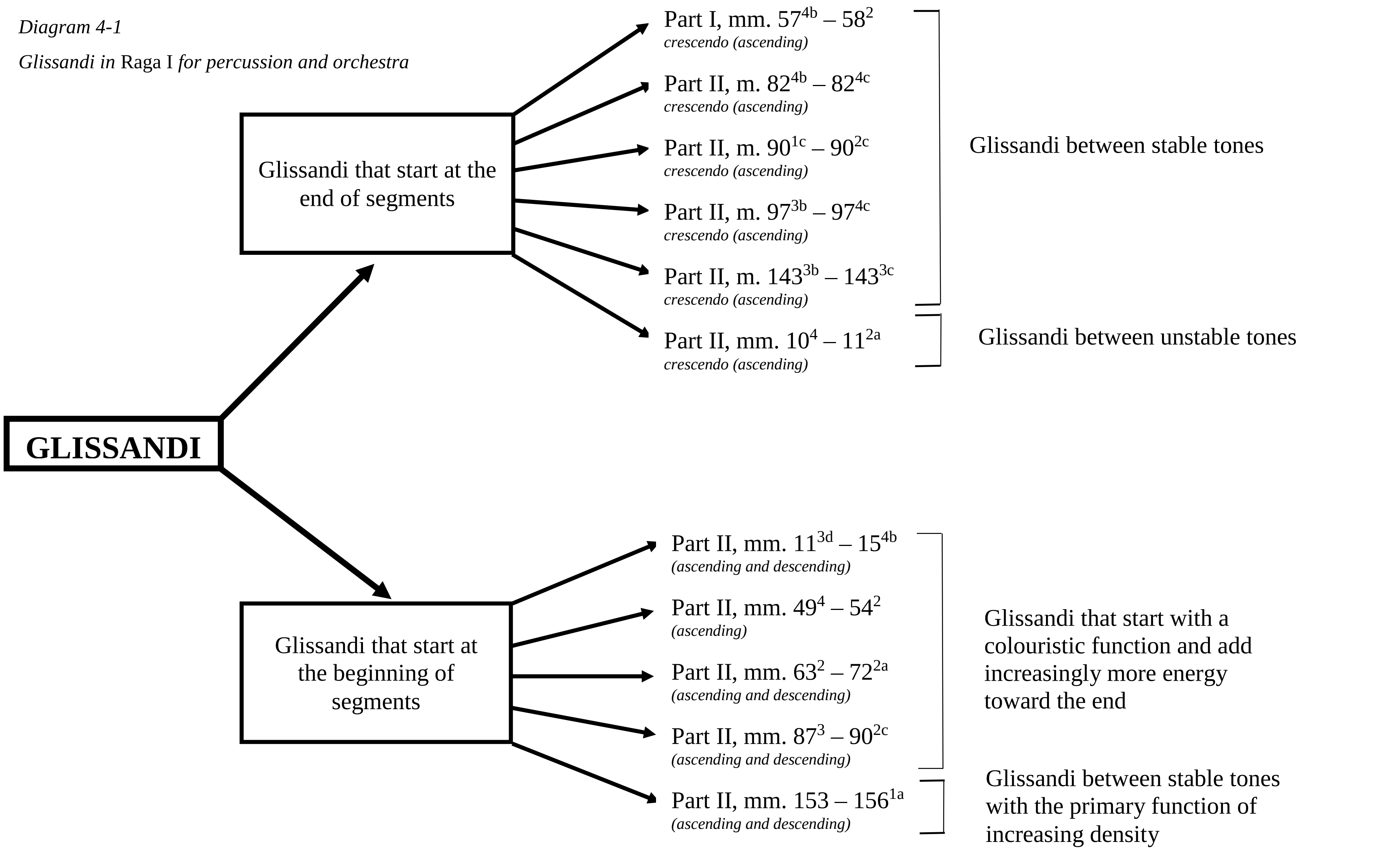
The significant glissandi included in this chapter are summarised in Diagram 4-1.

Some glissandi in *Raga I* for percussion and orchestra were excluded because

- they serve a colouristic function only, and
- they do not add energy in a significant way.

Diagram 4-1

Glissandi in Raga I *for percussion and orchestra*



2.1 Significant Glissandi that start at the End of Segments

All of the instances that start at the end of segments are ascending glissandi, and should be performed with crescendo, as indicated in the score. An 'instance' is not necessarily a single glissando, but can also be multiple glissandi or repeating glissandi that can be grouped together in listening and/or in analysis. The harp glissandi are quick successions of tones from the seven tone scale because the strings of the harp are tuned to the seven tone scale of the composition. The bowed string glissandi are quick successions of all possible tones – including microtones – between the two outer tones of those glissandi. Glissandi in the harp are heard as dense because strings that are plucked continue to ring while other strings are plucked. Glissandi for the bowed string instruments are heard as dense – but in a different way – because of quick successions of microtones that are produced between the outer tones of the glissandi. Ascending glissandi are more salient and fulfil functions of adding energy, discussed below, better than descending glissandi – especially in the harp. This is because of the strings that get increasingly shorter as the tones get higher, and their sound become increasingly more salient or sharper. The crescendos support the glissandi in becoming more salient.

Some glissandi at the end of segments serve the functions below or a combination of some of these functions.

- They add energy to the end of segments. In segments where glissandi are found, they start at different points to accumulate energy towards the end. The addition of glissandi at the very end of those segments cause significant increases in energy at the end of those segments. This addition of energy by the glissandi at the end of segments are due to the quick succession of tones, heard as momentum building up and culminating with a splat on a hardened platform. (The terms 'splat' and 'hardened platform' are taken from Hatten (2012b).)

- They add density to the end of segments. Two instrument groups are involved in the glissandi that I include in my discussion: the harp and the bowed strings. Although both are string instruments, they differ notably when compared in terms of the performance manner and sound of glissandi. Despite their notable differences, glissandi of both instrument groups fill the musical space in a significant way and are therefore heard as dense.[2]
- They amplify stability or instability at the end of segments. The outer tones of the glissandi are the most salient tones in terms of pitch. Listeners do not hear individual tones during the quick successions of tones between the outer tones of the glissandi. The outer tones of the glissandi amplify stable tones, amplify unstable tones, or amplify movement of unstable tones to stable tones – and subsequently the operation of musical forces, as will be discussed later. Because these outer tones are heard as the most salient tones of the glissandi, they relate to some of the functions served by the addition of musical instruments on stable tones, unstable tones, or unstable tones that move to stable tones.[3] This is only valid for the outer tones, but the outer tones are not heard as disconnected from the glissandi, but rather as part of a larger musical pattern. The glissandi are thus heard as a sound pattern that is repelled from a stable or unstable tone, and again approaching a stable or unstable tone.
- They elucidate larger structures, such as segments. Glissandi are goal-directed in terms of their ascending or descending direction, they fulfil an important structural function for listeners and help listeners to hear larger structures, like segments, better in the composition. The glissandi, listed here, emphasise the end of segments for listeners. Glissandi that start at the beginning of segments help listeners to hear smaller structures,

[2] Density is directly linked with energy: material becomes denser when more energy is added, and vice versa; material in which more energy is added becomes denser, and vice versa. For the remainder of this report I discuss energy and density concurrently.
[3] The addition of instruments is discussed in §5.

like musical gestures and segments as the glissandi becomes denser toward the end of the segment.

- They connect conjunct segments. Some glissandi connect two conjunct segments. Instead of ending a single segment with more energy and density, some significant glissandi expand further from the end of one segment into the beginning of the next segment. The two segments remain structurally distinct and can be clearly heard as two segments, but they are connected by the glissando. Segments that are connected by glissandi change their conjunction from separate, joint, or close positioning to bridged or hinged positioning (see Thoresen, 2017 – discussed in Chapter 3, §3.2.3). Accumulated energy is transferred from one segment to the next and the glissando ends with the culmination of the energy in the beginning of the new segment, investing energy in the new segment.

Glissandi at the end of segments – between stable tones

Raga I, part II, mm. 95-97

Example 4-1a

The first piano mostly has tremolos between stable Ds an octave apart in the right hand part, and dyads constructed from the pitch class series in the left hand part. The dyads in the left hand part are separated by rests. The second piano has melodic material constructed from the pitch class series. The material of both pianos is marked ***mf*** and each tremolo is marked with a crescendo.[4] The tremolo and scalar passage of the first piano, and the melodic material of

[4] Although it is not marked explicitly in the score, every tremolo should start at the dynamic level ***mf***.

the second piano are marked with a crescendo towards the end of the segment (m. 97). The last crescendos of the segment culminate in cluster[5] chords in m. 97^{4c}.

Example 4-1b

The harp cooperates from the beginning of the segment (m. 95) with the woodwind and brass instruments to amplify the chords that consist of stable Ds only. In m. 97^{3b} the harp starts with a glissando on D3. The end of the glissando on D5 coincides with an added dyad in the harp that consists of the tones D4, D6, and D7 in m. 97^{4c}.

This exemplar shows a harp glissando that was added between stable Ds at the end of a segment. The quick succession of fifteen tones from D3 to D5 in this glissando

- adds energy to the end of the segment. The end of this segment in m. 97^{4c} is on a cluster chord which is the climax of the segment. The glissando starts to add energy prior to the arrival on the cluster chord and anticipates the arrival on the climax at the end of the segment. This is because listeners anticipate the movement of the harp to continue in the same direction and to culminate at a point. The crescendo of the glissando also amplifies the crescendos of the other material. This makes the cluster chord – the climax of the segment – the loudest point of the segment.
- adds density to the end of the segment. Even without the glissando, the segment becomes denser as it moves towards the end, and the energy provided by the glissando contributes to the accumulating density at the end of this segment. The cluster chord at the end of the segment is the densest point of the segment and of the harp glissando. It is considered as a dense point in the harp glissando, because all the other strings that are activated to perform the glissando are still ringing.

[5] I include harmonically inverted clusters when I use the term 'cluster' in this thesis.

- amplifies stability at the end of the segment. Although the segment ends on a cluster chord that is constructed of stable and unstable tones, the chord itself is heard as stable. The glissando start on only stable Ds and end on the cluster chord, which is constructed mostly of stable Ds. The moving glissando is heard as unstable, and when it ends on stationary stable tones, it amplifies the stability of those tones in a stable context.
- elucidates the end of the segment (m. 97) with a climax and the start of a new segment (m. 98) with a contrasting percussion solo. Although the glissando is not the most salient factor that elucidates the structure of this segment, it does play a supporting role.

Example 4-1a

Raga I *for percussion and two pianos, part II, mm. 95-97*

Example 4-1b

Raga I *for percussion and orchestra, part II, mm. 95-97*

Glissandi at the end of segments – between unstable tones

Raga I, part II, mm. 9-11

Example 4-2a

The first piano mostly has trills between D and its semitonal auxiliaries. In mm. 10^{1}-11^{1} (right hand part) and mm. 10^{3}-11^{1} (left hand part) the trills are replaced by octave tremolos on C♯s and E♭s. Both tremolos culminate as octave dyads in m. 11^{2a} (C♯4, C♯5, E♭5, and E♭6), marked with a marcato. These dyads also mark the end of the segment.

Example 4-2b

Harp glissandi were added at the end of the segment in mm. 10^{4}-11^{2a}, starting on unstable tones C♯4 and C♯5, and ending on unstable tones E♭5 and E♭6.[6] The culmination of the glissandi on the octave C♯s and E♭s are marked with marcatos. The glissandi are also marked with a crescendo.[7]

---

[6] A single glissando line is indicated in the score, but Henderickx (2016) confirmed that it should be a double glissando from C♯4 and C♯5 to E♭5 and E♭6.

[7] This crescendo ends on the dynamic level ***ff***.

This example shows the only instance of a harp glissando between unstable tones at the end of a segment. This quick succession of ten tones of the glissandi, starting on C♯4 and C♯5 and ending on E♭5 and E♭6 in this segment

- adds energy to the end of the segment. The key trills in the woodwind instruments and the quarter-tone trills in the violins, both marked with crescendos, accumulate energy towards the unstable C♯s and E♭s in the woodwind instruments and violins. The glissandi at the end of this segment add more energy to the culmination on the unstable chord in m. 11^{2a}.
- adds density to the end of the segment. The key trills in the woodwind instruments and the quarter-tone trills in the violins, both marked with crescendos, become denser as they move towards the end of the segment, and the glissandi add more density toward the end of this segment.
- amplifies instability at the end of the segment. This segment ends on unstable tones only, and the glissandi also start and end on unstable tones, doubling C♯s and E♭s in the woodwind instruments and violins at the end of the segment. The unstable glissandi do not resolve into any of the instruments that had the unstable tones. The end of this segment is thus unstable and has the tendency to resolve to a stable start in the segment that follows. The conjunction of the two segments is overlapping, as described by Thoresen (2017).

Example 4-2a

Raga I *for percussion and two pianos, part II, mm. 9-11*

Example 4-2b

Raga I *for percussion and orchestra, part II, mm. 9-11*

2.2 Significant Glissandi that start at the Beginning of Segments

The glissandi discussed in the previous section (§2.1) are added only at the end of segments. The glissandi discussed in this section are added at the beginning of segments and continue for the whole segment, adding significantly more energy towards the end of segments. Yet, these glissandi have similar functions to the glissandi that are only added at the end of segments on a larger structural level.

- Energy and density are added increasingly more towards the end of the segment.
- Stable or unstable tones are amplified at the end of segments.
- Larger structures, such as segments, are elucidated.
- Conjunct segments are connected by glissandi.

Although the functions of the glissandi mentioned in this section are similar to the functions of the glissandi discussed in the previous section, they also function on smaller meso-levels of structure, such as musical gestures. These musical gestures amplify listeners' experience of stability, instability, and movement between stability and instability in musical gestures (operation of musical forces). The elucidation of these meso-levels of structure (musical gestures) has subsequent implications on the macro-levels of structure (segments).

Glissandi starting with colouristic functions and increasing in energy toward the end

Raga I, part II, mm. 49-54

In Example 4-3a

Repeated musical gestures in the second piano start with an E♭1, C♯2 and D2 cluster, followed by an ascending scalar nonuplet, and then a sustained G♯2 and B♭3[8], followed by permutations of the pitch class series in semiquavers (mm. 49-54).

Example 4-3b

The material of the second piano was orchestrated for the clarinets, bass clarinet, bassoons, contrabassoon, harp, violoncellos and contrabasses. The start of each gesture – the cluster and scalar nonuplet – is amplified by the harp up to the G♯s and B♭s. The harp starts in mm. 49^{4} with E♭1, C♯2, D2 cluster chords – which is a doubling of the material in the violoncellos and contrabasses – and these cluster chords are followed by ascending glissandi – moving in the same direction as the ascending scalar nonuplet. The glissandi end on chords that consist of pitches G♯2, B♭3, G♯3, and B♭4, doubling the material of the two bassoons. This material in the harp amplifies the musical gestures of the second piano that were orchestrated for the woodwind instruments. Although the glissandi in mm. 53^{3}-54^{2} also start on a cluster, they are different from the preceding glissandi. The glissando in m. 53^{3}-53^{4a} goes past the G♯3 and B♭4 to D4, and the glissando in mm. 53^{4b}-54^{2} follows immediately, starting at D3 and ascending to D4 and D5. The end of the last glissando (m. 54^{2}) is marked with an accent.

[8] In the gestures of m. 50^{3}-54^{1}, the sustained G♯s and B♭s are extended with short suffixes.

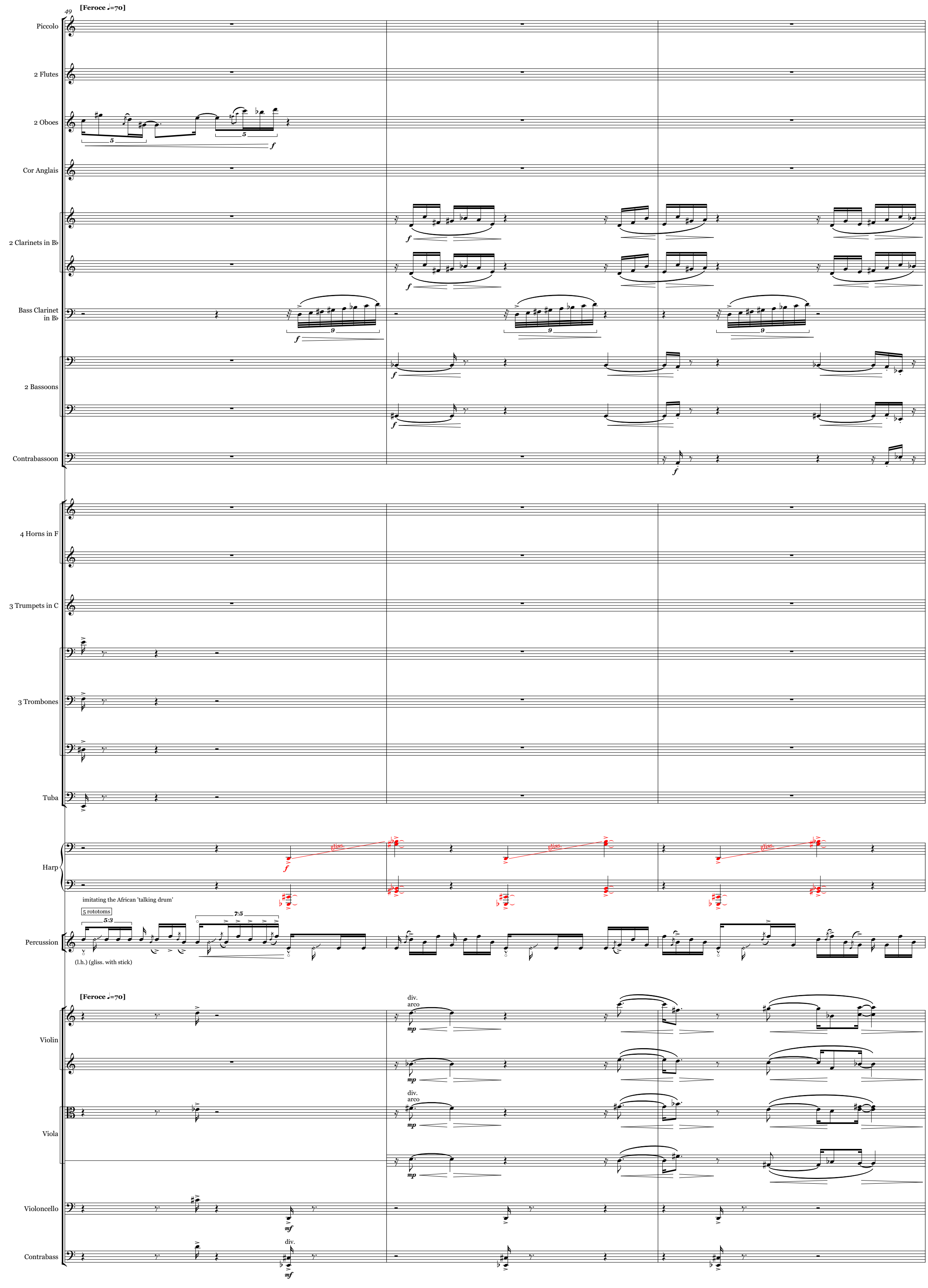
This exemplar shows how harp glissandi were employed from the beginning of the segment, at first supporting movement of musical gestures, and then transforming into more significant glissandi at the end of the segment. These glissandi

- add energy to the segment. Because glissandi start at the beginning of the segment, and not at the end like the previous instances that were discussed, they add energy to the entire segment, and significantly to the end of the segment. The range of the glissandi was enlarged towards the end of the segment, and more energy was subsequently added to the end of the segment.
- add density to the musical gestures and the end of the segment. The glissandi fill musical space on a horizontal dimension and make the musical gestures denser. When more tones were added to the glissando at the end of the segment, it made the texture even denser.
- amplify instability in the musical gestures and then stability at the end of the segment. The musical gestures that are amplified by the glissandi start stable and end unstable. The unstable tones, G♯ and B♭, on which the harp ends, amplify this instability of the musical gestures. The end of this segment ends on both stable and unstable tones, but it is heard as a stable end. The final tones of the last glissandi (mm. 53^{4b}-54^{2}) are stable Ds that amplify the stability at the end of this segment.
- elucidate smaller and larger structures of the segment. The glissandi elucidate the start of the musical gestures (mm. 49^{4}-50^{1}; m. 50^{3}-50^{4}; m. 51^{2}-51^{3}; m. 52^{1}-52^{2}; and mm. $52^{4}53^{1}$) which help listeners to hear these musical gestures clearly. The glissandi in mm. 53^{3}-54^{2} also elucidate the larger structure – the movement of one segment to the next.
- connect two segments. The last glissandi, mm. 53^{4b}-54^{2}, end on stable Ds at the start of the new segment in m. 54^{2}. These stable Ds coincide with the stable Ds in the violins

and violoncellos of the new segment. The range of this glissando over two segments is at first heard as unstable, but then heard as stable when it reaches its final, stable, tones.

Example 4-3a

Raga I *for percussion and two pianos, part II, mm. 49-53*



Example continues on next page

Example continues

Example 4-3b

Raga I *for percussion and orchestra, part II, mm. 49-54*

Glissandi providing density and adding energy toward the end of segments

Raga I, part II, mm. 153-156

Example 4-4a

Raga I *for percussion and two pianos, part II, mm. 153-156*

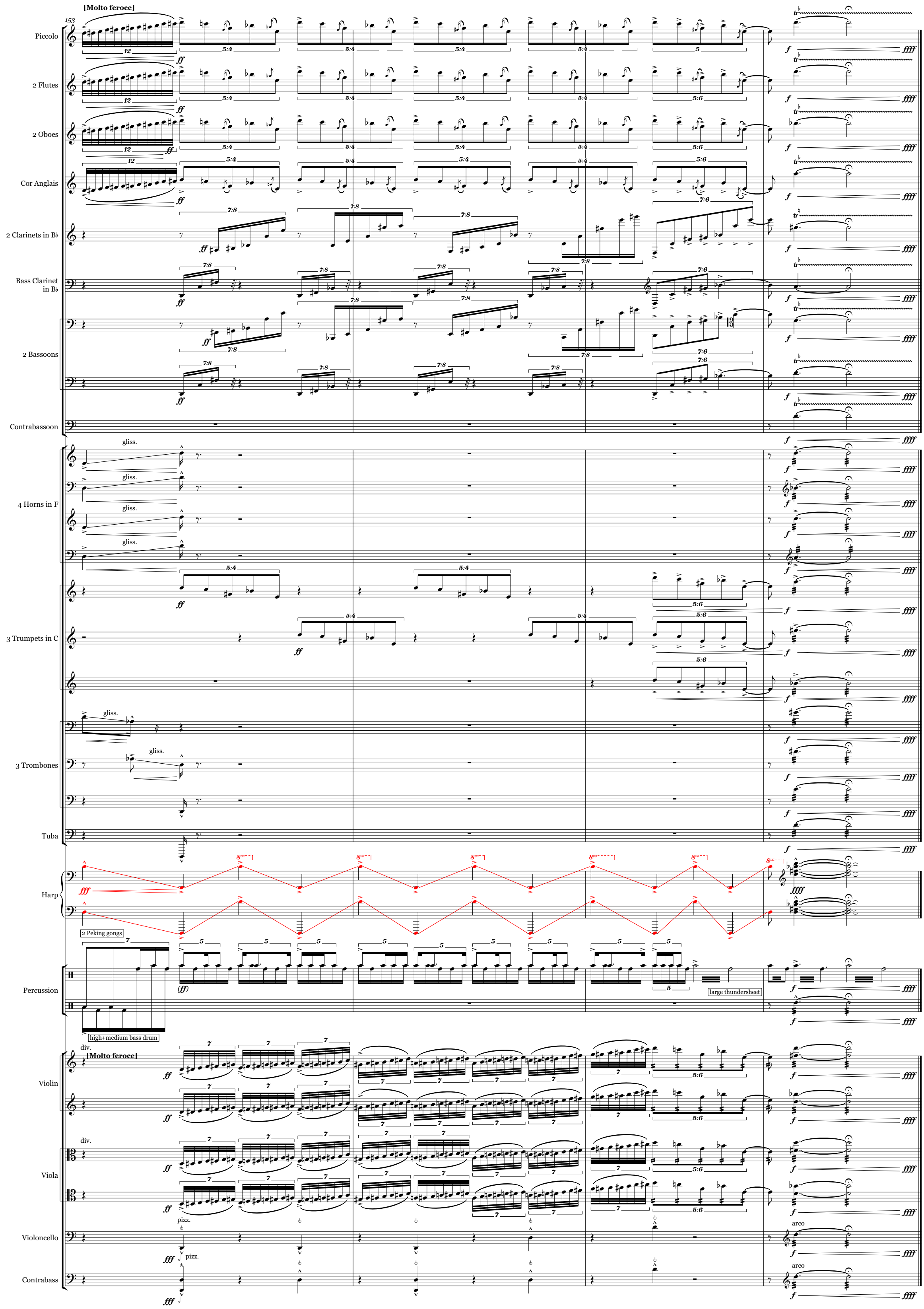
Example 4-4a

This segment starts with an ascending glissando over two octaves for the first piano and a descending glissando over two octaves for the second piano. The material of this segment consists mainly of descending musical gestures in the first piano and ascending musical gestures in the second piano. The descending musical gestures in the first piano are repeats of the musical gesture that first appears in m. 153^2-153^3 and the ascending musical gestures in the second piano are permutations of the pitch class series on which this composition is based. Each of these musical gestures in both the first and the second piano start on accentuated stable Ds.

Example 4-4b

The material of the first piano was orchestrated for the piccolo, flutes, oboes, cor anglais, and trumpets (mm. 153-156). The material of the second piano was orchestrated for the clarinets, bass clarinet, bassoons, violoncellos, and contrabasses (m. 153-156), as well as the violins and violas (m. 155^2-156). The harp adds descending and ascending glissandos during the largest part of this segment (mm. 153-156^{1a}), of which only the descending glissando in m. 153^1 is an orchestration of the descending glissando of the second piano in the version for percussion and two pianos.[9] The D1s and D2s, which are the lower turning points of the harp glissandi, correspond with the stable Ds orchestrated for the violoncellos and contrabasses. Each descent and ascent start on an accentuated stable D and they should be performed louder[10] than ***fff***.

[9] The ascending glissandi in the four horns were not indicated as significant phenomena here because they are heard as an orchestration of the ascending glissando of the first piano.
[10] My understanding is that the harp glissandi should be performed louder (if possible) than the dynamic indication ***fff*** because the dynamic indication at the beginning of the segment is followed by a crescendo and not indicated otherwise after the crescendo.

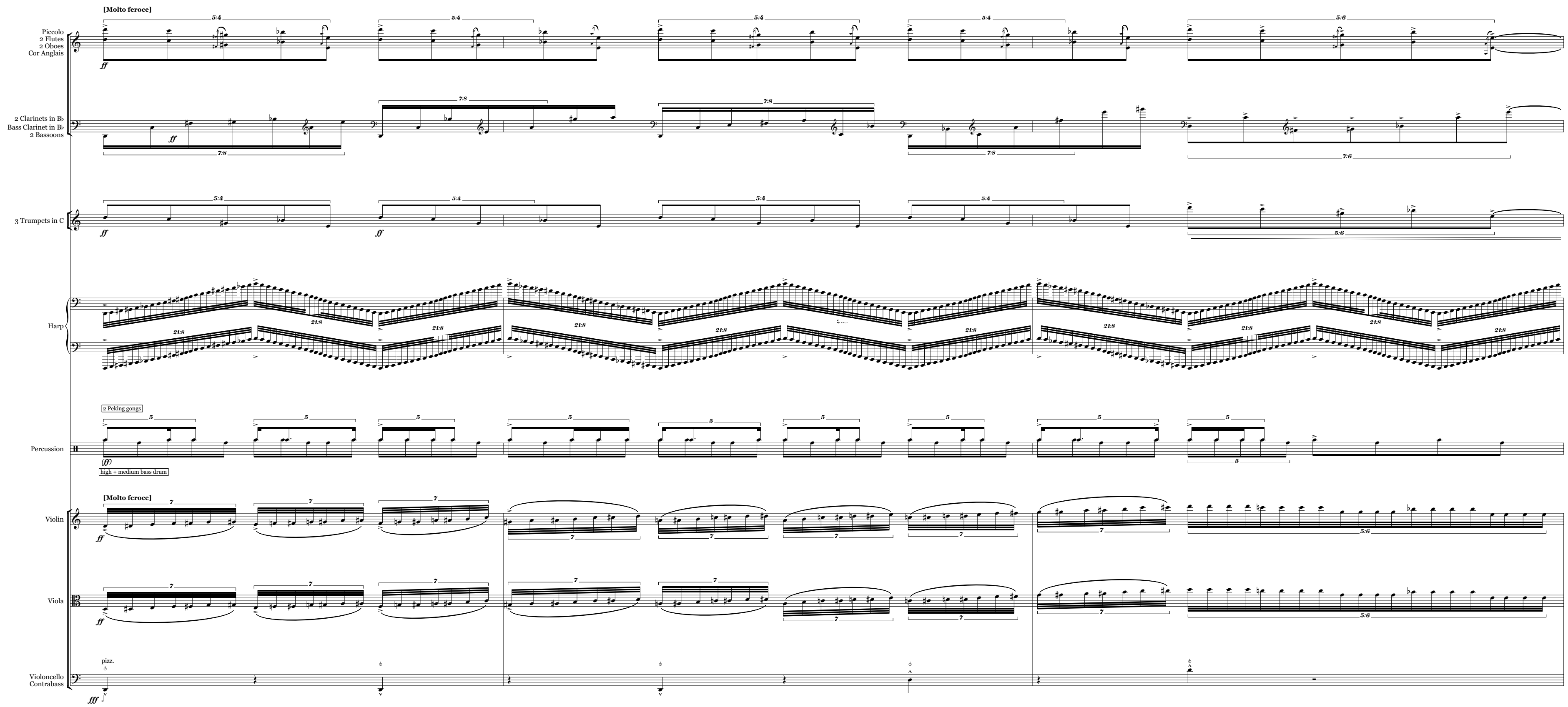


Example 4-4b

Raga I *for percussion and orchestra, part II, mm. 153-156*

This exemplar shows how ascending and descending harp glissandi between stable Ds were employed to

- provide density. The continuous addition of tones by the ascending and descending glissandi adds energy and density to the segment. In order to invest a lot of energy, and subsequently condense the segment, the ascending and descending glissandi of the harp are employed to achieve this increase in density in the entire segment. In Example 4-4c I notate the glissandi to show how the glissandi operate among other dense textures in the segment – the material of the other instruments was reduced to enhance legibility in the example.
- amplify stability. The outer tones of the glissandi are stable Ds, of which the lower D1s double the material of the violoncellos and contrabasses in the same and other registers. The motion of the glissandi is heard as tones that are repelled from a stable platform, and that are then immediately attracted again by a stable platform. This amplifies stability in the segment.



Example 4-4c

Raga I *for percussion and orchestra, part I, mm. 153-156: glissandi operating among other dense textures in the segment*

3. Additions of New Material

All instances[11] of new material in *Raga I* for percussion and orchestra were included in this section. I did not exclude any instances, because I heard all additions of new material in the version for percussion and orchestra as salient when compared with the version for percussion and two pianos. The new material added can be divided into four classes:

- New material that moves from instability to stability;
- New material that consists of stable tones only;
- Vertical chords that consist of both stable and unstable tones[12]; and
- Chromatic chords that ascend and descend[13].

These classes of new material added in *Raga I* for percussion and orchestra are discussed in the sections below. The classes and instances of this category are shown in Diagram 4-2.

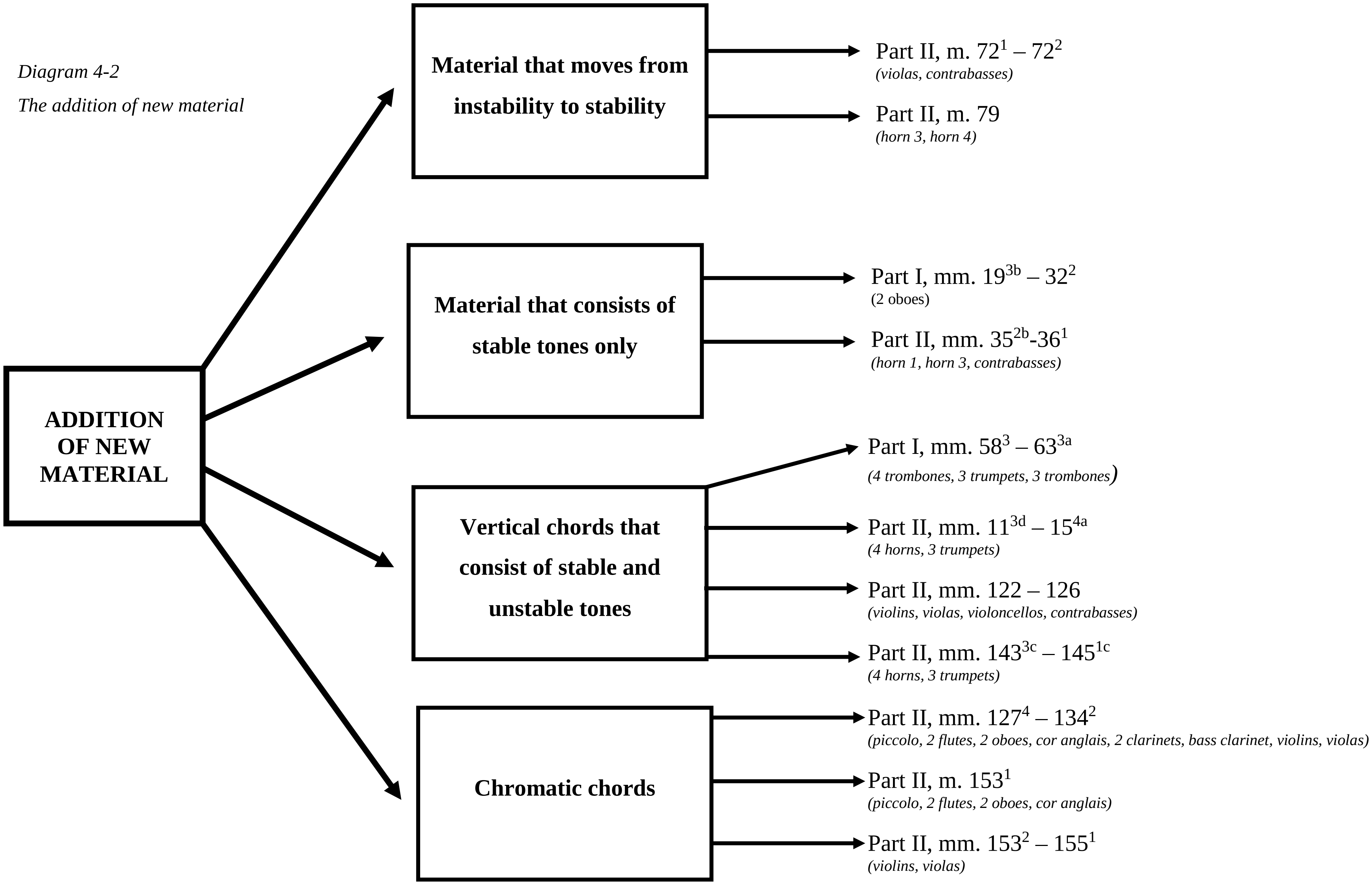
[11] Orchestrated pedal effects are not considered as new material in *Raga I* for percussion and orchestra. Thus, when instruments are employed in order to give the resonance of the undampened piano strings, that material is not discussed here.
[12] These vertical chords are heard as new material, but the pitch material of the vertical chords is derived from the pitch material of the horizontal gestures that coincide with those chords.
[13] The start of the vertical pitch material is derived from chords in *Raga I* for percussion and two pianos, and orchestrated as ascending and descending chromatic lines. These chromatic chords are heard as new material.

Additions of new material serve the following six functions.

- They add energy to segments. Playing instruments provide the energy of music, and when playing instruments are added, energy is added.
- They add density to segments. Additions of energy cause denser textures, either in the middle of segments or at the end of segments.
- They amplify stability or instability in segments. Added material is either stable material, unstable material, or a combination of stable and unstable material. This material amplifies stability or instability of the material that they are added to.
- Some of them create new sources of instability with tendencies to move to stable tones. This new material approaches the stable tones from a different direction, firstly amplifying the instability and then the stability when the stable tone is reached. Ultimately, stability is amplified.
- Some of them elucidate structures, such as musical gestures. These additions of new material are vertical chords that are heard only at the beginning of musical gestures. The beginnings of musical gestures subsequently become more salient to listeners.
- Some of them add vertical dimensions to horizontal material. The pitch classes of new vertical material are derived from the horizontal material.

Diagram 4-2

The addition of new material



3.1 New Material that moves from Instability to Stability

Instances in this class are additions of unstable and stable tones where the unstable tones resolve to stable tones in order to amplify stability. Two instances of new material that moves from instability to stability are found in *Raga I* for percussion and orchestra. One instance listed, part II, m. 79, is found only in the CeBeDeM edition.

Addition of new material that moves from instability to stability

Raga I, part II, mm. 71-72

Example 4-5a

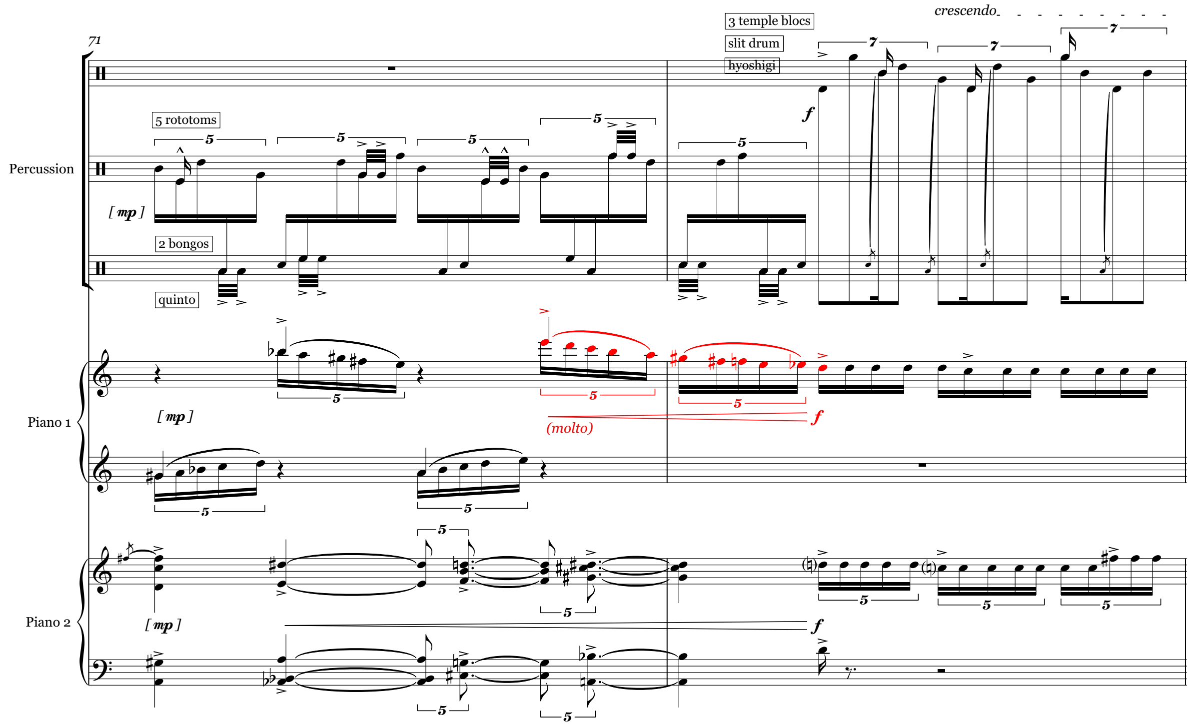
The material of the first piano ends the segment with a descending gesture and merges in m. 72^{2} with the start of a new segment. The two segments are joined through hinged position.

Example 4-5b

The descending gesture in mm. 71^{4}-72^{2a} was orchestrated for tutti woodwind instruments and tutti string instruments. However, the material in the violas and contrabasses does not descend in m. 72 – it ascends. Unlike the descending material towards the stable D, the added ascending material approaches the stable D from the bottom. This change in direction is heard as the addition of new material at the end of the segment, and it influences the operation of musical forces, an observation that will be discussed later

This new material is the only instance in the category and serves the following functions in *Raga I* for percussion and orchestra.

- It adds energy and density to the end of the segment.
- It creates a new source of instability that has the tendency to resolve to a stable tone.
- Because the ascent is approaching the stable tone from a different direction, it is heard as a new source of instability, but the stable goal is the same as that of the descent.
- It amplifies stability, because unstable material is heard as resolving to stable material.



Example 4-5a

Raga I *for percussion and two pianos, part II, mm. 71-72*

Example 4-5b

Raga I *for percussion and orchestra, part II, mm. 71-72*

3.2 New Material that consists of Stable Tones only

Instances in this class are additions of new material that consists of stable tones only. These added stable tones are combined with stable and/or unstable surrounding material. Two instances of new material that consists of stable tones only are found in *Raga I* for percussion and orchestra.

New material that consists of stable tones only

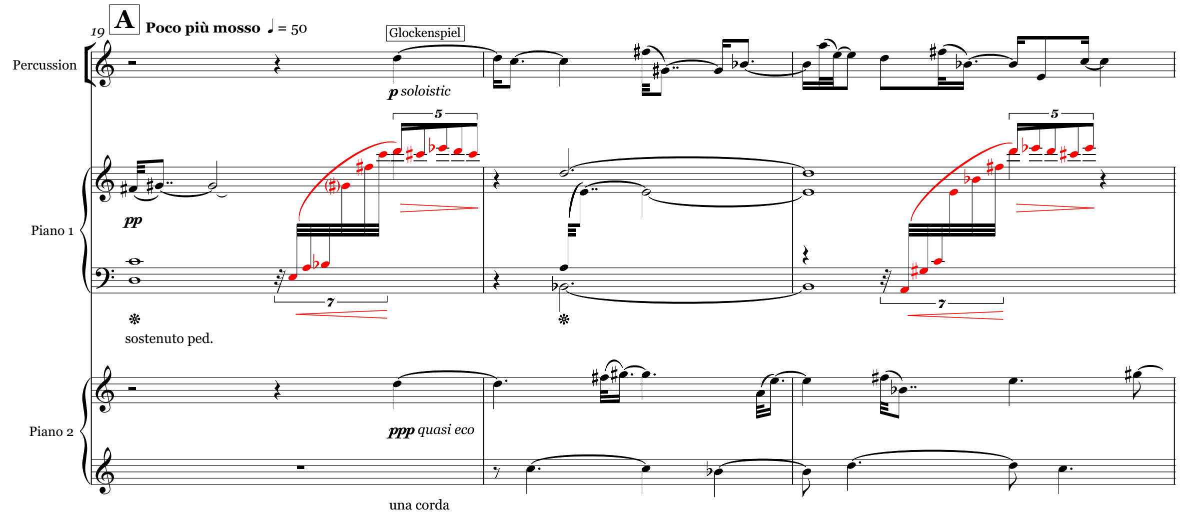
Raga I, part I, mm. 19-21

Example 4-6a

The material of the first piano consists of short musical gestures. Each musical gesture consists of ascending tones, and ends on a quintuplet that consists of Ds, C♯s, and E♭s.

Example 4-6b

The starts of these musical gestures were orchestrated for four horns, violins, violas, and violoncellos. The ascending tones that are part of the musical gestures were orchestrated for the harp, and the quintuplets at the end of the musical gestures were orchestrated for two oboes. The stable D of each quintuplet is extended by a preceding dotted quaver that is tied to the first D of each quintuplet. These stable Ds that precede the quintuplets are added stable tones that are not in the version for percussion and two pianos. It is thus heard as an addition of material.



Example 4-6a

Raga I *for percussion and two pianos, part I, mm. 19-21*

Example 4-6b

Raga I *for percussion and orchestra, part I, mm. 19-21*

These stable tones were added in *Raga I* for percussion and orchestra to serve the following functions:

- They add stable tones to the musical gestures.
- They amplify stability in the musical gestures, and make the stable tone (D) and unstable tones (C♯ and E♭) aurally more salient.
- They create a stable platform for the material of the harp.
- They anticipate the resolution of the unstable material to stable material. The ultimate goal of these musical gestures is a stable D6, which is the same pitch as the tones added to the two oboes.

3.3 New Vertical Chords that consist of Stable and Unstable Tones

The pitch class material of the vertical chords added in this class is derived from horizontal musical gestures. The added material is thus a combination of stable and unstable tones. Four instances of new vertical chords that consist of stable and unstable tones are found in *Raga I* for percussion and orchestra.

New vertical chords that consist of stable and unstable tones

Raga I, part II, mm. 122-126

Example 4-7a

The material in the second piano consists of short hinged musical gestures, and the start of each musical gesture is marked by an accentuated octave in the left hand part.

Example 4-7b

These musical gestures were orchestrated for bass clarinet, two bassoons, and contrabassoon. Each musical gesture starts in the contrabassoon and bassoon 2, and continues in the bass clarinet and bassoon 1. The starts of these horizontal musical gestures are amplified in the string instruments with vertical quaver chords: the tones of the horizontal musical gestures are condensed as vertical chords at the start of each horizontal musical gesture.

Example 4-7a

Raga I *for percussion and two pianos, part II, mm. 122-126*

Example 4-7b

Raga I *for percussion and orchestra, part II, mm. 122-126*

The addition of the vertical chords in *Raga I* for percussion and orchestra serves the following functions:

- They elucidate the start of each musical gesture.
- They add energy and density to the musical gestures.
- They amplify stability or instability in the musical gestures.

3.4 New Chromatic Chords that Ascend and Descend

Two types of chromatic ascents and descents are found in *Raga I* for percussion and orchestra. The first type is chromatic ascents and descents of which the starting tones are derived from dissonant chords. They are thus dense dissonant ascents and descents. The second type is chromatic ascents and descents that move in unison or octaves apart. They are thus dense consonant ascents and descents.

New chromatic chords that ascend and descend

Raga I, part II, mm. 127-134

Example 4-8a

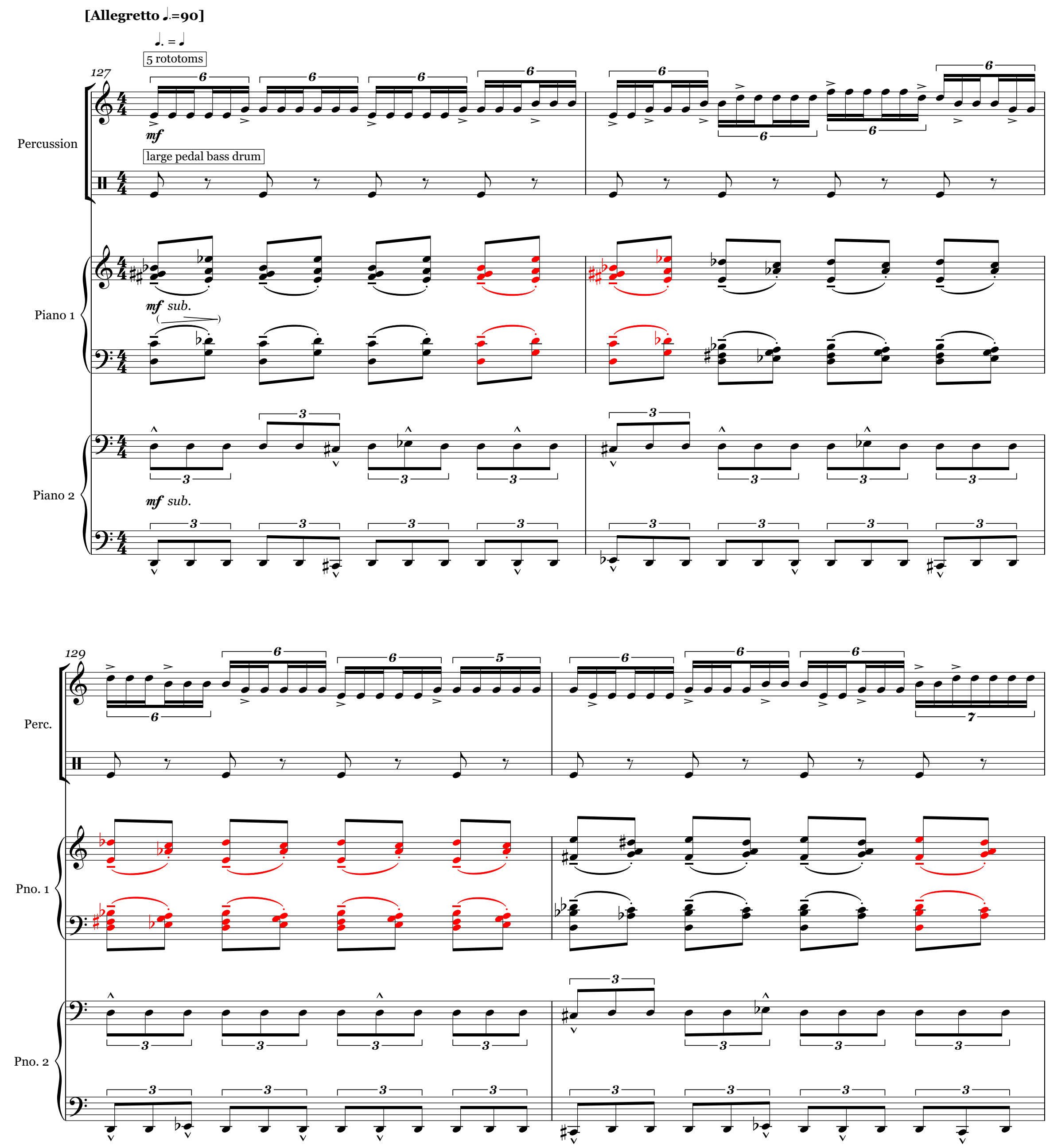
The material of the first piano consists of cluster chords made up of the tones of the series of the composition, and the material of the second piano consists of repeated Ds that are interrupted with accentuated C♯s, Ds, and E♭s.

Example 4-8b

The cluster chords of the first piano were orchestrated for four horns, three trumpets, and harp. The material of the second piano was orchestrated for the violoncellos and contrabasses, and the accentuated unstable tones that move to stable tones in this material are amplified in the two bassoons and contrabassoon. The focus of this discussion is on the cluster chords that are alternated with the altered chords. The cluster chords in the four horns and three trumpets are alternated with chords in the tutti woodwind instruments, violins, and violas – chords of which the pitch material is derived from the cluster chords. These chords in the woodwind instruments continue immediately as chromatic chords of semiquaver sextuplets that ascend and descend with semitone intervals.

The ascending and descending chromatic chords in *Raga I* for percussion and orchestra serve the following functions:

- They add energy and density to the segment. The chords in mm. 127^4-134^2 for the woodwind instruments are alternated with less dense chords in the brass instruments. Even though those alternations are heard as dense, the end of the segment (mm. 133^2-134^2) play an even more significant role in creating density – especially towards the end of segments: the chromatic chords in mm. 133^2-134^2 do not alternate with chords in the brass instruments, but are combined with those chords. Thus, the material becomes denser at the end of that segment because the short durations of the semitones add horizontal energy and density, and the combination of material adds vertical energy and density.
- They amplify instability in the segment. Apart from their dissonance, most of these cluster chords are heard as unstable. The continuous ascending and descending cluster chords in semitones create instability because they do not resolve to a stable chord.
- They elucidate larger structures, especially the alternation between instrument groups. The chromatic chords in mm. 127^4-134^2 for the woodwind instruments, violins, and violas alternate with chords in the brass instruments. These chromatic chords are first heard for two crotchet beats (mm. 127^4-128^1), four crotchet beats (m. 129), two crotchet beats (mm. 130^4-131^1), one crotchet beat (m. 132^1), and then five crotchet beats (mm. 133^2-134^2). These additions of chromatic chords get increasingly longer toward the end and this helps listeners to hear the end of the segment (m. 134^2) as a climax, and the start of a new segment (m. 134^3) with contrasting material.



Example continues on next page

Example continues

Example 4-8a

Raga I *for percussion and two pianos, part II, mm. 127-134*

Example continues on next page

Example continues

Example 4-8b

Raga I *for percussion and orchestra, part II, mm. 127-34*

4. **Trills and Tremolos**

I combine instances of trills and tremolos[14] heard in *Raga I* for percussion and orchestra in my discussion below. They are combined here because the tremolos of *Raga I* for percussion and two pianos were orchestrated as either trills or a combination of trills and tremolos in the version for percussion and orchestra.[15]

Instances of trills, tremolos, and a combination of trills and tremolos – as well as the interrelation between them – are shown in Diagram 4-3. Some subdivisions of bars are not indicated on the diagram because some trills and/or tremolos do not start concurrently. Instances of trills and tremolos are discussed below.

[14] In this section I distinguish between the terms 'trills' and 'tremolos' – terms which are often used interchangeably – to describe different phenomena. Here, 'trills' refer to the rapid alternation between two adjacent tones, a quarter tone, a half tone or a whole tone apart. The term 'tremolo' is used here to refer to a rapid reiteration of tones, or a rapid alternation between two tones that from dyads that are a minor third or larger than a minor third.

[15] I would like to stress that some tremolos of *Raga I* for percussion and two pianos were orchestrated as trills in the version for percussion and orchestra. The phenomena of trills and tremolos that were included and excluded here refer to trills and tremolos in the version for percussion and orchestra of *Raga I*.

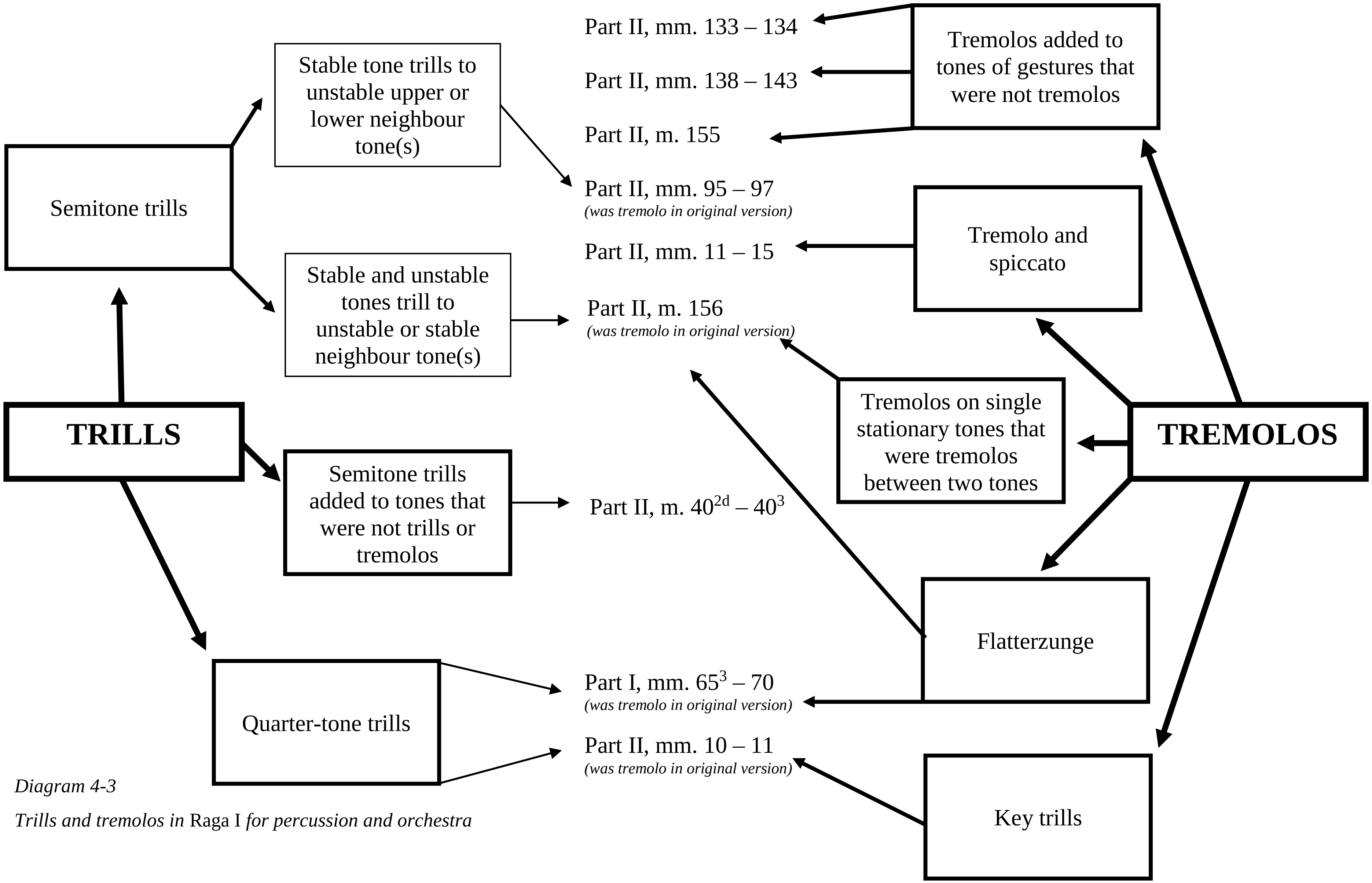


Diagram 4-3

Trills and tremolos in Raga I *for percussion and orchestra*

The trills that are included in my discussion can be grouped into three classes in terms of the differences between the two versions of *Raga I* that are compared here:

- Semitone trills for woodwind instruments of which all were tremolos in *Raga I* for percussion and two pianos: these semitone trills can be classified further into
    - stable tones that trill to unstable upper or lower neighbouring semitones, and
    - a combination of stable and unstable tones that trill to unstable or stable neighbouring semitones.
- Semitone trills that were added in the version of *Raga I* for percussion and orchestra, where no trills or tremolos are heard in the version for percussion and two pianos.
- Quarter tone trills for bowed string instruments of which all were tremolos in *Raga I* for percussion and two pianos.

The tremolos that are included in my discussion can be grouped into five classes in terms of the differences between the two versions of *Raga I* that are compared here:

- Tremolos for tones of some musical gestures in *Raga I* for percussion and orchestra that were not marked as tremolos in the version for percussion and two pianos.
- Some tremolos in *Raga I* for percussion and orchestra are a combination of tremolos and spiccatos for bowed string instruments that were not marked as tremolos in the version for percussion and two pianos.
- Some tremolos from *Raga I* for percussion and two pianos are tremolos between two different tones; these tones were orchestrated as multiple tremolos for multiple instruments of which each tremolo is a rapid reiteration of these tones.

- Some tremolos from *Raga I* for percussion and two pianos were orchestrated as flatterzunge[16] for woodwind instruments.
- Some tremolos from *Raga I* for percussion and two pianos were orchestrated as key trills for woodwind instruments.

All instances of tremolos in *Raga I* for percussion and orchestra were included in this section. Trills that serve a colouristic function in *Raga I* for percussion and orchestra, but not in the version for percussion and two pianos, were excluded here. I discuss instances below where

a) trills and tremolos are combined,

b) tremolos are added, and

c) trills are added.

4.1 Trills and Tremolos Combined

Three instances where trills and tremolos are combined are found in *Raga I* for percussion and orchestra.

- Trills, tremolos, and flatterzunge combined
- Quarter-tone trills combined with flatterzunge
- Quarter-tone trills combined with key trills

An example of each of these instances is presented in this section.

[16] The tones that should be performed with flatterzunge in m. 156 are notated as tremolos for the brass instruments. In part I, mm. 65^{3}-70 flatterzunge is written out as a performance instruction.

Trills, tremolos, and flatterzunge combined at the end of the composition

Raga I, part II, m. 153-156

Example 4-9a

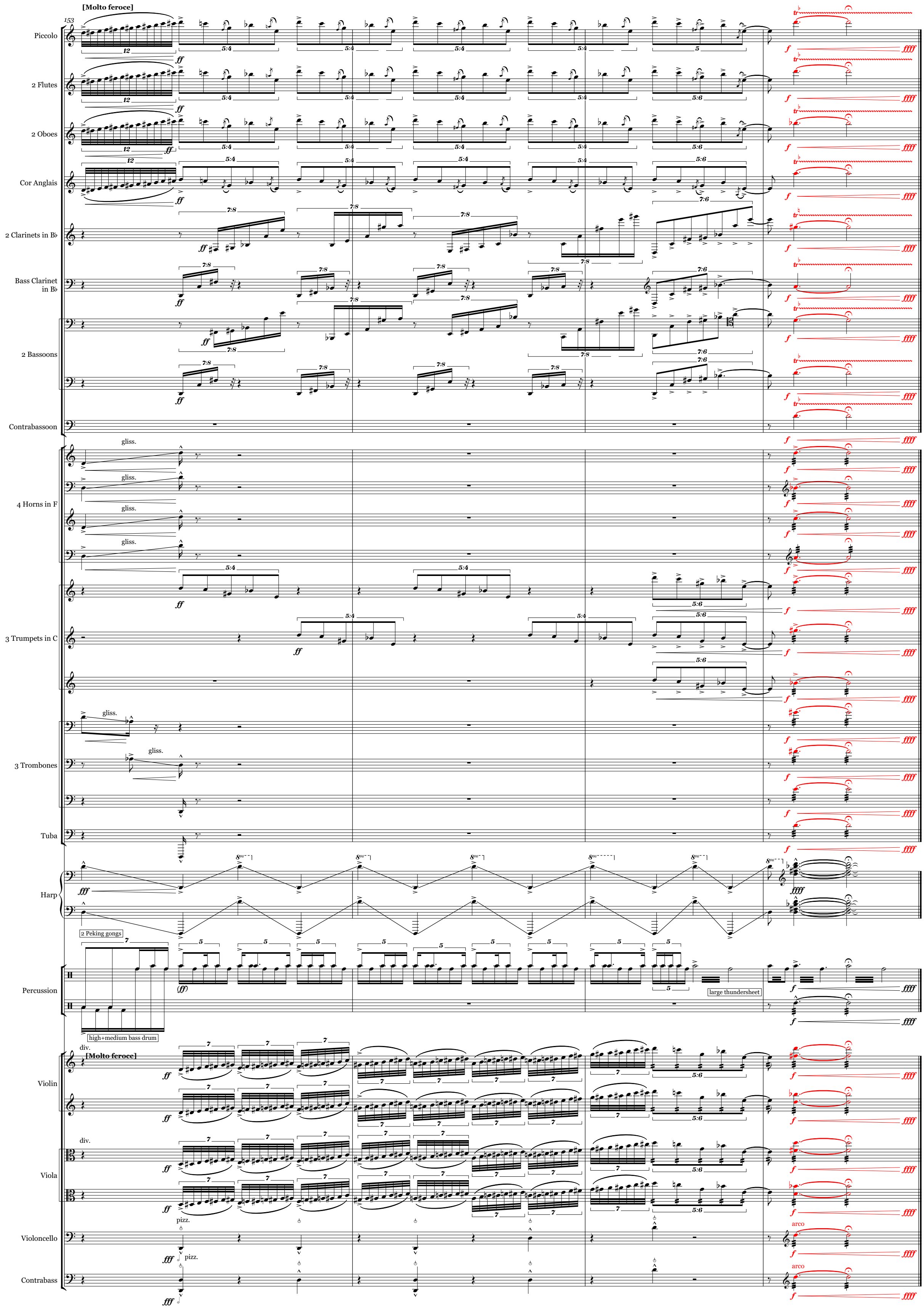
Raga I *for percussion and two pianos, part II, mm. 153-156*

Example 4-9a

The composition is ended by both pianos performing tremolos between dense cluster chords. The cluster chords in each piano are the same, but an octave apart. The pitch class material of the chords is D, E, A, and C for the one chord, and F♯, G♯, and B♭ for the other chord. The material of both pianos is marked with molto crescendo from ***ff*** to ***ffff***.

Example 4-9b

The material of both tremolo chords were orchestrated for tutti orchestra and a different performance technique was employed in each instrument group. The tones in the woodwind instruments are marked with semitone trills. These semitone trills are between pitch classes D-E♭, B♭-A♭, A-A♭, and G♯-G♮. Tones that were orchestrated for the brass instruments are marked with tremolo and consists of pitch classes D, E, F♯, G♯, A, B♭, and C. The tremolo symbols for the brass instruments indicate flatterzunge. The material is orchestrated for the string instruments as double stops (violins and violas) and single stops (violoncellos and contrabasses) marked with tremolos. This material consists of pitch classes D, F♯, and B♭. The start of the material of the four horns is marked with accents. This material is the only material that is not marked with crescendos – all other material is marked with crescendos from ***ff*** to ***ffff***.



Example 4-9b

Raga I *for percussion and orchestra, part II, mm. 153-156*

It is clear from the observations above that three performance techniques were employed in the orchestration of tremolos between chords in the version for percussion and two pianos: trills, tremolos, and flatterzunge. These performance techniques on stable and unstable tones at the end of this composition serve the following functions:

- They add energy to the end of the segment. The alternation between the tones (trills) and the reiteration of tones (tremolos and flatterzunge) is heard as reiterated investments of energy at the end of the segment. These investments of energy also increase because of even more energy that is required by the crescendos. They are also not strictly measured. Performers can thus increasingly speed up the alternations and reiterations of tones in the trills, flatterzunge, and tremolos towards the end.
- They add density to the end of the segment. The alternating tones of the trills and the reiterated tones of the tremolos and flatterzunge increase the density of the material.
- The trills add tones to the end of the segment. The tones to which the tones of the original cluster chord trills are not necessarily one of the tones of the cluster chord and thus add tones to the end of the segment.

Quarter-tone trills combined with flatterzunge

Raga I, part I, mm. 65-70

Example 4-10a

The second piano starts with short musical gestures in m. 65^3, and each of these musical gestures start with octave trills between stable Ds (D3-D2 and D5-D4) – these stable D octave trills result in octave tremolos. They are marked with crescendos from ***mf*** and the last tone of each trill is marked with an accent.

Example 4-10b

The musical gestures of the second piano were orchestrated for two clarinets, bass clarinet, two bassoons, contrabassoon, four horns, harp, and contrabasses. The two bassoons, contrabassoon, four horns, harp, and contrabasses have stable only Ds, and the remainder of the musical gestures were orchestrated for the two clarinets and bass clarinet. The stable Ds of the two bassoons and contrabassoon are marked with flatterzunge and the stable Ds of the contrabasses are marked with quarter-tone trills. These performance techniques are used together with standard ways of playing the instruments.

The quarter-tone trill for the contrabasses combined with flatterzunge for the two bassoons and contrabassoon serve the following functions:[17]

- They add energy and density to the stable Ds. Because the trills and flatterzunge are for the stable Ds only, they have more energy and is denser than the surrounding material.
- They amplify the stable Ds because the stable Ds become audibly more salient. The reiterated tones of the tremolos and the alternating tones of the quarter-tone trills are only heard for the stable Ds and not the surrounding or concurrent material. This amplifies the stable Ds in this segment.
- They elucidate musical gestures, because each gesture starts with tremolos and quarter-tone trills with a certain combination of instruments, and continues without tremolos or quarter-tone trills for that specific combination of instruments. The starts of musical gestures are thus more salient to listeners.

[17] I specifically discuss functions in terms of orchestration and not how these trills and flatterzunge imitate the octave tremolos found in *Raga I* for percussion and two pianos.

Example 4-10a

Raga I *for percussion and two pianos, part I, mm. 65-70*

Example continues on next page

Example continues

Example 4-10b

Raga I *for percussion and orchestra, part I, mm. 65-70*

Quarter-tone trills combined with key trills

Raga I, part II, mm. 10-11

Example 4-11a

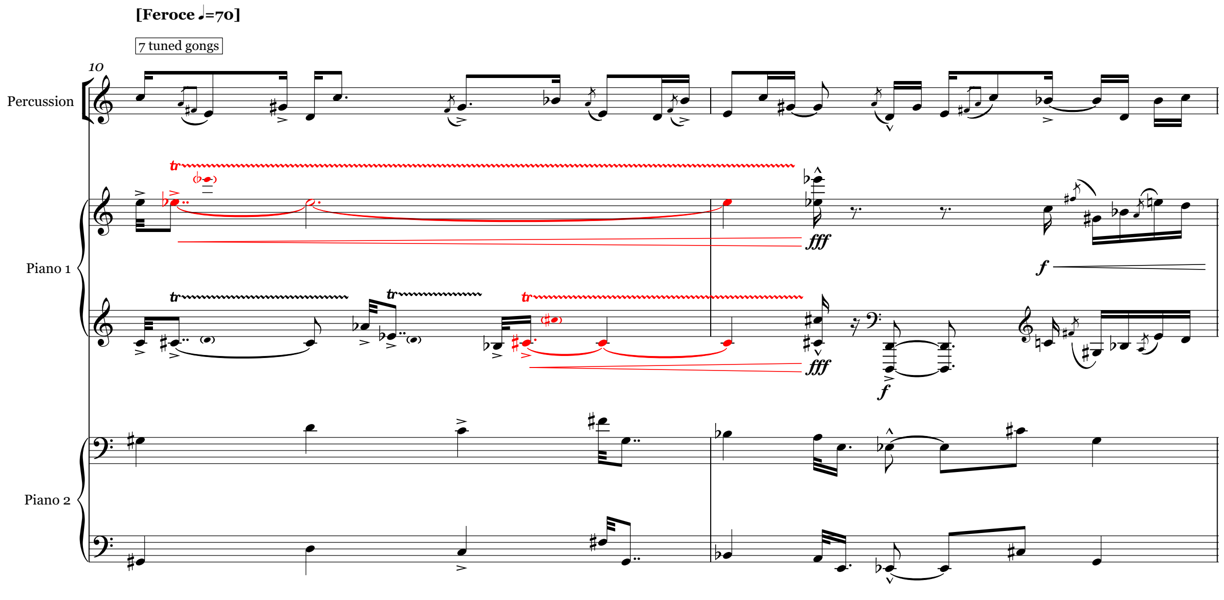
The material of the first piano consists of mainly semitone trills between stable Ds and neighbouring unstable C♯s or E♭s. In m. 10 the semitone trills become octave tremolos between unstable E♭s (right hand part) and C♯s (left hand part). These unstable octave tremolos culminate in m. 11^{2a} on marcato dyads that consists of tones C♯4, C♯5, E♭5, and E♭6.

Example 4-11b

The material of the first piano was orchestrated for two flutes, two oboes, cor anglais, two clarinets, bass clarinet, two bassoons, harp, and violins. Semitone trills are at first only heard in the violins, but when key-trills are added for the two oboes, cor anglais, two clarinets and bass clarinet in m. 10, the violins change to quarter-tone trills. When the key trills for the woodwind instruments are added, the violins change their semitone trills to quarter-tone trills. The key trills of the woodwind instruments are combined with the quarter-tone trills of the violins.

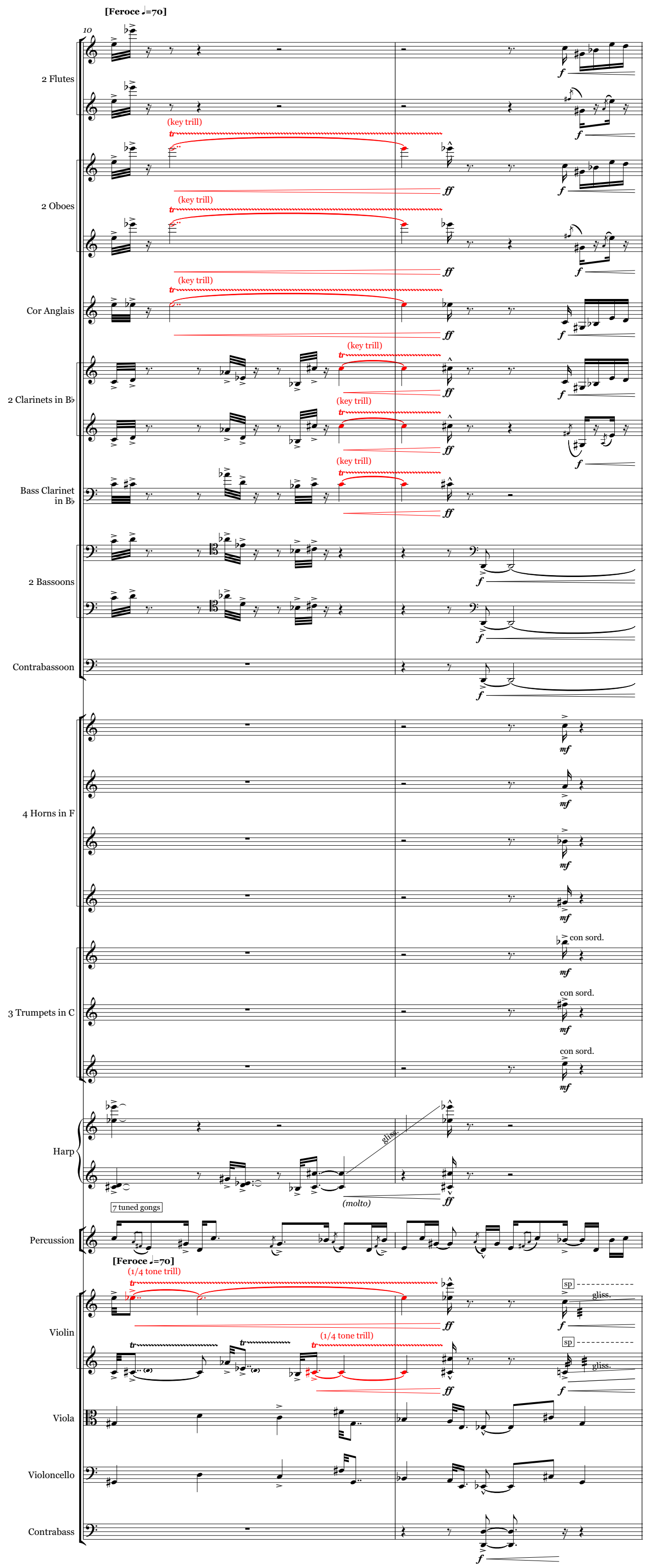
The combination of quarter-tone trills with key trills in *Raga I* for percussion and orchestra serve the following functions:

- They add energy towards the end of the segment. Increasingly more energy is added by the reiterated tones of the key trills and the alternating quarter-tone trills. Both are marked with crescendos. This energy culminates in the unstable dyads, constructed of C♯s and E♭s, heard in m. 11^{2a}.
- They add density to the end of the segment. The quarter-tone trills follow after various semitone trills in the violins, and because the interval between the tones of the trills is smaller, it is heard as more complex and denser. The addition of the key trills in the woodwind instruments also adds density to the end of this segment.
- They amplify instability because the unstable tones C♯ and E♭ become increasingly more salient towards the end of the segment. The key trills and quarter-tone trills culminate in unstable dyads that do not resolve in the same instruments. The instability of the tones at the end of that segment is thus amplified.
- They elucidate larger structures, such as the end of the segment. The key trills and quarter-tone trills create the expectation that they will culminate at a specific point. This expectation to culminate is satisfied in m. 11^{2a} when the unstable chord is reached. The expectation created by the unstable tones to resolve to stable tones is not satisfied in the same instruments, but by other instruments. The instability of these dyads, and the material in the violas, violoncellos, and contrabasses enable listeners to hear the conjunction of the two segments as overlapping. The unstable material is heard as an immediate resolution to the start of the next stable segment in m. 11^{2b}.



Example 4-11a

Raga I *for percussion and two pianos, part II, mm. 10-11*



Example 4-11b

Raga I *for percussion and orchestra, part II, mm. 10-11*

4.2 Tremolos only

There are four instances of tremolos only. Two examples of tremolos only are presented in this section – each example represents a class of this category. The first example is of tremolos that were added to tones of musical gestures in *Raga I* for percussion and orchestra that were not tremolos in *Raga I* for percussion and two pianos. The second example is the addition of tremolos, performed with spiccatos by bowed string instruments. This class is discussed in more detail in the example below. The spiccatos in the violins, found in *Raga I* for percussion and orchestra, part I, mm. 47^{1b}-54^{1a} are not included in my discussion because I do not hear them as significant, but rather as a colouring of the trills in the violas.

Tremolos that were added to tones of musical gestures

Raga I, part II, m. 153-156

Example 4-12a

In the last segment of this composition, the first piano starts in m. 153^{2}-153^{3} with a musical gesture in octaves. This musical gesture is repeated in the remainder of the segment and when it is heard in mm. 155^{2}-156^{1a}, it is heard in three octaves. The latter is also the last repeat of this musical gesture in the segment.

Example 4-12a

Raga I *for percussion and two pianos, part II, mm. 153-156*

Example 4-12b

Raga I *for percussion and orchestra, part II, mm. 153-156*

Example 4-12b

The musical gestures of the first piano were orchestrated for piccolo, two flutes, two oboes, cor anglais, and three trumpets. The last repeat of the musical gesture is heard in three trumpets, the violins, and violas. This musical gesture in the violins and violas is marked with tremolos.

The addition of tremolos to the tones of this musical gesture in *Raga I* for percussion and orchestra serves the following functions:

- They add energy and thus density to the musical gesture. Because this musical gesture is at the end of the segment, it serves as a preparation for an energetic and dense end of the segment.
- They amplify the instability of the musical gesture that prepares for a resolution to a stable ending.
- They elucidate the structure of the musical gesture. The musical gesture becomes more salient than other musical gestures that are not marked with tremolos.

Tremolos combined with spiccatos

Raga I, part II, mm. 11-16

Example 4-13a

Short musical gestures are heard in the first piano, marked in red on the score. These musical gestures are alternated with accompanying material in the left hand part of the first piano.

Example 4-13b

The short musical gestures were orchestrated for two flutes, two oboes, cor anglais, and two clarinets. (The two bassoons and contrabassoon have the accompanying material of the musical gestures.) The vertical chords in the brass instruments, of which the material was derived from the pitch classes of the musical gestures, are discussed in §3.3. The outer tones of the musical gestures are heard in the violins, and these outer tones are connected with a glissando.[18] These glissandi are marked with tremolos and spiccatos.

These violin glissandos, marked with tremolos and spiccatos, seem to serve a colouristic function at first, but the interval distance between the outer tones increase in m. 13 and these patterns become audibly more salient. These glissandos that combine tremolos and spiccatos serve the following functions:

- They add energy and thus density to the musical gestures. The patterns with spiccatos and tremolos fill the musical space between the outer tones of the musical gestures. This adds energy and density to the musical gestures and the segment.

[18] This instance was not included in the category of glissandi because the glissandi (without the tremolos and spiccatos) were not heard as significant.

- They add colour to the musical gestures they are combined with. This addition of colour elucidates the musical gestures and makes them audibly more salient to listeners.
- They amplify the outer tones of the musical gestures, which are mostly unstable, in order to maintain tonal tension in the segment.
- They elucidate the direction of the musical gestures because the musical gestures are demarcated by a spiccato tremolo pitch – at the beginning of each gesture – that ascends or descends with a glissando to an ordinary pitch[19] that marks the end of the musical gesture. Ascending glissandi indicate that the musical gesture will end on a higher tone than its beginning tone, and descending glissandi indicate that the musical gesture will end on a lower tone than its beginning.

[19] These patterns are indicated to transform from spiccato and tremolo to ordinary tones.

Example 4-13a

Raga I *for percussion and two pianos, part II, mm. 9-16*

Example 4-13b

Raga I *for percussion and orchestra, part II, mm. 11-16*

4.3 Trills only

Two instances of trills only are found in *Raga I* for percussion and orchestra. Each instance is presented below as examples that represent the instances of this class.

Addition of trills to unstable neighbouring tones

Raga I, part II, mm. 95-97

Example 4-14a

The material in the right hand part of the first piano consists mainly of octave tremolos between stable Ds. These octave tremolos are interrupted by octave Ds an octave higher than the tremolos.

Example 4-14b

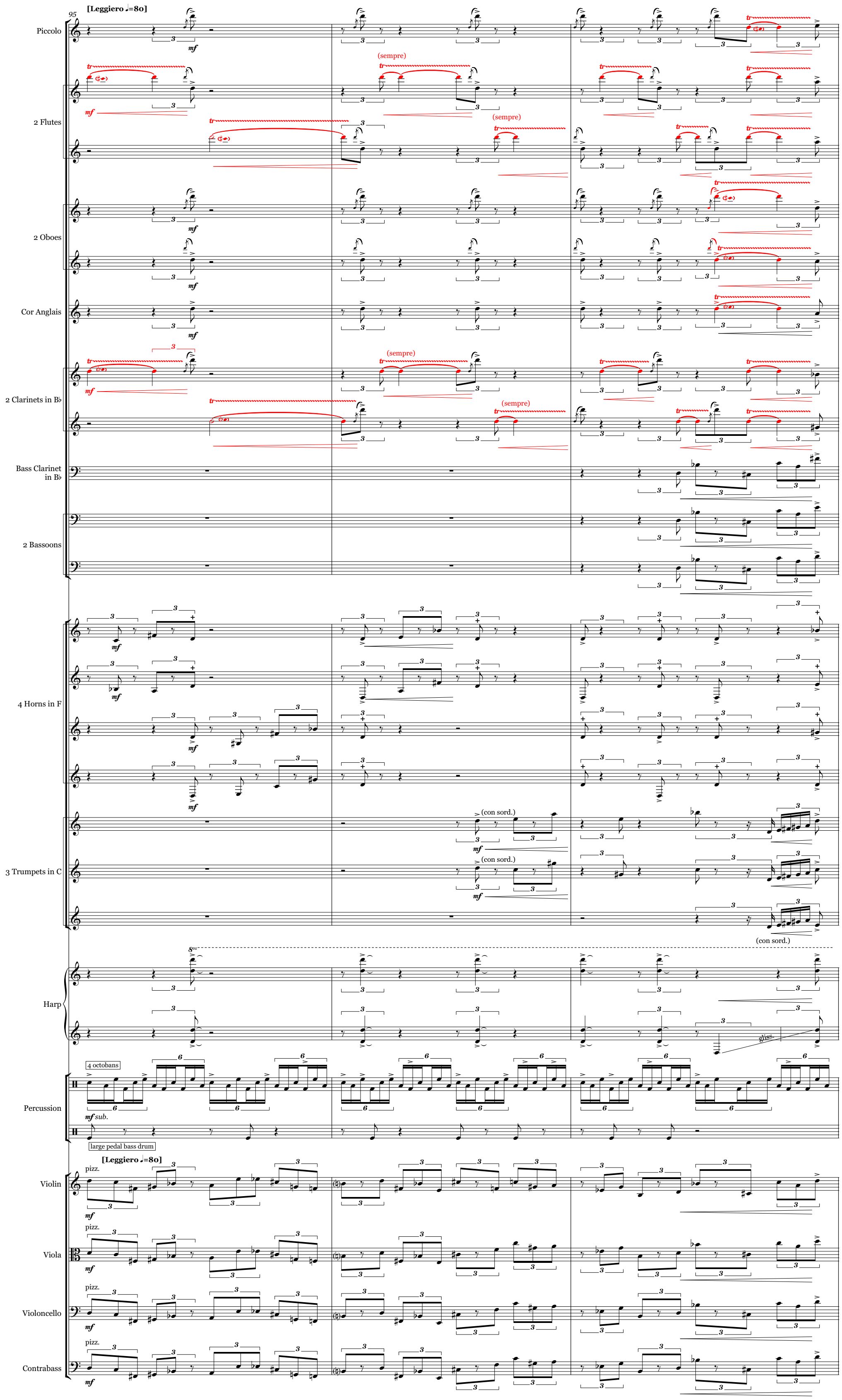
The material of the right hand part of the first piano was orchestrated for piccolo, two flutes, two oboes, cor anglais, two clarinets, and harp. They were orchestrated as trills for two flutes and two clarinets (mm. 95-97), and two oboes and cor anglais (m. 97^{3b}). These trills are heard in octaves, which are on the same pitches as the tremolos found in the version for percussion and two pianos. The higher stable Ds trill to the neighbouring unstable C♯s and the lower stable Ds trill to the neighbouring unstable E♭s.

The functions served by the tremolos of this segment in the version for percussion and two pianos, and the trills in the version for percussion and orchestra are similar. In the points below I highlight significant differences between tremolos and trills that were employed in this segment.

- The trills add new tones to the segment. Instead of stable Ds in octaves (tremolos), the trills add unstable C♯s and E♭s that alternate with stable Ds. There are thus alternations between stable and unstable tones (trills), instead of an alternation between stable tones only (tremolos).
- The trills between unstable and stable tones are denser than octave tremolos because the unstable tones have tendencies to resolve to stable tones. They are not reiterated stable tones, as was the case with the octave tremolos.
- The trills amplify the stable tones because the tendencies of the unstable tones to resolve to stable tones are satisfied, and tremolos amplify only the stable tones by alternating between those stable tones and reiterating them.

Example 4-14a

Raga I *for percussion and two pianos, part II, mm. 95-97*



Example 4-14b

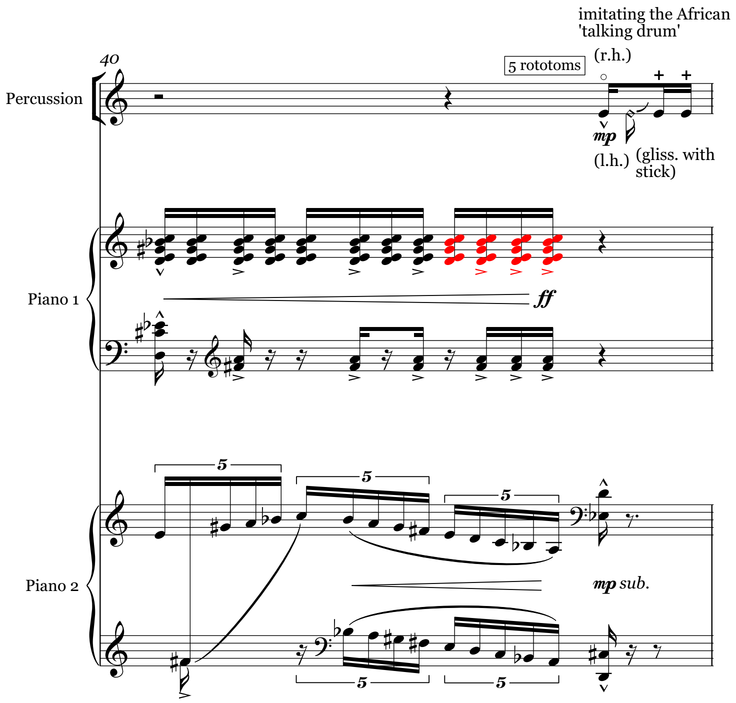
Raga I *for percussion and orchestra, part II, mm. 95-97*

Addition of trills to material that did not have trills in the original version

Raga I, part II, m. 40

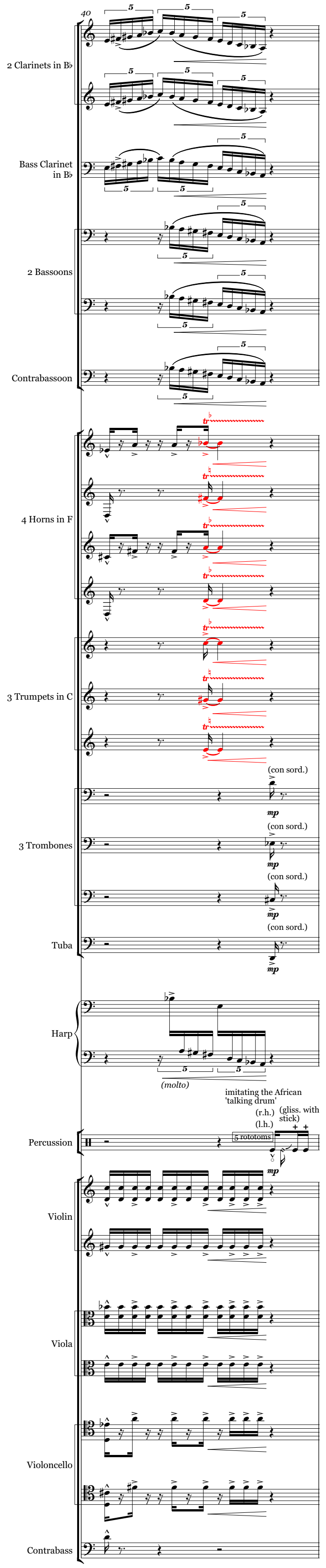
Example 4-15a

The material in the right hand part of the first piano consists only of cluster chords constructed of tones D4, E4, G♯4, B♭5, and C5. The material in the left hand part consists of two chords: a cluster of D3, C♯4, and E♭4 in the one chord, and a dyad of F♯4 and A5 in the other chord.



Example 4-15a

Raga I *for percussion and two pianos, part II, m. 40*



Example 4-15b

Raga I *for percussion and orchestra, part II, m. 40*

Example 4-15b

The material of the right hand part of the first piano was orchestrated for the violins and violas, and the material of the left hand part of the first piano was orchestrated for the four horns, violoncellos, and contrabasses. The pitches of the cluster chord in the right hand part and the chord in the left hand part are heard in m. 40^{2d}-40^{3} in the four horns and three trumpets as semitone trills.

These trills were added to the brass instruments in *Raga I* for percussion and orchestra to serve the following functions:

- They add tones to the end of the segment. Some of the tones in the trills are not present at the end of the segment in the version for percussion and two pianos.
- They add energy and density to the end of the segment. The alternation between tones of the trills adds energy and density to those patterns, and subsequently to the end of the segment.
- They amplify instability at the end of the segment. The segment ends unstable, and the alternation of unstable tones to their neighbouring tones amplifies this instability at the end of the segment.

5. Addition of Instruments to Existing Material

The addition of instruments to existing material can be divided into four classes in terms of differences between the two versions of *Raga I* that are compared here:

- Targeted addition of instruments to stable tones;
- Targeted addition of instruments to unstable tones that move to stable tones;
- A sudden addition of instruments at the end of segments; and
- The gradual addition of instruments towards the end of segments.

I distinguish between 'targeted', 'sudden', and 'gradual' addition of instruments. The 'targeted' addition of instruments targets specific tones based on their quality as stable or unstable. The 'sudden' addition of instruments occurs suddenly at the very end of segments, and the 'gradual' addition of instruments is instances where instruments are gradually added towards the end of segments.

The instances included in this chapter are summarised in Diagram 4-4.

The addition of instruments to existing material serves the following functions:

- Some of them amplify the stable and/or unstable tones to which they were added. When stable tones only are targeted and stable tones are added, the tones they were added to become more salient than the surrounding tones, with a subsequent increase in the stability. When multiple tones are targeted where unstable tones move to stable tones, the movement of the unstable tones to the stable tones become more salient, with a subsequent increase in the melodic force that governs that movement. In instances where tones are suddenly added at the end of segments, the stability and/or instability of the pitch material added to the chords play an important role in the amplification of the stability or instability of these chords at the end of segments.

- Some of them expand the registers of the targeted chords that consist of stable and/or unstable tones, and subsequently the density of those chords. In instances where instruments are suddenly added, the denser texture is heard for that specific chord only.
- They add energy to the end of segments. In instances where tones are suddenly added, the addition of energy is heard as a sudden addition of energy. In instances where instruments are gradually added, energy accumulates towards the end and plays a significant role in culminating energy at the end of segments because the start of every instrument is heard as an investment of more energy.
- Some of them elucidate larger structures, such as segments. Some ends are the climaxes of those segments, and the gradual addition of instruments contributes significantly to the end of those segments as salient climaxes of segments. When the climax of a segment is elucidated by added instruments and the climax is immediately followed by new material, the material is aurally divided: the climax is separated from the less-energetic material that follows. This helps listeners to hear structures such as different segments better.

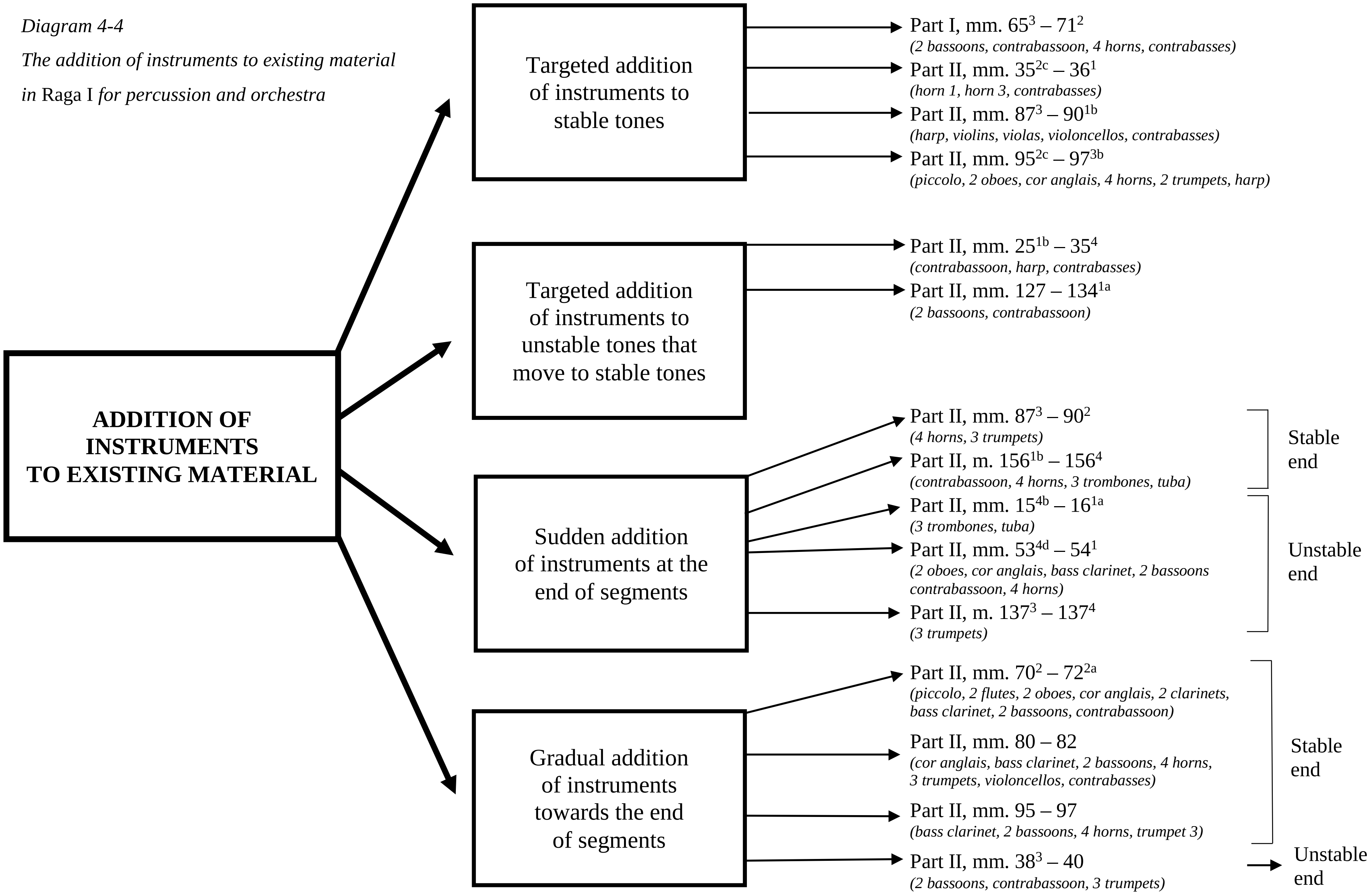
5.1 Targeted Addition of Instruments to Stable Tones

The target for the addition of instruments is the stability of tones to which instruments are attracted. The instances discussed here target stable tones, and instruments are added for those tones only and not for longer melodic lines. The example presented here is an exemplar of the four instances where the addition of instruments targets stable tones.

Diagram 4-4

The addition of instruments to existing material

in Raga I *for percussion and orchestra*



Targeted addition of instruments to stable tones

Raga I, part II, mm. 95-97

Example 4-16a

The tremolos in the right hand part of the first piano are interrupted by accentuated stable D3s, D4s, D6s, and D7s. Because the tremolos are marked with crescendos, the interrupting Ds are louder than their surrounding material.

Example 4-16b

These interrupting Ds were orchestrated for the piccolo, two flutes, two oboes, cor anglais, four horns, two trumpets, and harp. They are heard as single accentuated D4s, D5s, D6s, and D7s, played by six instruments (cor anglais, four horns, and harp); upward octave leaps of D5 and D6 acciaccaturas to D6 and D7 accentuated tones (piccolo, oboe 1, two clarinets); and downward octave leaps of D6 acciaccaturas to D5 accentuated tones (two flutes and oboe 2). The piccolo, two oboes, cor anglais, two clarinets, and harp have no other material than these stable Ds. Their dynamic indication is ***mf***.

Example 4-16a

Raga I *for percussion and two pianos, part II, mm. 95-97*

Example 4-16b

Raga I *for percussion and orchestra, part II, mm. 95-97*

In this exemplar the targeted addition of musical instruments

- amplifies the stable Ds – and subsequently the stability in the segment – and make them audibly more salient than surrounding tones in the segment.
- expands the registers of, or increases the density of the stable Ds. D5 is added in the version for percussion and orchestra – there is no D in that register in the version for percussion and two pianos.
- adds energy and density on the stable Ds. The Ds in the woodwind instruments are preceded by acciaccaturas, these additional tones add energy and density to the stable Ds.
- creates anticipation among listeners that the segment approaches its end. The segment becomes denser towards the end and the time intervals between these targeted chords become shorter. Thus, listeners expect a climax at the end. This climax is the chord at the very end of the segment (m. 97^{4c}).

5.2 Targeted Addition of Instruments on Unstable Tones that move to Stable Tones

Multiple tones are targeted when the addition of instruments targets unstable tones that move to stable tones. There are no instances in *Raga I* for percussion and orchestra where stable tones move to unstable tones.

Addition of musical instruments to unstable tones that move to stable tones

Raga I, part II, mm. 127-134

Example 4-17a

The pitch material of the second piano in this segment consists of only stable Ds and neighbouring unstable C♯s and E♭s. The stable Ds are repeated and alternated with the unstable C♯s and E♭s. All the C♯s and E♭s, and some of the Ds are marked as marcato.

Example 4-17b

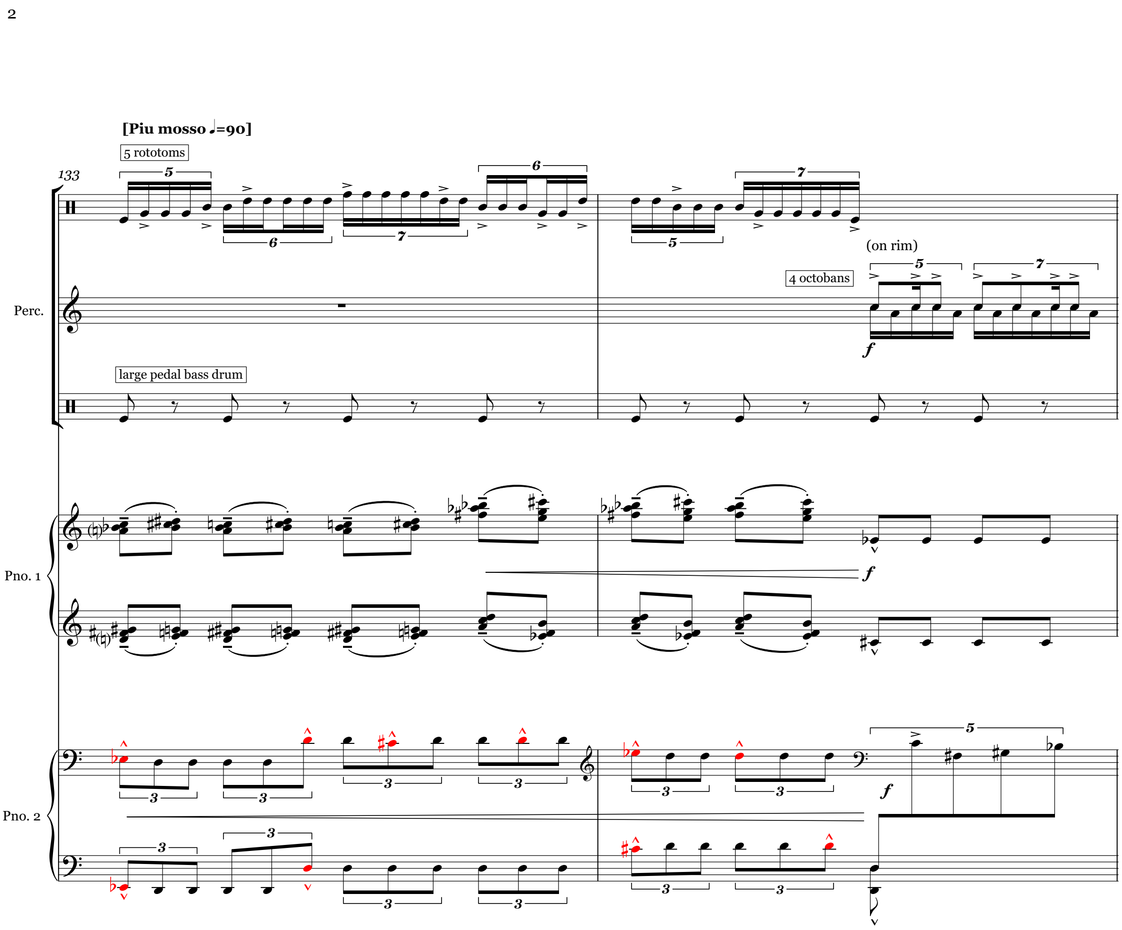
The material of the second piano was orchestrated for the violoncellos and contrabasses, with the addition of instruments on unstable tones that move to stable tones in the two bassoons and contrabassoon. The repeated Ds are thus only heard in the violoncellos, but the accentuated stable Ds and the accentuated unstable C♯s and E♭s that move to stable Ds are heard in the bassoons and contrabassoon. The material of the contrabassoons was not treated the same, possibly to maintain imminent doublings in the woodwinds and not a continuous doubling. They are thus salient additions because the timbre of the bassoons and contrabassoon is significantly different from the tone colour of the violoncellos and contrabasses.

The addition of instruments to unstable tones that move to stable tones

- amplifies the unstable C♯s, E♭s, and their resolution to the stable Ds, because they make up the only material played by the two bassoons and contrabassoon.
- adds energy and density to unstable material that resolves to stable material.
- amplifies stability in the segment, because all unstable tones are resolved to stable tones.

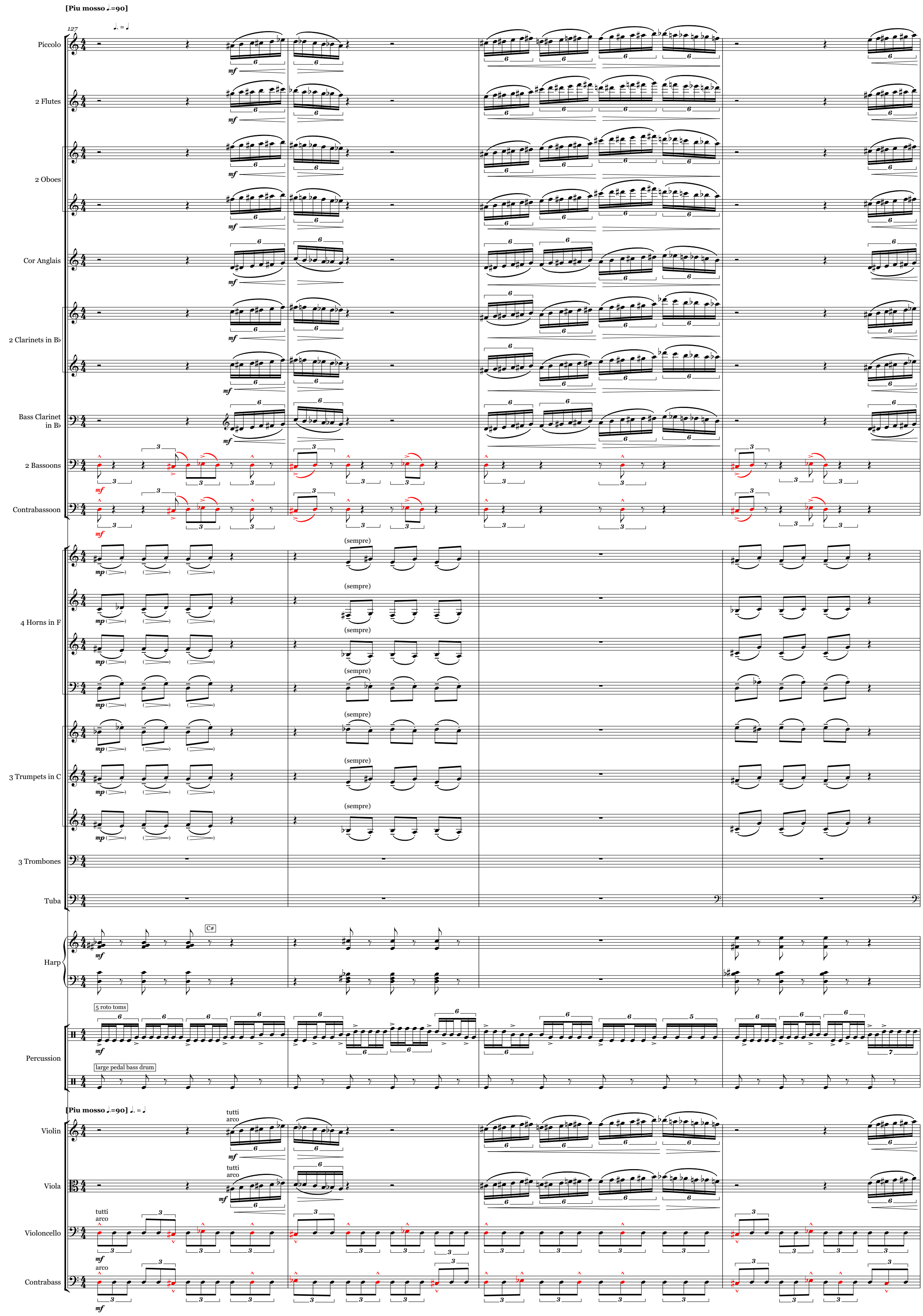
Example continues on next page

Example continues

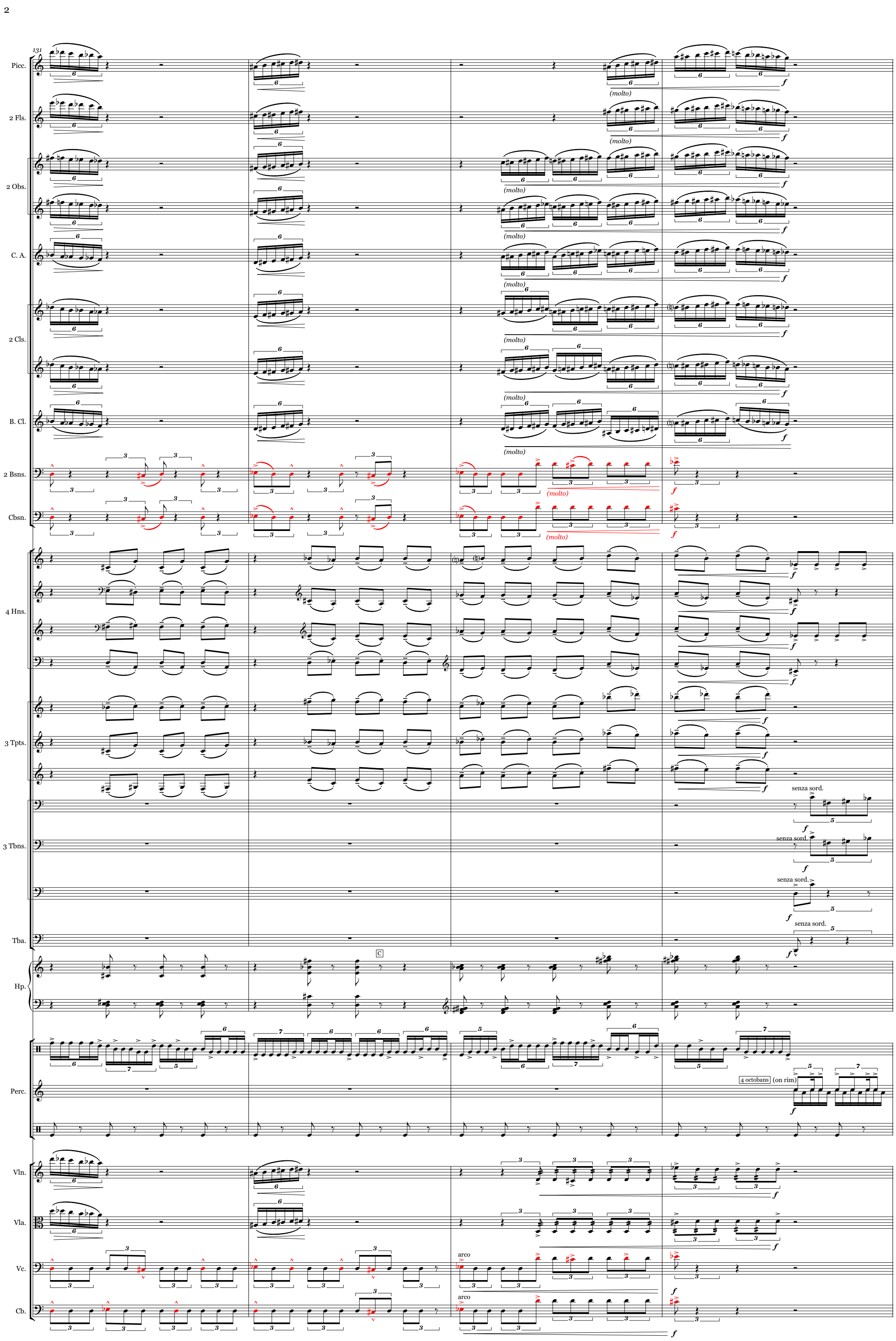


Example 4-17a

Raga I *for percussion and two pianos, part II, mm. 127-134*



Example continues on next page



Example 4-17b

Raga I *for percussion and orchestra, part II, mm. 127-134*

5.3 Sudden additions of Instruments at the End of Segments

Sudden additions of instruments discussed here are similar to the targeted addition of instruments because it targets the end of segments. The difference is that the ends of segments are targeted despite their degree of stability. This is why this category is discussed as a separate section.

Five instances of sudden additions of instruments at the end of segments are found in *Raga I* for percussion and orchestra. These instances can be divided further into two groups:

- instances present at stable endings and
- instances present at unstable endings.

An exemplar of each group is presented and discussed below.

Sudden addition of musical instruments at the end of segments

Raga I, part II, mm. 87-90

Example 4-18a

The material of the first piano consists mostly of octave leaps between stable Ds and trills around Ds. The melodic material of the second piano was derived from the pitch class series of this composition. Both pianos end on a cluster chord in m. 90^{2c} and this cluster chord consists of all the pitch classes of the scale of this composition. The pitches of the cluster chord are C4, D4, E4, F♯4, G♯4, A5, B♭5, C5, D5, A6, and E6.

Example 4-18b

This segment was orchestrated for the piccolo, two flutes, two oboes, cor anglais, two clarinets, bass clarinet, and two bassoons, harp, and string instruments. In m. 90^{2c}, some brass instruments (four horns and three trumpets) are suddenly added to the cluster chord at the end of the segment. This sudden addition of material with a strong contrasting timbre causes listeners to hear these tones as a sudden addition of tones at the end of the segment. Because the material is salient, it is not heard as the result of a large crescendo in the segment.

The sudden addition of instruments at the end of this segment

- adds energy and density to the end of the segment, because instruments are added that were not heard in other parts of the segment.
- amplifies stability at the end of the segment. The D4 is the lowest tone and D5 the highest tone in the brass instruments – both are stable tones.
- elucidates the end of the segment. The material in the segment accumulates towards the end of the segment and the addition of these instruments contributes to the climax at the end of this segment.

Example 4-18a

Raga I *for percussion and two pianos, part II, mm. 87-90*

Example 4-18b

Raga I *for percussion and orchestra, part II, mm. 87-90*

5.4 Gradual addition of Instruments towards the End of Segments

The instances discussed in the previous section (§5.3) are instances where instruments are suddenly added to the very last tone or chord of a segment. For the instances discussed here, instruments are added gradually towards the end of segments. The differences between 'sudden' and 'gradual' additions are important enough to warrant the creation of a separate category.

Four instances of the gradual addition of instruments at the end of segments are present in *Raga I* for percussion and orchestra. These instances can be divided further into two groups:

- instances toward stable endings and
- instances toward unstable endings.

Instances that were excluded from this category include instances where the gradual addition of instruments is not audibly salient or significant.

Gradual addition of instruments at the end of segments

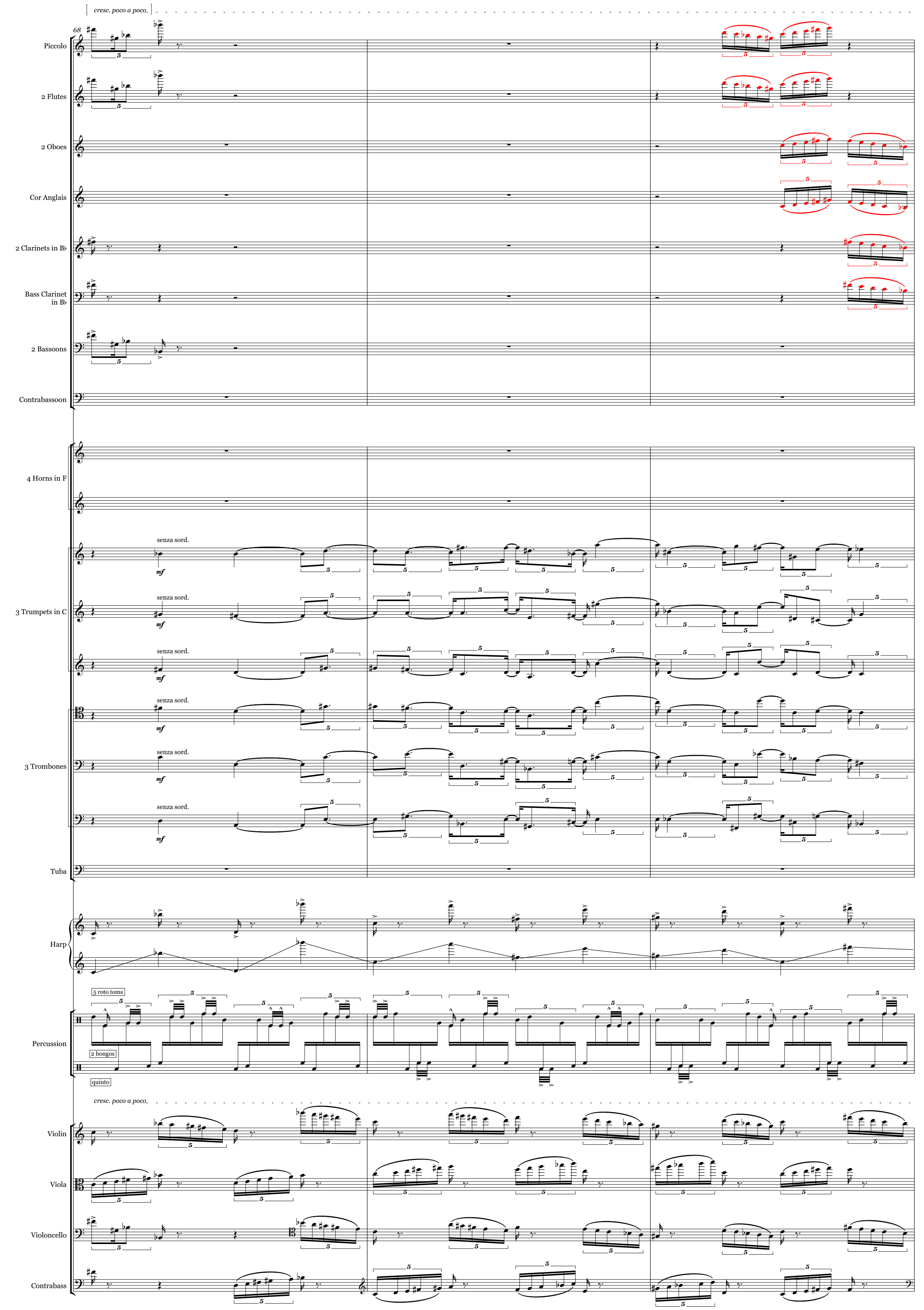
Raga I, part II, mm. 68-72

Example 4-19a

The material of the first piano consists of ascending and descending gestures, and the material of the second piano consists of chords constructed from the pitch class series. The material of the two pianos merges in m. 72^2 with similar material – this causes a hinged conjunction between the two segments.

Example 4-19a

Raga I *for percussion and two pianos, part II, mm. 68-72*



Example continues on next page

Example continues

Example 4-19b

Raga I *for percussion and orchestra, part II, mm. 68-72*

Example 4-19b

The material of the first piano was orchestrated for the string instruments and amplified by harp glissandi, and the material of the second piano was orchestrated for brass instruments (three trumpets and three trombones). In m. 70^2 the piccolo and two flutes were added to double the material of the string instruments, and increasingly more woodwind instruments were added towards the end of the segment to double the material of the string instruments. The gradual addition of instruments is summarised in the table below.

m.	**Woodwind instruments**	**Number of woodwind instruments**
70^2	Piccolo, two flutes	3
70^3	Piccolo, two flutes, two oboes, cor anglais	6
70^4	two oboes, cor anglais, two clarinets, bass clarinet	6
71^1	Piccolo, two flutes, two clarinets, bass clarinet, two bassoons, contrabassoon	9
71^2	Piccolo, two flutes, two oboes, cor anglais, two bassoons, contrabassoon	9
71^3	Two oboes, cor anglais, two bassoons, contrabassoon	6
71^4	Tutti woodwind section	12

This table shows how instruments are gradually added in every crotchet beat of mm. 70^2-71^4. The pattern of addition is only interrupted in m. 71^3 by a decrease to six instruments. This can be motivated as a technique employed by the composer to avoid predictability and to cause the addition of three more instruments to the larger structure (or six instruments to that beat) in m. 71^4 to be more salient for listeners. The addition of six instruments to the last beat supports the end of that segment as the climax.

The gradual addition of instruments towards the end of this segment

- gradually adds energy to the end of the segment. The addition of three instruments in every crotchet beat is heard as an investment of new energy that accumulates from three instruments to twelve instruments.
- gradually adds density towards the end of the segment. Instruments are added that were not present in other parts of the segment.
- amplifies the resolution of unstable material to stable material. Instruments are gradually added to unstable material. This unstable material only resolves to stable material when the addition of instruments culminated in twelve instruments.
- elucidates the end of the segment and the start of a new segment because the end of the segment is heard as a climax that is immediately followed by solo percussion material and that is clearly heard as the beginning of a new segment.

6. Changes in Dynamics

In this section I discuss changes in dynamics: crescendos and decrescendos. Some instances of crescendos and all instances of decrescendos were excluded from the discussion. The reasons for this are provided below. In this section I explain why some instances of crescendos and all instances of decrescendos were excluded. Instances of included crescendos found in *Raga I* for percussion and orchestra can be subdivided into two classes:

- Crescendos at the beginning of segments and
- Crescendos at the end of segments.

Some instances of crescendos were excluded for the following reasons.

- They are insignificant when contextualised in terms of surrounding material. Some instances are heard as significant when they are isolated from surrounding material and segments, but when this surrounding material and segments contextualise these instances, they are heard as insignificant.
- They are not salient due to concurrent material. Some instances look significant on scores, but are not heard as significant because the concurrent material is complex and disguises the change in dynamics.
- The type of change in dynamics (crescendo or decrescendo) is unclear. Some instances are material that has simultaneous crescendos and decrescendos. Although they can be heard as changes in dynamics for meso-level structures such as musical gestures, they are unclear in terms of the larger structures or when surrounding material is considered. This lack of clarity precludes a convincing discussion of the way in which forces operate.
- They shape musical gestures with dynamic changes. Musical gestures and other material, especially material in the middle of segments, are shaped with dynamic

changes such as crescendos and/or decrescendos. Such instances were not considered significant.

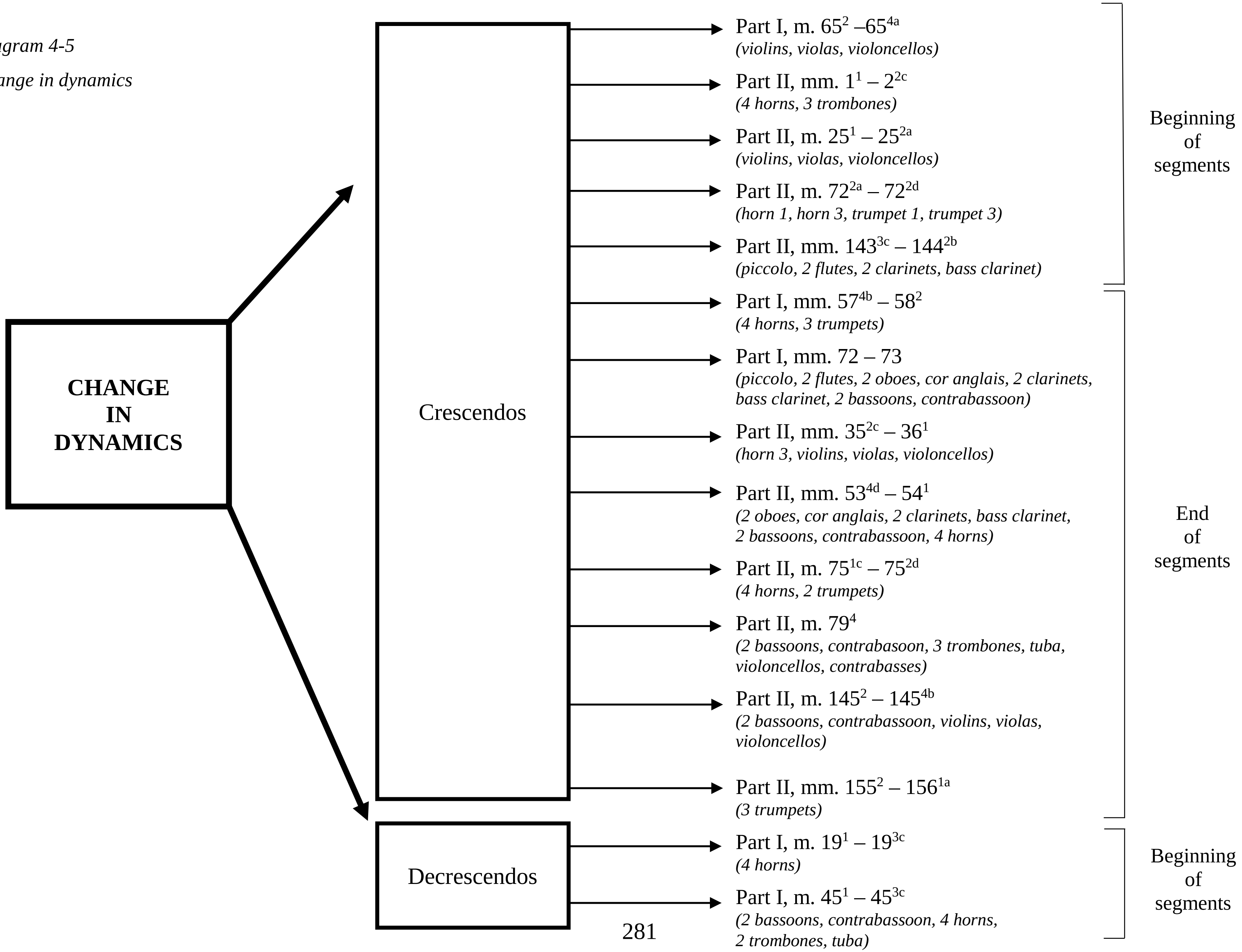
Instances of included crescendos found in *Raga I* for percussion and orchestra are summarised in Diagram 4-5.

All instances of decrescendos in *Raga I* for percussion and orchestra were excluded for the following reasons:

- Some decrescendos imitate the natural decrescendo al niente of a sustained piano tone and these instances are not heard as significant.
- Some decrescendos imitate the effect of the sustain and/or sostenuto pedal(s) of the pianos.
- Decrescendos are not as significant as crescendos because they lose energy and do not add energy like crescendos. This makes the decrescendos insignificant.

Diagram 4-5

Change in dynamics



Crescendos at the end of segments serve the following functions:

- They amplify stability or instability at the end of segments because increasingly more energy is added to the stable and/or unstable tones at the end of those segments where crescendos were added.
- They cause the stable and/or unstable tones at the end of those segments to be heard as salient because they increase in dynamics and become more prominent for listeners.
- They add energy and density to the end of segments because increasingly more energy should be added to achieve the crescendo and the end of segments become denser.
- They help listeners to hear larger structures, such as segments, because the stable tones become more salient and they are heard as the climax of the segment.
- They elucidate structures, such as segments. Crescendos at the end of segments help to amplify the ends of those segments as the climaxes. This makes the ends of those segments clear to listeners.

6.1 Crescendos at the Beginning of Segments

Two instances of significant crescendos are found at the beginning of segments. These crescendos amplify only stable tones at the beginning of segments.

Crescendos at the beginning of segments

Raga I, part II, mm. 1-2

Example 4-20a

The stable Ds in the first segment of *Raga I* for percussion and two pianos start in the first piano with the pitch class D in four octaves: D2, D3, D4, and D5. The expressive indication of these Ds is marcato and the dynamic indication is ***fff*** *feroce*. These prominent Ds at the beginning of the movement provide a stable platform for listeners, and subsequent material is heard as unstable when compared with these sustained Ds. Sustained piano tones will result in a natural decrescendo al niente.

Example 4-20a

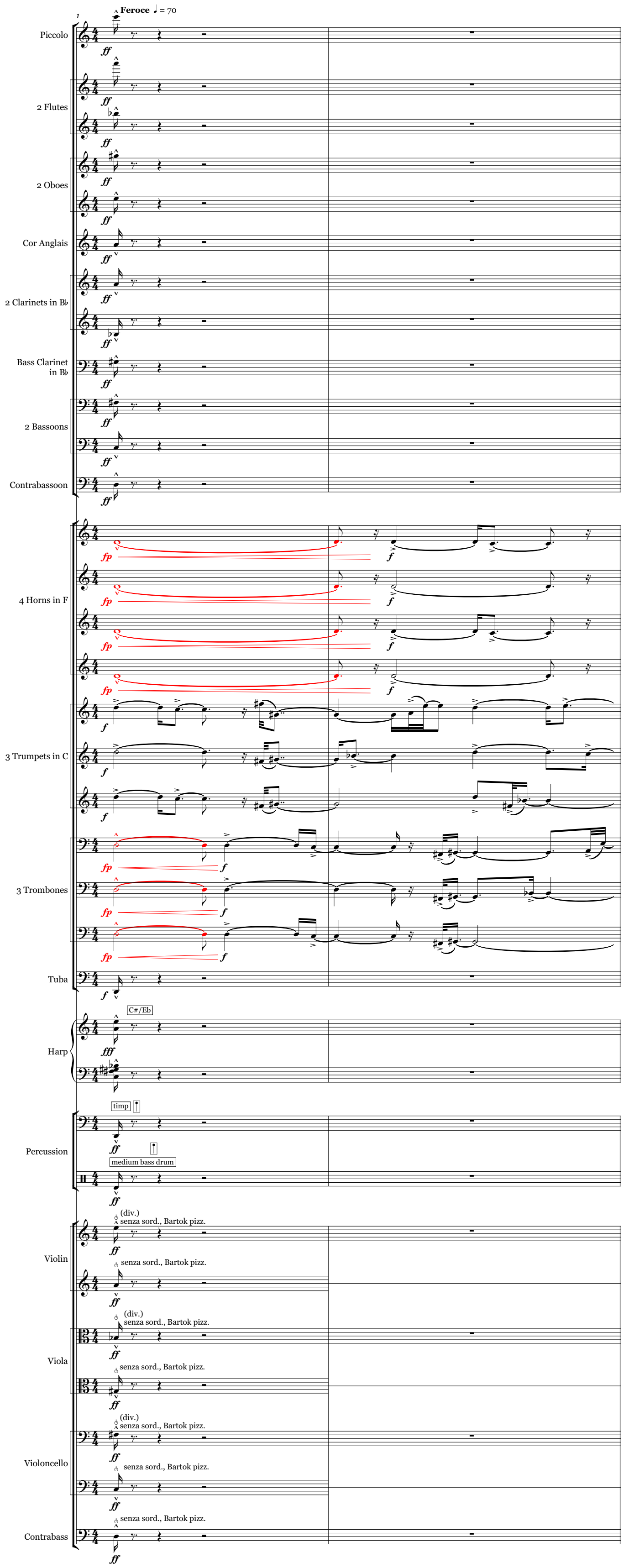
Raga I *for percussion and two pianos, part II, mm. 1-2*

Example 4-20b

These Ds were orchestrated in m. 1-2^{1} as sustained tones for four horns and in m. 1 for three trombones. The dynamic indication of the orchestrated Ds is ***fp*** with a crescendo to ***f***. These crescendos are only present at the sustained Ds in the horns and the trombones. The sustained Ds are followed by subsequent Ds in m. 2^{2} for the horns, and in m. 1^{3} for the trombones. The subsequent Ds are indicated to be performed ***f*** – a culmination of the crescendo from ***p***.

The crescendos at the beginning of this segment serve the following functions:

- They amplify stability at the beginning of the segment because the stable Ds become increasingly more salient.
- They add energy and density to the beginning of the segment.
- They emphasise the stable tones in the segment.



Example 4-20b

Raga I *for percussion and orchestra, part II, mm. 1-2*

6.2 Crescendos at the End of Segments

Thirteen instances of significant crescendos are found at the end of segments. These crescendos amplify both stable and unstable tones at the end of segments. They also cooperate with other categories that amplify material – this is discussed later in this report.

Crescendos at the end of segments

Raga I, part II, mm. 75-79

Example 4-21a

The segment (mm. 75^3-79) ends on stable Ds with fermatas. When these tones are performed on the pianos, a natural decrescendo al niente will take place.

Example 4-21b

In the orchestral version the opposite effect takes place in terms of the sustained tones: instead of fading tones, tones can be sustained or performed crescendo. These tones are marked with crescendos for the two bassoons, contrabassoon, three trombones, tuba, violoncellos, and contrabasses. The stable Ds at the end of the segment thus become increasingly more salient.

Example 4-21a

Raga I *for percussion and two pianos, part II, mm. 75-79*

Example 4-21b

Raga I *for percussion and orchestra, part II, mm. 75-79*

This exemplar shows an addition of crescendos at the end of a segment. These crescendos

- amplify the stable Ds at the end of the segment and subsequently the stability at the end of the segment.
- increase the salience of the stable tones.
- add energy and density to the end of the segment, because increasingly more energy is needed to perform the crescendo.
- elucidate the structure of the segment. This helps listeners to hear these tones as the final tones of the segment.

7. Changes in Register

I included all instances of register changes at the beginning and end of segments in *Raga I* for percussion and orchestra (see Diagram 4-6). I firstly discuss why all instances were included, and how the functions of the register change.

All instances of register changes at the beginnings and ends of segments were included for the following reasons.

- I did not perceive some register changes as more significant than others, because material was transposed either an octave or two octaves. The exception is m. 72^{2a}, where two segments overlap and transpositions are up to four octaves.
- Register changes are aurally not as salient as some of the other categories of phenomena discussed in this thesis. Thus, I did not create specific criteria to determine what should be included and what should be excluded. Despite this, register changes play a role in how we perceive stability and instability, especially at the beginnings and ends of segments, even when the phenomena are not very salient.

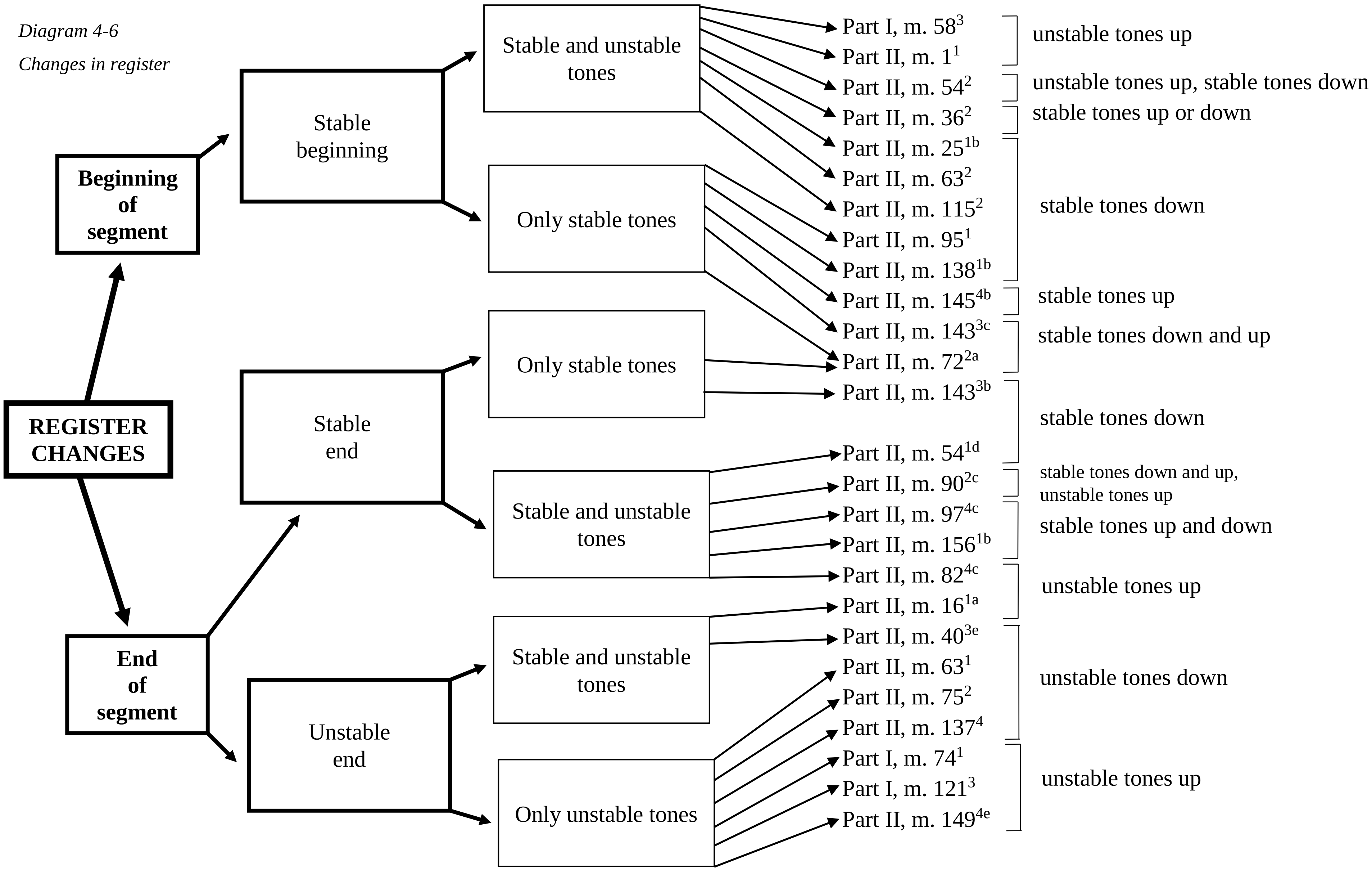
Only instances of register changes at the beginnings and ends of segments are included in this section.

The register changes in *Raga I* for percussion and orchestra can be divided into two classes:

- register changes at the beginning of segments and
- register changes at the end of segments.

Diagram 4-6

Changes in register



The functions of the register changes found in *Raga I* for percussion and orchestra serve the following functions:

- Some of them amplify stability or instability at the beginnings and/or ends of segments. This is discussed further at the end of this section.
- Some of them add energy and density to chords and segments in which registers are changed.
- Some of them elucidate structures, such as the beginnings and ends of segments.

7.1 Register Changes at the Beginning of Segments

Instances of register changes at the beginning of segments are only found at segments that have a stable beginning. These stable beginnings of segments are subdivided into two classes:

- The beginning of stable segments with chords that consist of stable tones only and
- The beginning of stable segments with chords that consist of stable and unstable tones.

7.2 Register Changes at the End of Segments

Instances of register changes at the end of segments are found in

- segments that have stable endings. These instances can be subdivided into
    - segments that have a stable end and consist of stable tones only and
    - segments that have a stable end and consist of stable and unstable tones.
- segments that have unstable endings. These instances can be subdivided into
    - segments that have an unstable end and consist of unstable tones only and
    - segments that have an unstable end and consist of stable and unstable tones.

7.3 Correlation between Register Changes and Stable and/or Unstable Tones

An analysis of instances of register changes show that the composer gave preference to a downward transposition of tones he wants to amplify, and an upward transposition of tones he did not want to amplify. For example, the stability of a chord that consists of both stable and unstable tones can be amplified when stable tones are transposed downwards and unstable tones are transposed upwards. In *Raga I* for percussion and orchestra, it is clear that unstable tones in segments with stable beginnings or ends were only transposed higher and stable tones were transposed higher and lower (to fill the musical space) – in most instances of stable endings stable tones were transposed lower. In segments with unstable endings, unstable tones were transposed higher and lower (to fill musical space), while stable tones were not transposed in those instances.

The vertical distribution of tones and the spacing between them in vertical chords play an important role in listeners' perception of stability and instability. Lower tones are more important in providing a harmonic basis for vertical chords and thus play a more important role in listeners' perception of stability or instability. This can be ascribed partly to the overtones of the stable and unstable tones: the harmonic spectra of lower tones interact with higher tones, but the harmonic spectra of higher tones might exceed listeners' hearing range. This is discussed further in Chapter 5.

A vertical chord with low stable tones and high unstable tones in close proximity is thus likely to be heard as stable, and a vertical chord with low unstable tones and high stable tones is likely to be heard as unstable. In both these examples the lower tones play a more important role in whether listeners hear those chords as stable or unstable. This explains the composer's preferences of specific register changes found in *Raga I* for percussion and orchestra.

The way in which register changes in *Raga I* for percussion and orchestra were employed can be summarised as follows:

- Downward transpositions of stable tones in chords at the beginnings and ends of stable segments amplify stability in those chords and subsequently the stability of the beginnings and/or ends of segments.
- Downward transpositions of unstable tones in chords at the ends of unstable segments amplify instability in those chords and subsequently the instability at the ends of segments.
- Upward transpositions of unstable tones in chords at the beginnings and ends of stable segments reduce instability in those chords in order to clarify downward transpositions of stable tones.
- Upward transpositions of stable tones or unstable tones in stable or unstable chords, respectively, fill the musical space of those chords with stable or unstable tones and amplify stability or instability in those chords.

Stable tones transposed higher and lower in chords that consist of only stable tones

Raga I, part II, mm. 71-72

Example 4-22a

The repeated stable Ds in m. 72^{2a} are in two registers: D4 and D5.[20]

Example 4-22a

Raga I *for percussion and two pianos, part II, mm. 71-72*

[20] The Ds in m. 72^{2a} are an overlap of two hinged segments.

Example 4-22b

Raga I *for percussion and orchestra, part II, mm. 71-72*

Example 4-22b

In the version for percussion and orchestra the stable Ds in m. 72[2a] are found in more registers: D1, D2, D3, D4, D5, and D6. The stable Ds were thus transposed higher and lower in this version. These changes in register serve the following functions:

- They expand the registers in which stable tones are found.
- They add energy and density to the end and beginning of the segments.
- They amplify stability because stable tones are found in more registers than in the version for percussion and two pianos.

Unstable tones transposed lower in chords that end on unstable tones

Raga I, part II, mm. 63

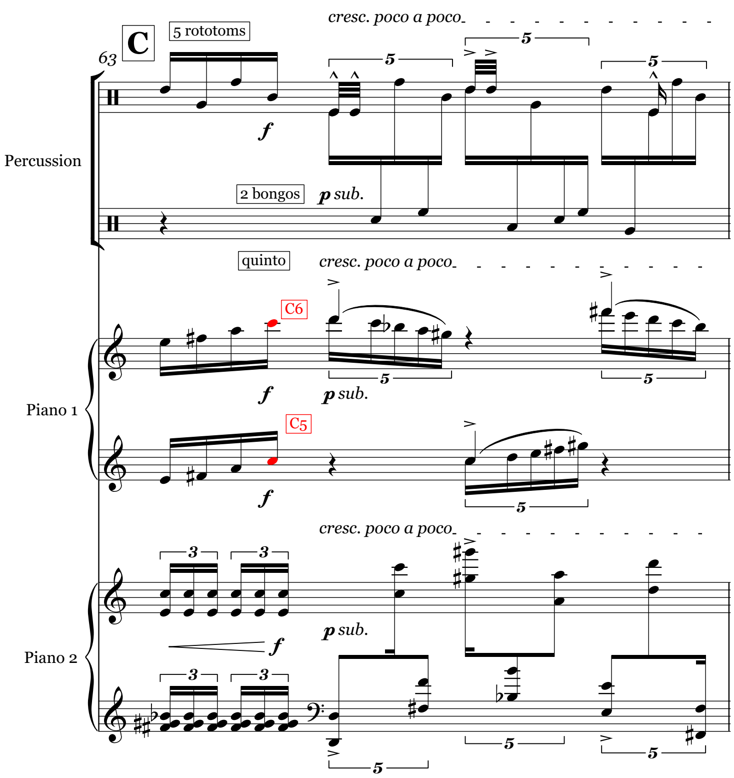
Example 4-23a

The unstable Cs at the end of the segment in m. 63[1d] (first piano) are in the registers C5 and C6.

Example 4-23b

The unstable Cs in m. 63[1d] are orchestrated in the following registers: C3, C4, C5, and C6. In this instance the unstable tones were transposed lower, and these changes in register serve the following functions:

- They expand the registers in which the unstable tones are found.
- They amplify instability. Instability is amplified by placing the unstable tones in more registers than in the version for percussion and two pianos.
- They add energy and density at these points because the lower tones are heard as denser than the higher tones.



Example 4-23a

Raga I *for percussion and two pianos, part II, m. 63*

Example 4-23b

Raga I *for percussion and orchestra, part II, m. 63*

Stable tones transposed lower and unstable tones transposed higher in stable chords that end on stable and unstable tones

Raga I, part II, mm. 87-90

In the table below I compare the register differences between the version for percussion and two pianos (Example 4-24a) with the version for percussion and orchestra (Example 4-24b). Changes in register are marked bold in the right column.

Version for percussion and two pianos	Version for percussion and orchestra
D4, D5	**D2**, **D3**, D4, D5, **D6**
E4, E6	E4, **E5**, E6
F♯4	F♯4
G♯4	G♯4
A5, A6	A5, A6
B♭5	B♭5
C5	C5

From the table above it is clear that three stable Ds were transposed downwards and upwards, and one unstable E was transposed upwards. The other tones remain in the same registers. The downward transpositions of the stable Ds and the upward transposition of the unstable E expand the registers, placing stable tones lower and unstable tones higher. Ultimately, the D as stable tone is amplified, as well as the stability of this chord.

Example 4-24a

Raga I *for percussion and two pianos, part II, mm. 87-90*

Example 4-24b

Raga I *for percussion and orchestra, part II, mm. 87-90*

8. **Conclusion**

In order to draw conclusions from the observations presented in the first part of this chapter, a new concept needs to be introduced: observations will be discussed in terms of *agency*, the new concept which is discussed first. The discussion of agency is followed by interpretations of the observations presented in this chapter in terms of motion, meaning, and metaphor.

8.1 Agency

Up to this point in the thesis a general approach to analysis, one that leans on research methods in qualitative research, allowed me to observe and categorise. Working in this way with coding processes only (Case 1), coding and abductive inference (Case 2), and coding and inductive inference (Case 3) enabled me to make certain observations and arguments, but it leads to an impasse in creating further theories. This is because I cannot interpret my observations further: the categories identified above contain sound patterns that move, but further questions need to be asked: questions such as 'how do they move?', and 'what moves them?'

It is clear that other scholars working in the field of musical forces also encountered similar impasses when they analysed music in terms of musical forces. Although they do not explicitly write about the problematic aspects of interpreting their observations, scholars suggest employing the notion of agency as an important aspect of interpreting observations in terms of how musical forces operate. Roger Graybill (2012:116), one of the reviewers of *Musical Forces*, writes that agency is an aspect of Larson's theory that lends itself to further exploration of how musical forces operate. My understanding is that Graybill's statement refers to further explorations of how musical forces operate in terms of Larson's current theory of musical forces, but also when Larson's theory is expanded further. Also, Matthew BaileyShea (2012) writes that agency is crucial in interpreting the operation of musical forces. BaileyShea (2012) demonstrates how he analyses and interprets Gustav Mahler's music in terms of musical forces and agency. Another scholar who gives an even more important role to agency is John Peterson (2014). He did not use the notion of musical forces as the starting point in his work, but worked with agency as the central concept of his research project. One of his findings was that the notion of agency is central to how musical forces can be contradicted. The notion of agency is also one of the central points in the work or Robert Hatten (2004).

I chose to work with agency in order to interpret my observations. It proved to be a useful tool that contributed to answering the research questions rigorously. This is mainly because it enabled me to further interpret my observations in ways that were not possible otherwise. In the paragraphs below I discuss agency briefly, and then present my conclusions of this chapter in terms of agency.

Although I employ agency in my analytical work, as suggested by the authors discussed above, I will not report here on the vast discourse regarding agency in literature. Instead, I rely strongly on the work of Seth Monahan (2013), who discusses core aspects of agency and music analysis in literature. He also provides clear classifications of the different types of agents and their interaction. I can rely on Monahan's work instead of making my own synthesis of the discourse on agency, because this was one of the aims of Monahan's work.

8.2 What is moving? – Motion

8.2.1 Musical Movement

Seth Monahan (2013:321), Associate Professor of Music Theory at the Eastman School of Music of the University of Rochester[21], writes that music-analytical writing has been pervaded by metaphors of agency for centuries. The aspect of Monahan's work that I found most valuable for my study is Monahan's (2013:327-333) classification of agents into four classes.[22] Monahan's classes of agents are

- the individuated agent,
- the work-persona,
- the fictional composer, and
- the analyst.

Monahan (2013:327) writes that the individuated element "includes any discrete component of the musical fabric that can be constructed as having autonomy and volition – in other words, any element that could be understood as a kind of dramatic 'character'. This includes individual themes, motives, [musical] gestures, keys, chords, topics, and even pitch classes." These agents are described by Monahan in terms of ontology, and he mentions that they can vary greatly. Although they are an integral part of music, they do not have full control over the music (Monahan, 2013:328). It is clear that the individuated elements, discussed by Monahan, relate to sound patterns.

---

[21] Monahan is a colleague of BaileyShea, and BaileyShea is also acknowledged for his contributions to Monahan's work.

[22] I am aware of other classifications of agents, such as those of Edward Cone (1974), Anthony Newcomb (1997), and Robert Hatten (2004). I only work with the classification of Monahan, who also took the work of these authors into consideration.

Eight criteria for individuated elements can be deduced from Monahan's writings: individuated elements are 1) part of a whole; 2) part of an intramusical world; 3) musical patterns with musical tasks; 4) part of the unfolding of a work; 5) participants in real-time musical drama with a dramatic character; 6) discrete components of the musical fabric; 7) musical patterns with autonomy and volition; and 8) musical patterns that do not fully control the musical drama.

I employed these criteria of individuated elements as a classification tool in order to compare the categories of sound phenomena, the observations in this chapter, in terms of Monahan's first class of agency. I summarise my findings in Table 4-1 below.

Table 4-1

Categories of this chapter and criteria for individuated elements

	Part of a whole	Intramusical world	Musical tasks	Part of unfolding	Drama/dramatic character	Discrete component	Autonomy and volition	Do not fully control	
Glissandi	X	X	X	X	X	X	X	X	1
Addition of new material	X	X	X	X	X	X	X	X	
Trills and tremolos	X	X	X	X	X	X	X	X	
Addition of instruments to existing material	X	X	X	X	X	X	X	X	
Changes in dynamics	†	X	X	X	X	†	X	X	2
Changes in register	†	X	X	X	†			X	

The first four categories – i.e. glissandi, addition of new material, trills and tremolos, and addition of instruments to existing material – meet all the criteria for individuated elements (marked with an X in the table). These categories are grouped together here as the first class of individuated elements. The next two categories – i.e. changes in dynamics and changes in register – meet most criteria for individuated elements, while some criteria are partially met (marked with a † in the table), and some criteria are not met (open cells in the table).

The four categories in the first of the two classes of individuated elements that I identified in Table 4-1 are clear instances of agents within the class of agents called individuated elements. I refer to each category as a subclass of individuated elements. The functions of the categories, discussed in the section of each category, relate to all the criteria for individuated elements. They are all part of a whole in different ways. The glissandi, both the ones that start at the beginning of segments and the ones that only start at the end of segments, and the addition of instruments to existing material are parts of entire segments. Added material, trills, and tremolos are parts of smaller wholes, such as musical gestures. They are all part of an intramusical world, because they amplify sound patterns – they are not connected to external agents. This amplification of sound patterns is a musical task that requires an agent. They are participants in the unfolding of the whole of which they are part. Some glissandi and the addition of instruments to existing material are part of the unfolding of segments, whereas the addition of new material, trills, and tremolos are part of the unfolding of musical gestures. Their unfolding is associated with the way in which they elucidate structures in the music. The way in which they are part of the unfolding of the music is also determined by their dramatic character. Glissandi at the end of segments have a more important role in the dramatic unfolding at the end of segments, but the addition of new material, trills, tremolos, and instruments to existing material have short dramatic contributions to material. However, they all have a dramatic character which is associated with the energy and density that they add to segments. Because they were coded and only significant material was included in this chapter, they are discrete components of the musical fabric. Although musical forces operate on them (and through them), they have autonomy and volition, without fully controlling the musical drama.

The categories in the second class of individuated elements are also instances of agents within the 'individuated elements' class of agents, but not all their functions relate to all the criteria for individuated elements. Because the changes in dynamics and changes in register are changes – and not additions, for example – to existing material, they are not as discrete as the individuated elements discussed in the paragraph above. Also, I only considered changes in dynamics and changes in register at the beginnings and ends of segments. As individuated elements, they are thus not part of whole segments but only of the beginnings and ends of segments. The changes in dynamics are only crescendos – thus, they add increasingly more energy and density to the musical patterns they are combined with. These crescendos have dramatic character and play an important role in the dramatic unfolding of musical patterns. Changes in register, on the other hand, do not have the same dramatic characteristics as changes in dynamics. They have a lesser contribution to the dramatic unfolding of the music. Although changes in register are discrete in my analytical comparisons, they are not discrete components of the musical fabric. Changes in register also do not have autonomy and volition.

Seven of the eight criteria, deduced from Monahan's writings, are criteria that tell us what individuated elements are doing. One criterion tells us what individuated elements are not doing: they do not fully control the musical drama. Although the individuated elements that are discussed in this chapter do not fully control the musical drama, they play significant roles in the musical drama because they were employed to amplify sound patterns. Some of these individuated elements were combined in order to amplify the sound patterns even more, and subsequently exercise more control over the unfolding of the musical drama.

The interactions between and combinations of individuated elements are summarised in Diagram 4-7.[23] These are only the individuated elements that were added to or changed in *Raga I* for percussion and orchestra. Many more individuated elements, and different combinations of them, are found in *Raga I* for percussion and two pianos and were also orchestrated in *Raga I* for percussion and orchestra. These are, of course, not discussed in this chapter.

8.2.2 Physical Movement

When Monahan (2013) writes about physical movements, he refers to fictionalised persons, which he gathers into the third class of agents (the 'fictionalised composer') or into the notion of avatars of individuated elements. He specifically writes about the fictionalised composer. I suggest an addition to Monahan's categories of agents: the historical agent. These persons are, in terms of the Ragas, the composer Wim Henderickx as a historical person, and the solo performers Gert François, Leo De Neve, and Marc Tooten also as real (or historical) people.

Monahan (2013:329-330) distinguishes between a fictionalised composer, the person who is presented as the controlling author of the music, and a historical composer, the person who created the music. However, he does not make a clear distinction between fictionalised

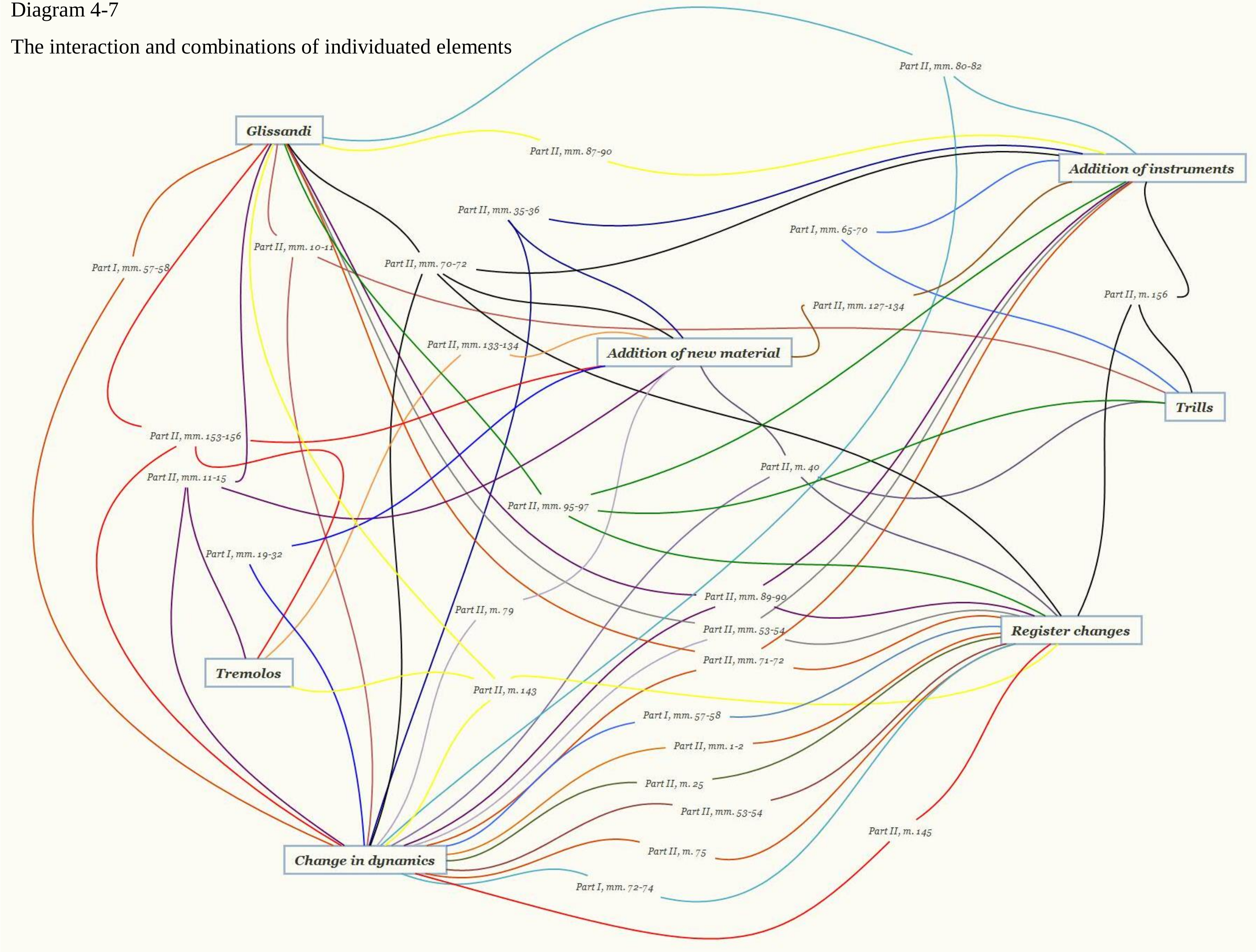
[23] In this diagram, each instance is coded with a unique colour, and the instances are categorised by lines connecting the instances to classes given in boxes.

performers and historical performers, hence my suggestion to add historical performers above. The notion of the composer as agent is discussed further in Chapter 6.

Monahan (2013:348) writes that we need the notion of the avatar to manage a broader spectrum of agents. He describes the avatar notion as follows: "[E]ach of the four agency [classes] can (and does) appear in an array of alternate guises and/or with a number of metaphorical overlays. This means that agents that defy immediate classification can usually be reconciled to one of [the] four [classes] in many of their attributes. Admittedly, the range of avatars is vast" (Monahan, 2013:348). According to Monahan, fictionalised performers that perform individuated elements are the most familiar avatars for the individuated elements class of agents. He uses the term 'fictional performer', because the actions of these performers are those of imagined performers and not an account of what real performers do. In such cases the performers, and here I include conductors as performers, are fictional agents that are avatars of individuated elements.

Diagram 4-7

The interaction and combinations of individuated elements



Fictional performers have much in common with the criteria for individuated elements. Monahan (2013:348) highlights the most notable similarities: "[They are] (a) entirely ad hoc, existing nowhere else in the analysis; (b) clearly unaware of what is to come (otherwise 'making a move' would require neither 'courage' nor a 'tentative' approach); and (c) only one of several agents of the same sort active at a single juncture (a situation never encountered by the other three classes)." Larson's discussions of the physical movement of listeners, performers, and conductors are also in terms of fictional performers. I specifically write about how amplified sound patterns influence the physical movements – more specifically the hand gestures – of conductors in this chapter. Before I discuss the physical movements of conductors, I first present an overview of Larson's writings about physical gestures.

Larson's discussion of Musical Forces and Physical Gestures

When Larson introduces and explains his theory of musical forces and other aspects relating to his theory, he relies on readers' (implied listeners') understanding and experience of physical movement and the operation of physical forces on physical movements. In this way, the ideas of Larson on persons as agents are closer to my notion of the historical agent than to Monahan's notion of the fictionalised person. Larson's use of physical movements and physical forces to explain musical movement and musical forces is an effective way to introduce metaphoric concepts such as movement in music and musical forces, because all readers have experienced physical forces before. Larson thus guides readers to understand the operation of physical forces in metaphoric ways that relate to ways in which we experience music.

Writings about the physical gestures that listeners will perform when required to do so and the operation of musical forces indicate some connections between the physical movements and musical movements. For example, when Larson (2012:87-88) writes about melodic gravity he indicates that such a music motion is associated – and can be understood better – in terms of downward movements.[24] This physical gesture is similar to the effect that physical gravity has on our bodies and can be seen as a representation of the metaphoric operation of melodic gravity on the unstable tone to resolve to the stable tone. He (Larson, 2012:136-179) also writes about the operation of rhythmic forces and physical gestures associated with the operation of rhythmic forces. For example, Larson (2012:148-149) writes about how an unstable upbeat is associated with an upward physical movement, and a stable downbeat with a downward physical movement.[25]

Larson uses the way in which we experience the operation of physical forces to illustrate his theory of musical forces. When he writes about the movements that fictional listeners will perform to illustrate the operation of musical forces in the music they listen to, he refers to imagined movements of the fictional listeners. Research into real movements of listeners, performers, and conductors was conducted extensively, among others, by Rolf Inge Godøy, Professor of Musicology at the University of Oslo, and Elaine King, Senior Lecturer in Music at the University of Hull. Their research is based on the movements of listeners, either their natural movements or the movements they perform when they are asked to move according to the music; the movements of performers while they perform music; and the movements of conductors when they conduct choirs, ensembles, or orchestra.

[24] "If we experience musical gravity as analogous to its physical counterpart, then our experience of physical gravity may suggest hypotheses that could flow from the theory of musical forces. Sometimes (for example, when perched atop a high, exposed, and somewhat rickety ladder, or when careening down a ski slope) gravity can have a powerful effect on us." (Larson, 2012:87-88.)

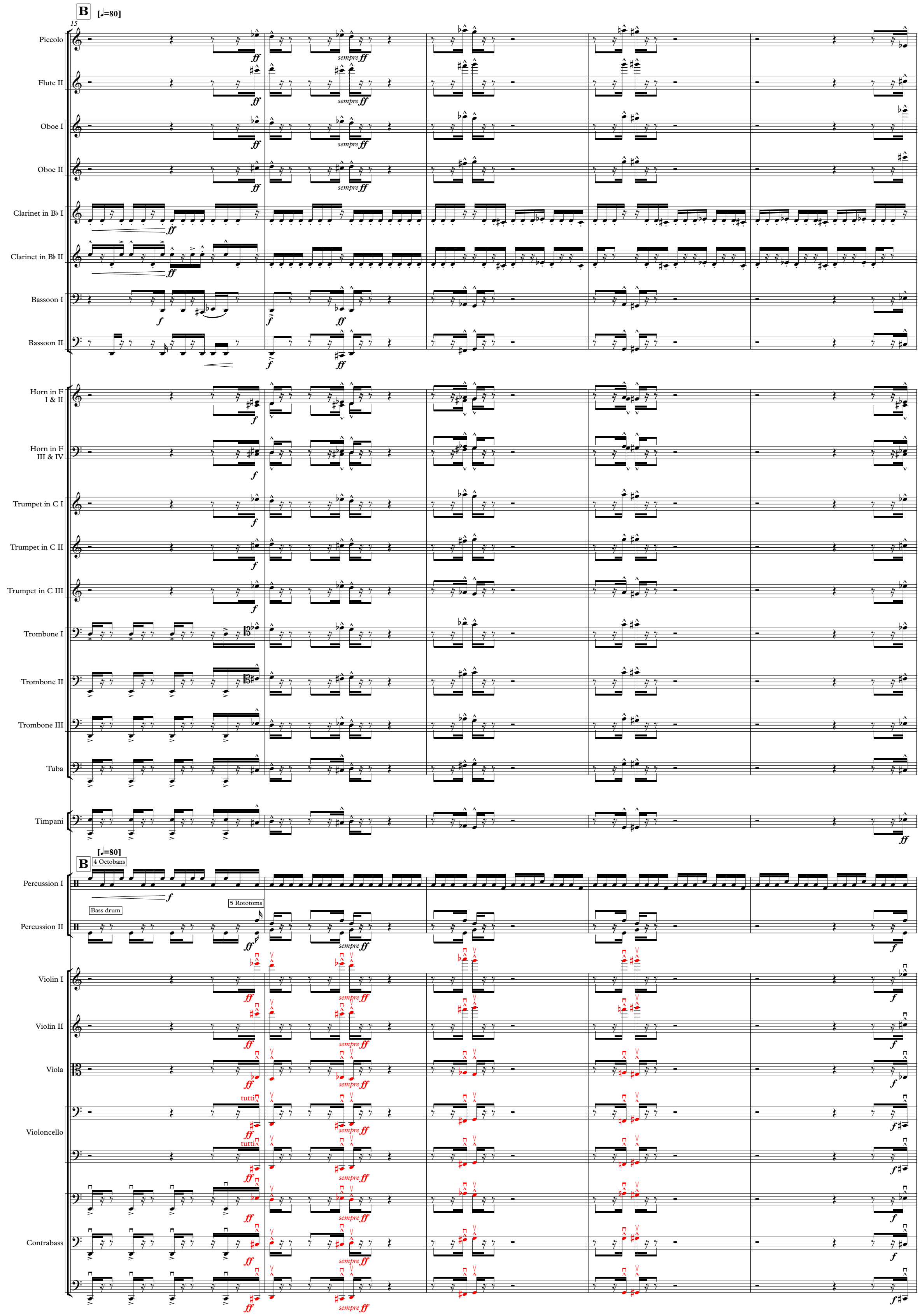
[25] "Conducting motions reflect this mapping [of musical forces onto physical forces] by showing 'downbeats' with downward motions. Effort, opening, and similar qualities associated with an upward (against gravity) motion are, according to this mapping, associated with upbeats." (Larson, 2012:148-149.)

Physical Movements of Performers and Conductors as Historical Agents

As a participant-observer and composer of SoundMine, I was able to observe the movements of the orchestra members of the Antwerp Symphony Orchestra and the movements of Wim Henderickx as conductor. These observations took place during Skype meetings[26] with Wim Henderickx during which he prepared and demonstrated his conducting[27] of my orchestral composition *Du bist mein Herzschlag*, and when I attended rehearsals[28] and the concert[29] of this composition and twelve other compositions by young composers.[30]

Firstly, regarding the orchestra members, I specifically observed the bow movements of the string players. String players will mostly, regardless of how melodic forces operate, play material on an upbeat with an upbow and material on a downbeat with a downbow (Drimatis, 2011:10). Although string players are used to receive specific bow-direction instructions in scores, I challenged the conventions of upbow-upbeat and downbow-downbeat in my orchestral composition: I indicated that unstable tones on an upbeat should be performed with a downbow, and the stable tones that follow on a downbeat should be performed with an upbow – see Example 4-25 for the full orchestral score (mm. 15-19) and Example 4-26 for only the strings section (mm. 15-19).

[26] These meetings took place on 5 March 2017 and 6 May 2017.
[27] Wim Henderickx was a guest conductor of the Antwerp Symphony Orchestra for this concert.
[28] These rehearsals took place on 23 May 2017 at the Filharmonisch Huis and on 24 May 2017 at the new Queen Elisabeth Hall in Antwerp, Belgium.
[29] The concert took place on 24 May 2017 at the new Queen Elisabeth Hall in Antwerp, Belgium.
[30] The other young composers are Stefan Bele (Netherlands), Siebrand Verhulst (Belgium), Jasper Charlet (Belgium), Athanasia Kontou (Greece), Bram Rooses (Belgium), Noah Senden (Belgium), Michaël Denis (Belgium), Vigdis Elst (Belgium), David Mastikosa (Bosnia and Herzegovina), Saskia Venegas (Spain), Fábio Videira (Portugal), and Carlos Britos Dias (Portugal).



Example 4-25

Du bist mein Herzschlag, *mm. 15-19 (full score)*

Example 4-26

Du bist mein Herzschlag, *mm. 15-19 (only string section)*

When the strings are seen in isolation, conventional bowing would seem to be apposite: upbows on the upbeats with unstable tones, followed by downbows on the downbeats with stable tones. However, when the strings are seen in context of the orchestra, the unconventional notation of bowing is apposite.

Secondly, regarding the conductor, I found that the conductor, Wim Henderickx, conducted the tonally unstable upbeats shown in Example 4-26 with a low downward hand gesture and the tonally stable downbeats with a hand gesture that can best be described as an upward leap. These hand gestures can also be ascribed partly to the energy that is invested immediately after the stable tones on stable beats: it is as if the energy 'rises' and 'pushes' the conductor's hand upwards. At the end of the composition, much energy is added by means of trills, tremolos, flatterzunge, and crescendos. This accumulation of energy evoked upward hand gestures of the conductor that resulted in an upward fist in the air, and although the string players had downbows, they ended the composition with their bows up in the air – see Image 4-1.

Image 4-1

Wim Henderickx conducting Du bist mein Herzschlag *(Photo: Musica)*

There are other reasons why these movements contradict Larson's descriptions: Larson discusses melodic and rhythmic forces separately, and he does not include other aspects such as energy as part of his theory of musical forces. When pitch and rhythmic content are combined with other musical elements, the movements will be different from the movements that will be performed when the focus is on either pitch or rhythmic content. The movements of orchestral conductors are examples of all-embracing movements: they have to convey different combinations of multiple elements and emotional expressions of the music through movements that are influenced by more than merely pitch or rhythmic content (Schuller, 1997:3). Research in movement and music is a broad topic and it is not in the scope of this thesis to discuss it in depth. However, Larson made a prominent connection between the operation of musical forces and physical movements, and also this aspect of his can be developed in this thesis. One could thus expect that I will also situate physical movements in the amplification of musical forces.

Musical Forces and Amplified Forces

I provide two examples below from *Raga I* in order to construct my arguments. The first example is an instance that combines glissandi, the gradual addition of instruments towards the end, addition of new material, and changes in register: *Raga I* for percussion and orchestra, part II, mm. 70-72. Example 4-27 shows the original version where the musical forces are amplified, and Example 4-28 shows an altered version of these bars without amplification of musical forces. I rely on an intersubjective consensus of scholars that the physical movements of conductors will be exaggerated for the material where the musical forces are amplified (Example 4-27). Schuller (1997:6-8) writes that the movements of conductors are based on the 'interpretations' of the music they conduct, and we can thus not generalise much about their movements. But if we accept my suggestion that the movements of conductors will be exaggerated when the music is amplified, the exaggerated physical gestures can be ascribed to the added energy in the music and the increased tendency of unstable tones to resolve to stable tones.

Example 4-27

Raga I *for percussion and orchestra, part II, mm. 70-72 (original version with amplification)*

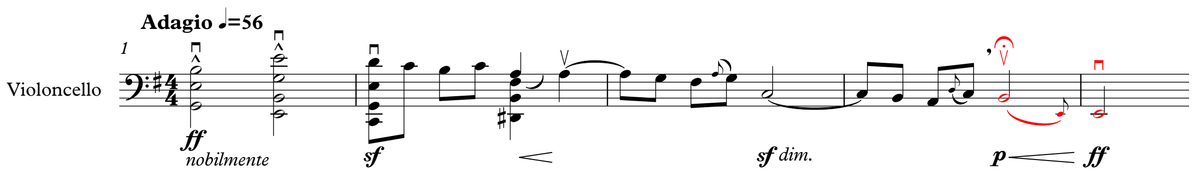
Example 4-28

Raga I *for percussion and orchestra, part II, mm. 70-72 (altered version without amplification)*

Visuals

Visual information influences the way in which listeners experience music and literature on this topic is discussed in Boltz, Ebendorf, and Field (2009:43-57). They specifically refer to a study conducted by Vines *et al.* (2006) where listeners had to indicate their perception of emotional tension on a potentiometer while listening to music. This study showed that the judgments of participants were more extreme in the audio-visual presentations than in the audio only presentations. It is not clear how the 'emotional tension' that was tested is defined, but my understanding is that it is similar to tonal tension as described in terms of musical forces.

The way in which performers move when they perform music is also linked to their understanding of the music they perform (the notion of embodiment). In turn, these movements influence the music that is performed visually for listeners who watch performances of the works. In most instances, the movements of performers support the music they perform, but they can also contradict or create ambiguity in the music. An example of such ambiguity is to first listen and then watch a performance of the opening segments, first movement, of Edward Elgar's Cello Concerto in E minor, Op. 85. When we listen to this composition, the glissando (see Example 4-29) is clearly a descending musical motion and the scale (see Example 4-30) is clearly an ascending musical motion. However, when we watch a performance of this composition, the cellist's hand slides upwards for the descending musical motion and the ascending scale is played with a downward physical motion. Although this is natural to most trained musicians, some untrained musicians and listeners will experience ambiguity or confusion between what they hear and what they see.



Example 4-29

Edward Elgar's Cello Concerto in E minor, Op. 85, first movement, mm. 1-5

Example 4-30

Edward Elgar's Cello Concerto in E minor, Op. 85, first movement, mm. 27-33

Raga I is an example of music that is visually enhanced in the version for percussion and orchestra when compared with the version for percussion and two pianos. In the version for percussion and two pianos, listeners who can see the performers, only see the physical movements of three musicians: the solo percussionist in the middle and the two pianists on the sides (see Image 4-2). In the version for percussion and orchestra, listeners see the physical movements of the conductor, the solo percussionist, and an entire orchestra (see Image 4-3).[31] We could say that the version for percussion and orchestra is a visual amplification of the version for percussion and two pianos. This is because some of the categories of amplification – the gradual addition of instruments is a good example – are visually supported: listeners can see how gradually more performers start to perform. It is in many cases not a salient phenomenon on a piano when more voices are added to increase energy and create a denser texture. The importance of the visuals is also echoed in the composer's choice to omit a second violin section and placing the solo percussionist at the front on the stage.

[31] The photo of the Beethoven Orchester Bonn was taken during the concert of "BOB goes India" during which *Raga I* for percussion and orchestra was performed, but the solo percussion instruments were not set up at the time this photo was taken.

Image 4-2

Performance of Raga I *for percussion and two pianos – Peter Cools (percussion), Mathias Coppens (piano, left), and Nathan Vanden Bulcke (piano, right) – Photo: YouTube*[32]

Image 4-3

The Beethoven Orchester Bonn that performed Raga I *for percussion and orchestra*

Photo: Felix von Hagen

[32] https://www.youtube.com/watch?v=5vzoM9FQi5s

8.3 How do we listen? – Meaning

Larson (2012) does not include agency in his theory of musical forces, but important aspects of the theory meets Monahan's criteria for individuated elements. The most important relation between Larson and Monahan is that both work with phenomena that are part of an intramusical world. It is clear in Larson's analyses and discussions how the other criteria are met, and therefore I will not discuss each criterion individually. However, I would like to briefly discuss autonomy and volition. Because Larson did not include aspects of Hatten's (2012b) work on energy and agency, many readers of Larson are under the impression that musical forces take full control of music and that tones have no autonomy or volition. I believe that the reader of this thesis will understand it differently, because I argued in Chapter 2 that Larson's musical forces can all be counteracted. This counteraction of musical forces can be explained in terms of the volition of tones, which relates to Hatten's work. This is the reason why I work with an integrated model (combining Larson with other scholars) in this research project.

Combining the theory of musical forces with agency enables us to create meaning of the music we listen to, because Larson is concerned about meaning and meaning is central in Monahan's writings about agency. In the paragraph below I firstly discuss Larson's ideas on meaning in music before I discuss how the work presented in this chapter supports meaning in *Raga I* for percussion and orchestra.

Larson's Ideas on Meaning in Music

Larson (2012:33, 328) writes that meaning is "something that our minds create when they group things into patterned relations".[33] Larson (2012:35) explains that "[t]he process by which listeners create musical meaning is captured in the phrase 'to hear as' – that is, 'to *hear x as y*,' where *x* is some sound and *y* is some meaning. For example, we may say that we *hear* a pattern of pitches [*x*] *as* an ascending gesture [*y*] or that we *hear* a pattern of durations [*x*] *as* a syncopated rhythm [*y*]."[34] Finding meaning in music in these ways is described as a "creative act" by Larson (2012:35). Larson's ideas about meaning in music also relates to Gestalt psychology in the sense that we create meaning "by finding ways of completing things in the simplest possible way" (Larson, 2012:35). According to Larson (2012:34), meaning is hierarchical and the different levels of meaning rely on the other levels of meaning. A fundamental aspect of creating meaning in music is to think in music, rather than thinking about music. Larson (2012:30) provides two examples to distinguish between these two concepts: "When we respond to music aurally – by auralizing pitches and durations – we are thinking *in* music; when we respond to music intellectually, we are thinking *about* music".[35] When scholars work with the theory of musical forces, they are encouraged to think in music, rather than to think about music.

[33] Larson (2012:31) writes that "[p]attern is central to meaning", an echo of Howard Margolis's (1987) work on meaning.

[34] Larson (2012:313) writes that he does not claim that pattern, analogy, and metaphor, as presented by the theory of musical forces, are a complete account of how listeners create meaning in music. It is certainly one of the ways in which listeners create meaning.

[35] The distinction between thinking in music and thinking about music was first introduced by Benjamin Boretz ([1968-1969] 1995).

Creating Meaning in Raga I *for Percussion and Orchestra*

When Larson (2012:35) writes about "completing things in the simplest possible ways" he implicitly refers to the operation of musical forces. For example, when listeners hear a melodic pattern 3-4-? they are most likely to complete it as 3-4-3 (due to the operation of melodic gravity and melodic magnetism) or 3-4-5 (due to the operation of musical inertia).[36] However, the pattern could be completed in many other ways, but that would require eluding the operation of musical forces. The implication of this is that different levels of meaning would be ascribed to different completions. To put it in context, the pattern completion would have a different meaning in tonal music than in atonal music. Meaning in music can thus be linked directly with the way in which we understand the operation of musical forces.

The individuated elements, discussed above, are not heard as elementary as the way in which they are presented in this chapter. Thus, they are not phenomena that were merely added in *Raga I* for percussion and orchestra to fulfil certain functions, although it is an elementary way of creating meaning. They might also be seen as amplifications of sound patterns – which they are for some instances – but on deeper hierarchical levels of creating meaning, they play an important role in how we hear the operation of musical forces: they amplify the operation of musical forces. When viewed through the lens of the theory of musical forces, the way in which these individuated elements amplify the operation of musical forces also has deeper meanings. I will now return to the individuated elements and discuss their role in amplifying the operation of musical forces and creating meaning from these amplifications.

[36] Also see Larson's (1992) work on aural-skills pedagogy and experiments with computer models (Larson, 2012:273-307).

Glissandi

Instances of glissandi discussed in this chapter are either moving from one point to the other (*a* to *b*) or between points (*a* to *b* and back to *a*) without specific pitch references in between. They also either start and end on stable Ds – which is the case for most glissandi – or they start and end on unstable C♯s and E♭s. The majority of glissandi are for the harp, therefore the tones between the outer tones of the glissandi are tuned to the scale of the composition. This is important because stable tones, unstable tones, and the tendencies of unstable tones are present in the harp in the same way in which they were made clear to listeners in the course of the composition.

The descending glissandi – here I exclude the glissandi that descend as part of a continuous descending and ascending pattern – amplify gravity. I specifically refer to 'gravity' and not 'melodic gravity' because my observations from this chapter led me to differentiate between these two terms. 'Melodic gravity', as described by Larson, is the tendency of an unstable tone to descend to the most stable tone. 'Gravity' is a broader term that is not limited to a specific tone, but a stable pitch class. In the case of descending material, a lower most stable tone can be heard as even more stable than the closest most stable tone. The start of each descending glissando is heard as tones that are repelled from a higher stable tone to a lower stable tone – there are no instances of descending glissandi between unstable tones in *Raga I*. Because the glissandi are descending, and continue to descend past some stable tones to the lowest possible stable tone, they are heard as an amplification of gravity. These descents exert energy and gain momentum as they are descending, because they are not braked by other agents. This is why they end with a splat on a hardened, stable platform: the energy is suddenly released.

The ascending glissandi – here I also exclude the glissandi that ascend as part of a continuous descending and ascending pattern – amplify magnetism. I specifically use the term 'magnetism' here in the broad sense, rather than the limiting 'melodic magnetism': tones are heard as repelling themselves from a stable platform and the operation of magnetism becomes stronger as the higher stable tones are approached. Their repelling from the stable platform can be ascribed to energy that is invested in the ascending tones, with the support of magnetism as stable tones are approached. Unlike descending glissandi that exert energy, ascending glissandi gain energy and momentum. This gain in energy enables us to hear these ascents as patterns with increasing tendencies as they move toward the upper platform, a notion which is closely related to the way in which magnetism operates. The higher tones of the ascent also become increasingly more salient due to the higher pitches, change in tone colour, and the crescendo. These aspects enable us to hear these ascents as amplifying magnetism, but some ascents start and end on stable tones and some ascents start and end on unstable tones. The ascents that start and end on stable tones are ascents that amplify magnetism and give in to the operation of magnetism at the same time. The ascents that start and end on unstable tones are ascents that amplify magnetism, but maintain the tendency to resolve further to a stable tone.

For both the descending and ascending glissandi, the outer tones are the most salient and listeners are able to identify those tones as stable or unstable. Although the tones of the descending or ascending glissandi are combinations of stable and unstable tones, the glissando itself is heard as unstable – even when stable tones are played – because individual tones of the descent or ascent cannot be identified. The salience of the outer tones of the glissandi plays an important role in amplifying stability. They are heard as a descent or ascent on a stable tone, moving up or down to the next stable tone, and back. Although these glissandi only amplify stability by making the stable tones clear turning points of the glissandi, the amplified stability further amplifies the operation of musical forces in material that is heard in concurrence with the glissandi. Another aspect of glissandi that is amplifying musical forces is their supporting the motion of the material with which they are combined. However, because they extrapolate the registers of the material they support, they reveal the operation of musical forces in advance.

Glissandi, both descending and ascending, are thus important individuated elements that amplify the operation of musical forces. In *Raga I* for percussion and concert band, descending glissandi amplify the operation of gravity and ascending glissandi amplify the operation of magnetism. I discuss other possibilities of glissandi and the amplification of musical forces in the section below.

Addition of New Material

New material that was added to *Raga I* for percussion and orchestra consists of stable and unstable tones that were added to the horizontal and vertical dimensions of the unfolding of musical gestures and segments. These additions of new material are not mere additions to existing material, but they amplify the way in which musical forces operate in/on the existing material. Some of the additions of new material are agents that create new sources of musical forces, and some amplify the musical forces that are already operating in the existing music.

The additions of new material that create new sources of musical forces also amplify musical forces that are already operating in the existing music they were added to, but they amplify those forces by adding material in which other musical forces operate. One of the instances listed in this chapter is an addition of ascending new material that was added to existing descending material. Gravity operates on the unstable tones of the descending material, pulling them down to stability, but magnetism operates in the added ascending material. Because both the descending and ascending material have the same stable tone as a goal, and this goal is approached from two directions, the operation of gravity on the existing descending material is amplified by the new material with ascending tendencies to resolve to the stable tone. The addition of material that is governed by magnetism can thus be employed to amplify the operation of gravity, and vice versa.

The addition of material that moves from instability to stability does not exert new musical forces but amplifies the musical forces that operate in the existing material by adding new material that exerts the same musical force. This added material is thus amplifying the tendencies of the unstable tones to resolve to stable tones, either by the operation of gravity or magnetism, and subsequently amplifying the operation of the musical forces that operate in the existing material. Unlike the addition of instruments to existing material, discussed below, the addition of material does not function merely parallel to the existing musical forces – they are independent and autonomous individuated elements.

The addition of new material that consists of stable tones only, amplifies musical forces in the same way as the addition of stable tones to existing material, discussed in more detail below.

The added chromatic chords amplify musical forces in the same way as glissandi. Each ascent and/or descent can be reinterpreted as a written-out glissando that strictly moves in semitones. However, some of them move in multiple layers that are denser than glissandi. The entire chord is thus heard as being repelled from a point of stability or instability and approaching a point of stability or instability. Most added chromatic chords ascend and descend, thus contributing to an amplified understanding of magnetism and gravity. I consider these additions as material that contribute to an amplified understanding of magnetism and gravity, rather than amplifying magnetism and gravity, because they are not clear in terms of which musical forces are amplified for which tones of the chords. Unlike the added material that creates new sources of musical forces, discussed above, these chromatic chords do not exert magnetism and gravity concurrently but successively.

Trills and Tremolos

The majority of trills in *Raga I* for percussion and orchestra replace tremolos of the percussion and two piano version. These semitone and quarter-tone trills are combined with tremolos that reiterate tones, flatterzunge, and key trills. These combinations of trills and tremolos imitate the movement created by the trills in the original version. Tremolos, tremolos combined with spiccatos, and semitone trills were added to tones of musical gestures in the orchestral version that were not marked tremolo or trill, respectively, in the two piano version. The movement created by the trills and tremolos makes the tones that are marked trill and/or tremolo more salient because of the additional energy that is invested in them. When these tones become more salient, their roles in the operation of musical forces become more significant.

I start my interpretation with quarter-tone trills that are combined with flatterzunge and key trills. Performing both flatterzunge and key trills requires that performers should reiterate a single tone. In the case of the key trills, the same tone is reiterated but with different fingerings – the result is similar to that of flatterzunge, with slight changes in tone colour, although the noise content of flatterzunge is missing. This combination of performance techniques was applied to both stable and unstable tones. In instances where they were applied to stable tones, they stand as part of the foreground auditory stream, amplifying the most stable tone of the composition. This amplification of the most stable tone creates a stable platform for the subsequent material, which is heard as unstable in relation to the stable platform. Although these tones are energetic and move away from the stable platform, they are constantly heard as being pulled down by gravity and magnetism to the stable platform. The quarter-tone trills are slight deviations from the stable tone which keep listeners' attention on the stable tone, rather than merely stating another stable tone. The operation of gravity and magnetism is thus amplified by the trills and tremolos. In most instances where the trills and tremolos were applied to unstable tones, they amplify the unstable neighbouring semitones of the most stable tone of the composition, pitch class D. The quarter-tone trills on these unstable tones are heard as an intensification of the preceding semitone trills because the interval of the trills is smaller. The instability of the tones of the trills is clearly heard because of the quarter-tone interval between the unstable tones and the stable tone. This tendency to resolve to the stable tone, approached by the higher and lower unstable tones, also becomes more salient due to the crescendo. This tendency of the unstable tones to resolve to the closest stable tone that gets stronger and more salient is not only closely related to the way in which magnetism operates, but is an amplification of magnetism.

The tremolos that were added to tones of musical gestures that were not marked tremolo in the two piano version, are significantly different from the tremolos described above because they are tremolos on many short durational tones and not tremolos on a few long durational tones. These tremolos are also not heard as providing a stable platform (gravity) or increasing the tendency of unstable tones to resolve to stable tones (magnetism) – they add density and a colour change to the musical gestures. The density that they add to the musical gestures is important in terms of how the musical forces operate in the entire musical gesture. For example, if the tones in the musical gesture are pulled downwards by the operation or gravity, or they have the tendency to resolve to the closest stable tone, these tendencies become more salient when tremolos are added. The reason why these tendencies become more salient is because the tones become more salient – and the tones contain inherent stability or unstable tendencies – and the added density is aurally associated with added friction. This added friction amplifies the musical force – gravity, magnetism, or both – that operates in the entire musical gesture.

The tremolos that are combined with spiccatos, glissandi, and crescendos are also listed as instances of glissandi that start at the beginning of the segment and add increasingly more energy toward the end of the segment. They also get increasingly more salient as they move toward the end of the segment, because the intervals between the outer tones increase from a major third and a major second at the beginning to larger intervals of a major sixth and a major eleventh toward the end. The starting and ending tone of each glissando correspond with the starting and ending pitch classes of the musical gestures that they are combined with. The direction of the glissandi reveals whether the musical gesture will end on a lower or higher tone than the tone it started on, and the transformation from spiccato to ordinario is a vague indication of the end of each descent or ascent. It is possible to argue compellingly that these sound patterns also amplify the operation of musical forces, especially when this argument is brought in relation with the other arguments presented here. I consider these sound patterns, however, as mere colourings of the musical gestures with which they are combined and not amplifications of musical gestures.

A significant change is audible in the octave tremolos in the version for percussion and two pianos that were changed to semitone trills in the version for percussion and orchestra. The octave tremolos in the two piano version merely reiterate the stable tone in octave alternations. Although it is a clear and transparent way to amplify stability, stability is amplified here by the addition of unstable tones that cause alternations between stable and unstable tones. The added upper unstable tones that neighbour the stable tone are attracted to the stable tone by the operation of melodic gravity, and the added lower unstable tones that neighbour the stable tone are attracted to the stable tone by the operation of melodic magnetism. The operations of musical forces in these tones are not amplified, but the continuous resolutions of unstable tones to the stable tone amplify that stable tone by means of a constant and dense reiteration of musical magnetism. These sound patterns are also denser than the octave tremolos, and this establishes listeners' attention more towards the stable tone. In the instance in *Raga I* where octave tremolos were changed to semitone trills, these trills serve as a high-sounding drone. The concurrent material of this instance is heard as material that move away, downwards and without energy, from the stable tone, and the unstable material has upward tendencies to the higher stable tone, rather than the lower stable tone. These upward magnetic tendencies are amplified at the end of the segment by the addition of an ascending scalar passage and an ascending glissando. Stable platforms are thus not limited to lower platforms, and therefore it is important to distinguish between lower and upper stable platforms. Furthermore, it became clear that stability does not only influence the operation of musical forces, streamlined in one direction, but the operation of musical forces can also influence stability.

There is only one instance in *Raga I* for percussion and orchestra where semitone trills are combined with tremolos and flatterzunge: the final chord of the composition. All the tones of the scale of the composition are employed in this dense chord. Due to the density of this chord and its placement at the end of the composition, it is not heard as an amplification of forces because it does not create any tendencies to resolve further.

Addition of Instruments to Existing Material

There are three types of additions of instruments to existing material: targeted additions, sudden additions, and gradual additions. The targeted additions target stable tones and unstable tones that move to stable tones, and the sudden and gradual additions are only at the end or towards the end of segments, respectively. Because they target specific tones, movements, and parts of segments, their role extends further than merely the dramatic unfolding of the music: they amplify stability and the operation of gravity and magnetism that shape musical gestures and segments.

Instances of the targeted addition of instruments to stable tones are found in the unfolding of segments where stable tones are heard intermittently or as a result of the operation of melodic gravity and/or melodic magnetism. When only these stable tones become audibly salient, they create stable pillars between the patterns consisting of unstable material. I specifically use the term 'pillars' to refer to vertical amplifications of stability in order to distinguish it from the term 'platform' by which I refer to horizontal amplifications of stability. Thus, the additions of instruments to stable tones do not create a stable horizontal platform that pulls unstable tones downwards, but they create stable vertical pillars or reference points in the linear unfolding of the material. Although I distinguish between 'pillars' and 'platforms', their function in amplifying the operation of musical forces are similar. The stable pillars make the stable tones salient to listeners, which enable listeners to clearly distinguish between stable and unstable tones, and they serve as 'reminders' of the stable tones which amplify their gravitational and magnetic tendencies to resolve to the stable tone.

The additions of instruments to unstable tones that move to stable tones are short and salient additions, similar to the addition of instruments to stable tones, but including unstable tones.

This individuated element exists only as instances in which unstable tones resolve to stable tones at the end of the material for the added instruments. The movement of the unstable tones to stable tones is thus amplified here. Because the unstable and stable tones are doubled in other registers by instruments of other timbres, the function of the added instruments extends beyond merely amplifying the movement of the unstable tones to stable tones – they amplify the musical forces that operate on the unstable tones. The unstable tones of the instances of this individuated element are semitones that neighbour the stable tone. The upper unstable tones are pulled down to the stable tone by the operation of melodic gravity, and the lower unstable tones are attracted upwards to the stable tone by the operation of melodic magnetism. These unstable tones give in to the operation of the melodic forces that operate on them, and therefore the operation of gravity and magnetism is amplified when instruments are added to these movements.

The sudden addition of instruments at the end of segments and the gradual addition of instruments towards the end of segments do not function as clearly as the additions that target specific tones. This is because they target stable and unstable ends of segments of which the operation of melodic forces in the material that precedes the ends are not necessarily salient due to energy of tones that counteract the operation of the melodic forces. For these instances, the melodic force(s) that continue to operate at the end of unstable segments, or the musical forces that operate to create segments that end stable, are amplified. This is because tones, and their quality as stable or unstable, are added, and if unstable tones are added, their tendencies governed by the operation of melodic gravity and/or magnetism, are also added. The sudden addition of instruments at the end of segments seems to work better in unstable ends, because the sudden addition of unstable tones amplifies the tendencies of those unstable tones, governed by melodic gravity or magnetism, to resolve to stable tones. The gradual addition of instruments towards the end of segments seems to work better in stable ends because the tension created by the tendencies of the unstable tones to resolve to stable tones is gradually increased. The culmination of added instruments then corresponds with the resolution of the unstable tones to the stable tone. In such instances the operation of the melodic force(s) is clearly amplified because their tendencies, as well as the result of its/their operation, are salient to listeners.

Changes in Dynamics

Instances of changes in dynamics are mainly crescendos at the beginnings and ends of segments. These crescendos are added to both stable and unstable tones. As argued by Hatten (2012b) and discussed in this chapter, crescendos amplify the tones they are added to and their tendencies, because they are heard as a gradual investment of energy in those tones. Thus, a crescendo that is added to an unstable tone will amplify the tendency of that unstable tone to resolve to a stable tone. Depending on the vertical position of the unstable tone in relation to the stable tone, the operation of gravity, magnetism, or both can be amplified by the added crescendo. The gradual addition of instruments to amplify the operation of musical forces can be considered to be a written-out crescendo, for example, and therefore the way in which crescendos and the gradual addition of instruments amplify musical forces is similar.

Changes in Register

Register changes were observed at stable beginnings and stable and unstable ends of segments. The composer's preference to transpose unstable tones higher and stable tones lower to amplify stability, or to transpose stable tones higher and unstable tones lower to amplify instability, is discussed in that section. The tones transposed upward carry less weight in determining stability or instability than the ones transposed downward, because the quality (as stable or unstable) of some of the higher tones become more indefinite and their overtones interact less with the other tones of the chord. Aspects of fundamental tones and overtones are discussed further in Chapter 5.

Conclusion

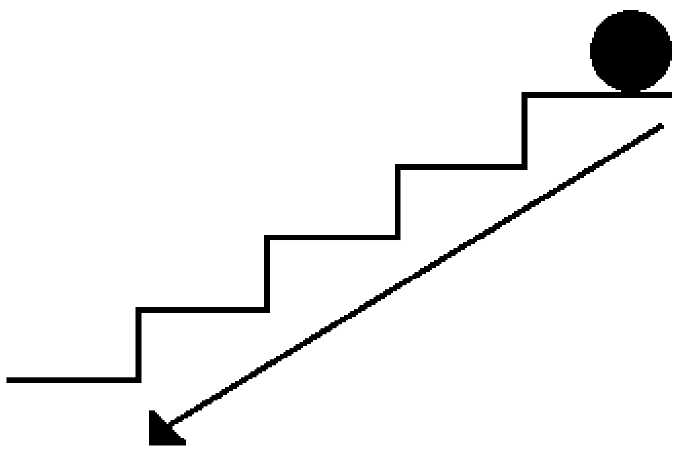
The analyses and comparisons of the two versions of *Raga I* in Case 1 enabled me to identify various ways in which the operation of gravity and magnetism can be amplified. Some readers might have found discussions of how musical inertia can be amplified conspicuously missing. It is also possible that some other readers do not consider inertia as a force and that it cannot be amplified, as argued by Hatten (2012b). However, the operation of musical inertia is amplified to some extent by some of the individuated elements discussed above. For example, a descending glissando of four octaves that is combined with descending material of one octave in order to amplify gravity in the descending material reveals, to some extent, the motion and directedness of the descending material. The tones of the glissandi are thus heard as giving in to the operation of musical inertia and we expect that the descending material will do the same. In this example we hear the glissando as an amplification of gravity, rather than musical inertia, but aspects of musical inertia are amplified. There are no instances in *Raga I* where musical inertia was specifically amplified when it was orchestrated. Reasons for this lack of amplifying musical inertia are because clear amplifications of musical inertia would not meet the criteria for individuated elements and, if sound patterns give in to the operation of amplified musical inertia, they would have limited movement in the music. However, an analysis of any one of the versions of *Raga I* will show very clearly that musical inertia is functioning almost throughout the composition.

8.4 How do we understand? – Metaphor

Larson (2012:50) returns to one of the principles (thinking in music) of his theory when he writes about metaphor: "The metaphor of musical motion goes beyond shaping the way we talk about music to shape our musical experience; we not only think *about* music but also think *in* music in terms of the metaphor Musical Succession Is Physical Motion". Larson's (2012:46-51) discussion of metaphor is summarised in Larson (2012:328) as follows: "That conceptual process described by George Lakoff and Mark Johnson (1999) in which we understand one (typically less familiar or more abstract) thing (from a *Target domain*) in terms of some other kind of (usually more familiar or more concrete) thing (the *Source domain*). Metaphors are thus *Cross-domain mappings*. All metaphors are analogies; not all analogies are metaphors." It is clear in *Musical Forces* (Larson, 2012) that Larson relies on the work of Lakoff and Johnson (1999) and a chapter in *Musical Forces* (Larson, 2012:61-81) was co-authored by Mark Johnson. The central argument of *Musical Forces* is also in terms of metaphor: "[O]ur experience of physical motion shapes our experience of musical motion in specific and quantifiable ways – so that we not only *speak* about music as if it were shaped by musical analogs of physical gravity, magnetism, and inertia, but we also actually *experience* it in terms of 'musical forces'". In this section I expand further on the individuated elements that amplify the operation of musical forces in *Raga I* and discuss how we understand them in terms of metaphor.

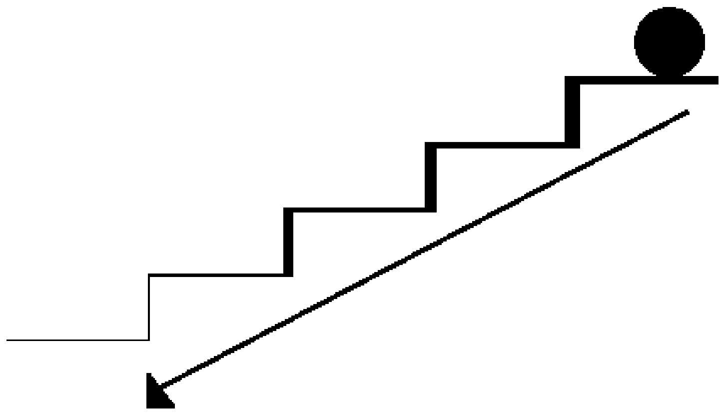
Glissandi

Glissandi that amplify gravity – thus, descending glissandi – can be expanded in a similar way to that in which the interactions of musical forces on a descending motion are expanded by Hatten (2012b): the descending pattern gains sustained agential momentum and will result in an impact (see Chapter 2, §16.1.5). Hatten (2012b) specifically refers to 'sustained agential momentum', because gravitational acceleration is not explicitly included in Larson's discussions of gravity, and braking or accelerating the descent would require the operation of other agents. Sustained momentum is also possible when gravitational acceleration is counteracted by friction. The glissandi in *Raga I* that amplify gravity can be heard as glissandi that have sustained momentum and that do not accelerate, or they can be heard as glissandi that gain momentum and accelerate. Because the majority of glissandi in *Raga I* are glissandi for the harp, we would best relate this motion to the physical motion of a ball that slides down a set of stairs. Each stair provides the same amount of friction to the ball so that it descends with sustained momentum and constant speed – see the illustration in Example 4-31. It is, however, unlikely that the tones of these glissandi will be performed with an equal speed. It is more likely that they will be performed slowly at the beginning, as if friction 'holds it back', and accelerated towards the end. If we relate this motion to the physical motion of a ball that slides down a set of stairs, the first stairs provide some friction and the last stairs provide less friction. This motion is illustrated in Example 4-32 with the stairs that provide friction illustrated with thicker lines and the stairs that provide less friction illustrated with thinner lines.



Example 4-31

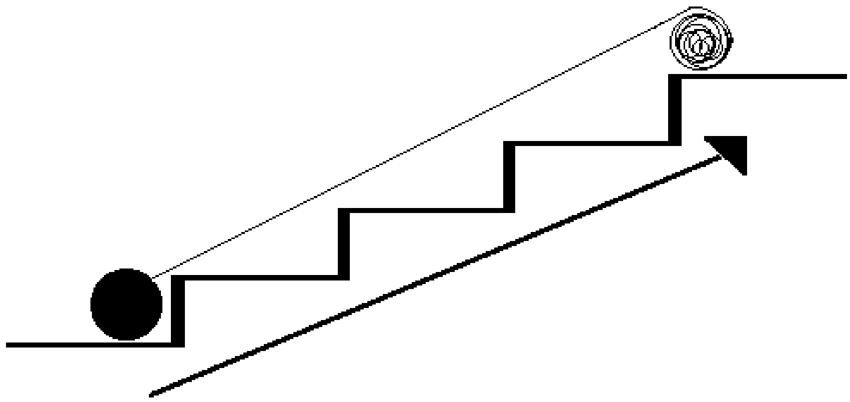
Physical movement of a ball going down stairs with sustained momentum and constant speed



Example 4-32

Physical movement of a ball going down stairs gaining momentum and accelerating in speed

Glissandi that amplify magnetism – thus, ascending glissandi – counteract the downward pull of gravity when they move upwards, but this upward movement is only possible with the help of an agent that provides energy for this ascending movement. The notions of momentum and speed remain, but they are determined by the agent because the agent has autonomy and volition. If I use the illustration of a ball on a set of stairs again, the ball will only be able to move up the stairs with the help of an agent. In Example 4-33 the agent is a person pulling the ball upwards with a string.

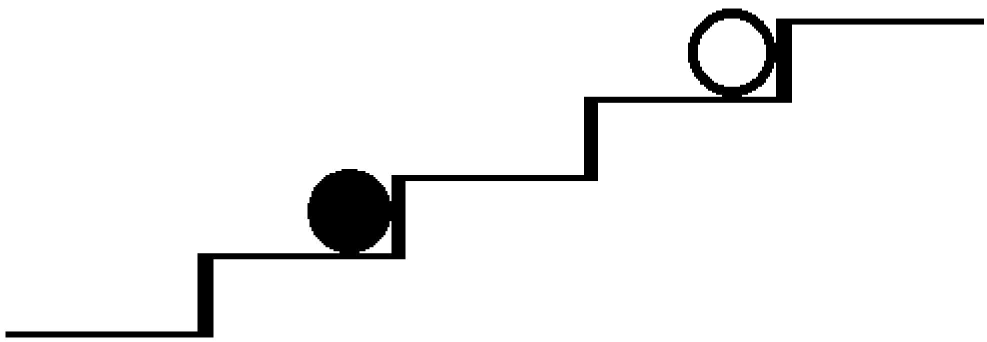


Example 4-33

Physical movement of a ball going up stairs when pulled on a string by a person

Addition of New Material

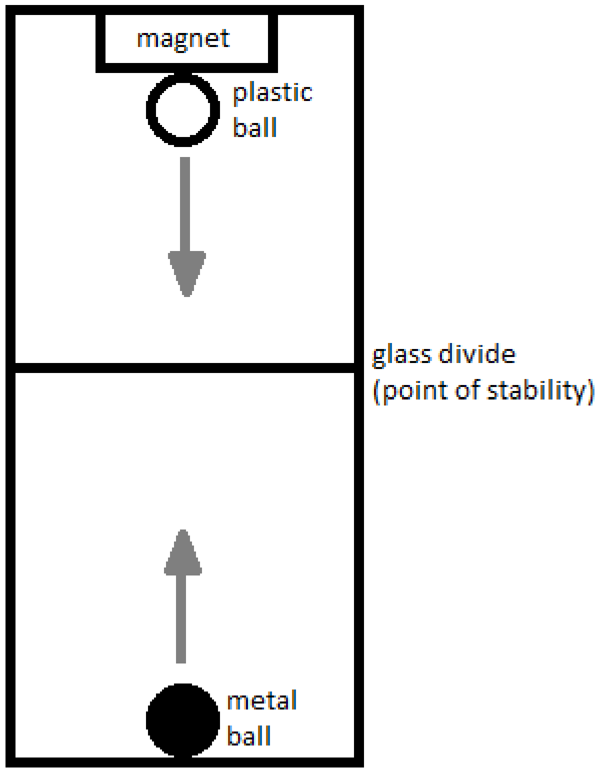
The addition of new material that amplifies the operation of existing musical forces is an addition of material that follows the same path as the existing material in terms of how musical forces operate. Using the stairs analogy of the examples above, the addition of new material can be understood in terms of physical motion as a second ball that is a few stairs behind and following in the same direction as the first ball – see Example 4-34. Although this second ball is similar to the first ball and moves in the same direction, it might not be moving at the same speed as the first ball or it might experience friction differently than the first ball. The second ball is thus not dependent on the movement of the first ball.



Example 4-34

The addition of a second ball to the first ball, moving in the same direction

The addition of material that exerts a new musical force to amplify an existing force contains the operation of different musical forces in different sound patterns. The operation of the musical force on the unstable tones in the one pattern is independent of the operation of the musical force on the unstable tones in the other pattern, but they have the same point of stability as a goal. To examine the operation of physical forces on such an instance we can take a glass container with a magnet on top and a glass divide in the middle of the container – the point of stability – and put two balls inside: a plastic ball on top and a light metal ball at the bottom. Gravity will pull the plastic ball downwards and it will not react to the magnet. Although gravity will also pull the metal ball downwards, it will move upwards due to the magnet that attracts it. If the goal is that both should reach the glass plate in the middle, both the plastic ball and the metal ball will reach points of stability and stop without moving any further – see Example 4-35.



Example 4-35

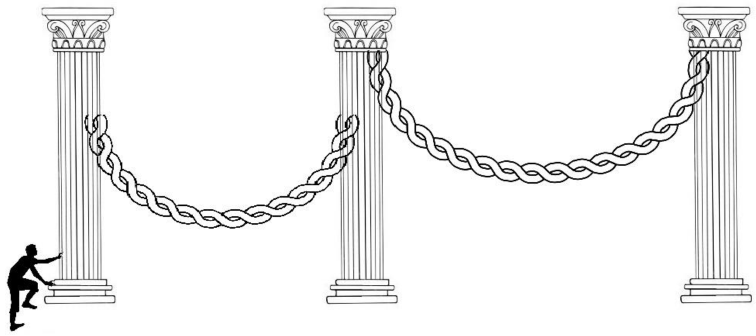
Plastic ball pulled downwards by gravity and metal ball attracted upwards by magnetism

Trills and Tremolos

The addition of trills and tremolos firstly amplifies stability or instability, and the operation of musical forces is subsequently amplified as a result of the amplified stability or instability. I discuss stability in this section with the metaphor of a light. If a light shines, some people will be aware of the shining light and some others might not be aware of it at all. Although it is constantly shining whilst switched on, the people who are aware of the light are not constantly thinking about it shining. However, when the light starts to flash, we become more aware of the light. The people who were not aware of the light might also become aware of it for the first time. When the light is flashing, it draws more attention than when it is stable. An example of this is the flashing headlights of emergency vehicles that draw more attention than the stable headlights of other vehicles on the road. If we think about tonal stability as a light that indicates stability or instability, the addition of trills and tremolos are the agents that will make the light flash. Every reiteration of a tone can therefore be seen as a flash of a light. Thus, they draw listeners' attention to the stable or unstable tones they are combined with.

Addition of Instruments to existing Material

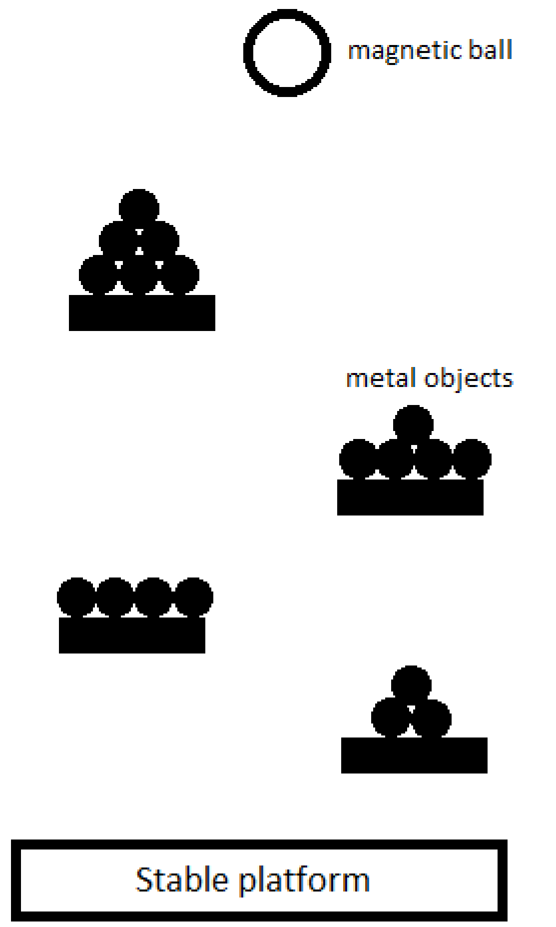
In my interpretation of this individuated element above I use metaphors of pillars and stable platforms to explain some of the movements we hear when instruments are added to existing material. The metaphor of pillars is efficient, because they provide stability for an object that moves horizontally. Imagine an athlete moving along with ropes between pillars (see Example 4-36). While the athlete is moving between the pillars, there are points where he is pulled downwards by gravity, and there are points where he is able to counteract gravity by adding additional energy and jumping up, for example. He is unstable in both instances. However, we can attribute a sense of stability to the athlete when he is on the floor between the pillars, or on one of the pillars. Unstable tones move in a similar way to the athlete, because forces operate on them but their volition and energy enable them to counteract those forces. When they reach the stable points, the pillars, they are more stable in the horizontal dimension.



Example 4-36

An athlete moving between pillars on ropes

When instruments are gradually added towards the end of a segment, the musical forces that operate on the unstable tones are amplified. This movement is similar to a magnetic ball falling downwards due to the operation of gravity. As this magnetic ball falls downwards, it picks up increasingly more metal objects and the mass of the ball increases. This increase in mass is equivalent to an increase in weight, and weight as a force will cause this ball to fall downwards with more force (see Example 4-37). Similarly, the addition of instruments increases the mass of the descending material which instruments are added to and the tendency to resolve to stability becomes increasingly stronger.

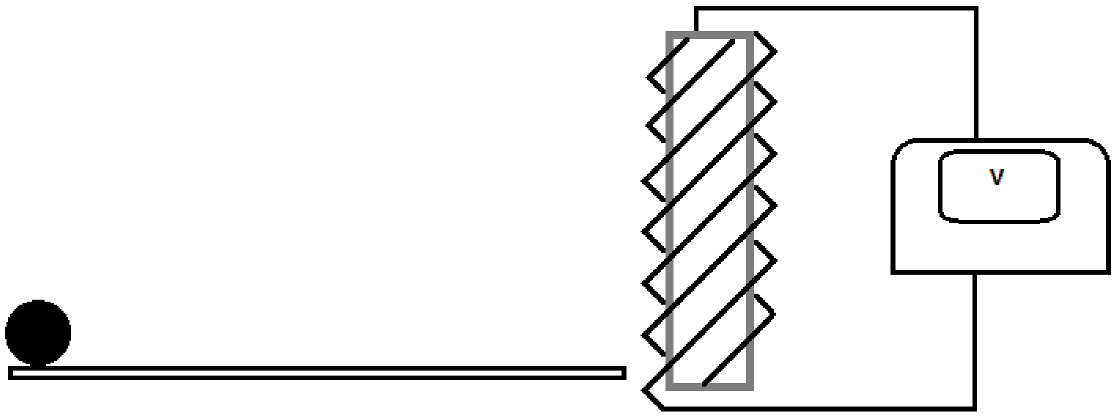


Example 4-37

Magnetic ball falling downwards and becoming heavier by attracting and adding metal objects

Changes in Dynamics

The operation of changes in dynamics can be described best with the metaphor of an electromagnet. If insulated wire is wrapped around and iron core to form a coil and it is provided with an electric current, it will create a magnet that will attract a metal object. A constant supply of electric current will enable the coil to magnetically attract a metal object in the same way as a permanent magnet. This metaphor can be applied to unstable tones that are governed by melodic magnetism to resolve to the closest stable tone. Intensifying this magnetic attraction of the unstable tone to the stable tone is achieved by the addition of the crescendo. This intensification of the magnet can be achieved in a physical world by gradually adding electrical current to the electromagnet, which will intensify the magnetic attraction. See Example 4-38 below.



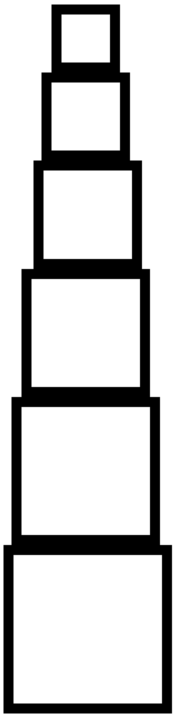
Example 4-38

The operation of an electromagnet on a metal ball

Changes in Register

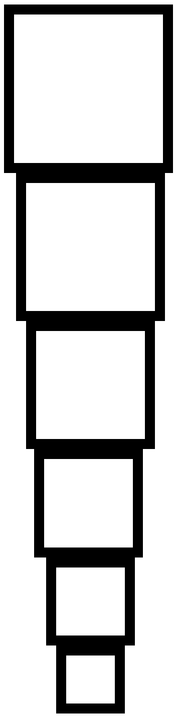
Changes in register are done primarily to influence the way in which listeners hear stability and/or instability. The amplification of stability is associated with transposing stable tones down and unstable tones up. The amplification of instability is associated with transposing unstable tones down and stable tones up. These transpositions of tones are similar to the way in which building blocks work. If we understand the larger blocks as stable tones, and the smaller blocks as unstable tones, the blocks can be stacked on top of each other in different ways. If we work with the extremes of the possibilities, the building blocks can be stacked with large blocks (stable) at the bottom to smaller blocks (unstable) at the top (see Example 4-

39) or with small blocks (unstable) at the bottom to larger blocks (stable) at the top (see Example 4-40).



Example 4-39

Building blocks stacked with largest (stable) blocks at the bottom



Example 4-40

Building blocks stacked with smallest (unstable) blocks at the bottom

It is possible to stack these building blocks in both the ways suggested in the examples above. However, the stack in Example 4-39 will be more stable than the stack in Example 4-40.

CHAPTER 5

Case 2: Wim Henderickx's *Raga I* and *Raga III*

Wim Henderickx's way of creating two of the versions of *Raga I* and *Raga III* (*Raga I* for percussion and concert band and *Raga III* for viola solo and smaller orchestra) is significantly different from the ways in which he created the other versions. *Raga I* for percussion and concert band can be seen as an instrumentation of *Raga I* for percussion and orchestra, and *Raga III* for viola solo and smaller orchestra can be seen as a reduction of *Raga III* for viola solo and large orchestra. The creation of both these versions can be considered as orchestration, but when I compared these newer versions of the two Ragas with their earlier versions, I discovered that they are significantly different from other versions that I compared. Due to the many similarities between *Raga I* for percussion and orchestra and *Raga I* for percussion and concert band, and also between *Raga III* for viola solo and large orchestra and *Raga III* for viola solo and smaller orchestra I will not provide a comprehensive comparison between these versions. An exhaustive comparison would also not contribute to answering the research questions rigorously. Instead, I will only discuss the most salient differences between these versions and then show how musical forces are affected by these differences.

This case is a local-knowledge case because literature on the topics discussed in this chapter can be found in textbooks on orchestration. I include this case in this research project to discuss these topics specifically in terms of musical forces in order to expand the theory of musical forces.

1. ***Raga I* for Percussion and Concert Band**

1.1 Introduction

When I compared *Raga I* for percussion and concert band with *Raga I* for percussion and orchestra, two prominent differences were found on a macro-level: change of instruments from percussion and orchestra to percussion and concert band; and the addition of material for percussion (performed by three players in addition to the solo percussionist).

I limit my discussion of these versions in the following manner: firstly (§1.2 and §1.3) I discuss the two prominent differences identified above, and secondly (§1.4) I discuss how the individuated elements, which I identified in Chapter 4 when comparing *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra manifest in *Raga I* for percussion and concert band. I specifically discuss the following individuated elements: addition of new material, changes in register, and changes in dynamics. My discussions of these differences and individuated elements enable me to further expand parts of Larson's theory of musical forces.

1.2 Change of Instruments

The change of instruments is a prominent difference between *Raga I* for percussion and orchestra and *Raga I* for percussion and concert band. This change has two important implications for the newer version:

- The change of instruments has an impact on the tone colour of the ensemble, even though the number of performers needed for both versions is similar.
- Other aspects of the composition are influenced by the limitations posed by the musical instruments of the concert band.

These two aspects will form the basis of my discussion in this section.

The instruments in *Raga I* for percussion and concert band have different tone colours and limitations than the instruments in *Raga I* for percussion and orchestra. The woodwind and brass instruments used in *Raga I* for percussion and concert band do not offer the same possibilities as the full orchestra of *Raga I* for percussion and orchestra. I will start by listing the most notable limitations of the wind instruments when compared to the instruments of the full orchestra.

- Double stops: double stops are not possible on the wind instruments and this technique can thus not be employed in the concert band to add tones or create density.
- Performance techniques that were employed in the string instruments of *Raga I* for percussion and orchestra such as pizzicato, spiccato, sul tasto, col legno battuto, and punta d'arco are not possible on the wind instruments of the concert band, and the wind instruments do not boast such a wide gamut of ways in which to alter the sounds that are produced. No performance techniques for wind instruments were employed in *Raga I* for percussion and concert band to replace the techniques of the strings.

However, as argued in Chapter 4, the performance techniques of the string instruments were mainly employed for colouristic purposes and did not play a significant role in the operation of musical forces. Thus, when they were left out in the version for percussion and concert band, it did not influence the operation of musical forces to any notable extent.

- Microtones: quarter-tone trills were employed in string instruments in *Raga I* for percussion and orchestra, but some of these trills are not idiomatic or possible on the wind instruments used for *Raga I* for percussion and concert band. In instances where these quarter-tone trills were orchestrated for wind instruments, they were changed to semitone trills. The colouristic aspect, density, and role of quarter-tone trills found in *Raga I* for percussion and orchestra are thus not present in *Raga I* for percussion and concert band.
- Artificial harmonics: although there is no difference in the outer pitch registers that are possible in the orchestra and the concert band, artificial harmonics are not possible on wind instruments and some natural harmonics on the wind instruments are limited and cannot be sued in the same ways as harmonics on the bowed string instruments. The changes in register due to these harmonics are lost in the version for percussion and concert band.
- Ringing: if the wind instruments are not supplied with air by the performers, they cannot sustain sound, but the strings of string instruments continue to ring after they were bowed. Listeners will thus hear tones of wind instruments as consecutive tones, while the tones of ringing instruments can be heard as overlapping tones.

These differences drew my attention to the different ways in which musical forces operate on/through sounds produced by different musical instruments. Upon investigating the operation of musical forces among different instruments I found that musical forces operate differently when the same material is played on different musical instruments. In my discussion below I will focus attention on the most salient aspects deduced from differences between some of the instruments employed in *Raga I* and *Raga III* in order to support my argument that musical forces operate differently on different instruments. The salient aspects regarding differences between musical instruments that I will focus on are overtones, multiple tones, microtones and tempering, dynamic range, and pedalling and sustain.

Overtones and Timbre

In my discussion here, I consciously simplify the issues. The aim of this discussion is not to give a definitive view of the issues, but to provide some foundation upon which I can interpret my observations.

The specific overtones[1] that are emphasised by a musical instrument determine its timbre (Meyer, 2009). The difference in overtones between instruments, specifically the string and wind instruments, the instruments compared here, causes tones and their inherent qualities to be heard differently among these instruments.[2] If we consider string instruments[3] as an example, the strings that are not played to perform a fundamental tone will respond sympathetically to the strings that are played. Some instruments, like the sitar and viola

[1] All discussions with regard to overtones refer to instruments that were tuned to equal tempering. I could also have used the term 'spectrum'.

[2] Cook (1994:68) refers to empirical work of Rita Wolpert (1990) who found that trained and untrained listeners experience the same music that is performed on different instruments differently. Wolpert found that trained listeners are more likely to group music that is played on different musical instruments together in terms of the same material. Untrained listeners are more likely to group music that is played on different musical instruments together in terms of the instruments they hear and not according to the material.

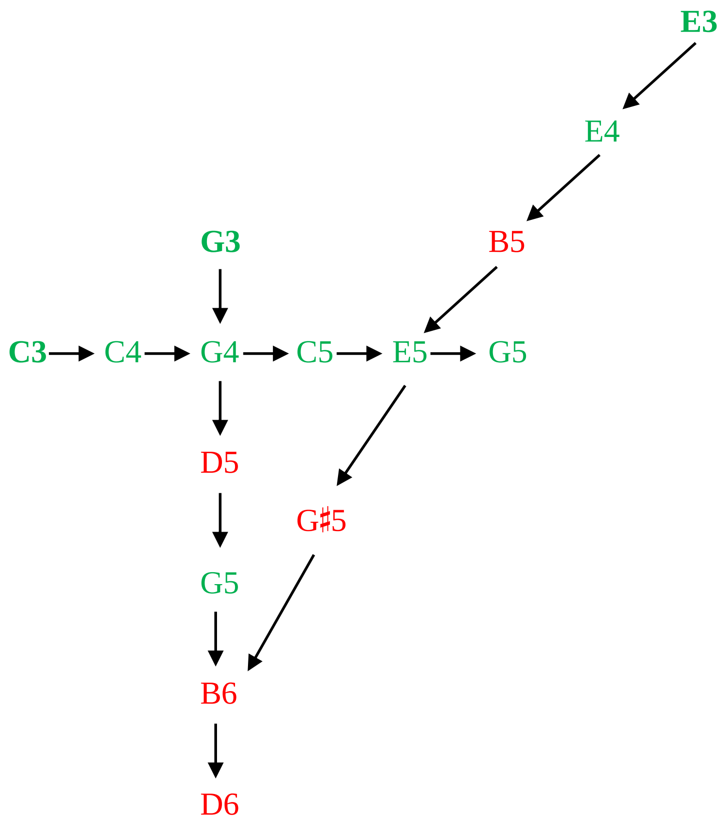
[3] Here I include the piano.

d'amore are built with dedicated sympathetic strings to emphasise certain overtones. Due to the different gamut of strings of instruments, like those of a piano versus those of a violin, the number of strings that can act sympathetically is different, and also the strings react differently because of tension, weight and so on. Similarly, the overtones produced by the low C string of a contrabass are not the same as the overtones produced by the low C string of a viola (Berg & Stork, 1982:313).

Although overtones and some sympathetic strings are not as salient as the fundamental tone, they influence the tones we hear significantly because they support the tonal context in which we hear certain tones. In Example 5-1 and Example 5-2 I show the overtones of a C major tonic triad and its dominant triad (G). For clarity, I ignored the small pitch differences that might be found between, for example, the E5 as overtone of the tempered E3 and as an overtone of the tempered C3.

In the context of C major, the G can be heard as stable and I show in the tonic chord and its fundamental tones[4] how the overtones of the tonic triad support stability[5] and how the overtones[6] of the dominant triad support instability[7]. Although I marked the G as a stable tone in the dominant chord – because it has some degree of stability as an isolated tone in the context of C major – it is clear that the G can be a stable or an unstable tone, depending on its tonal context. The overtone partials of the fundamental tones in the examples are according to the overtone series as described by Berg and Stork (1982:72-74), Hall (2002:122-124), and Sethares (2005:21-22). The quality of tones to be stable or unstable will be discussed further in Chapter 6.

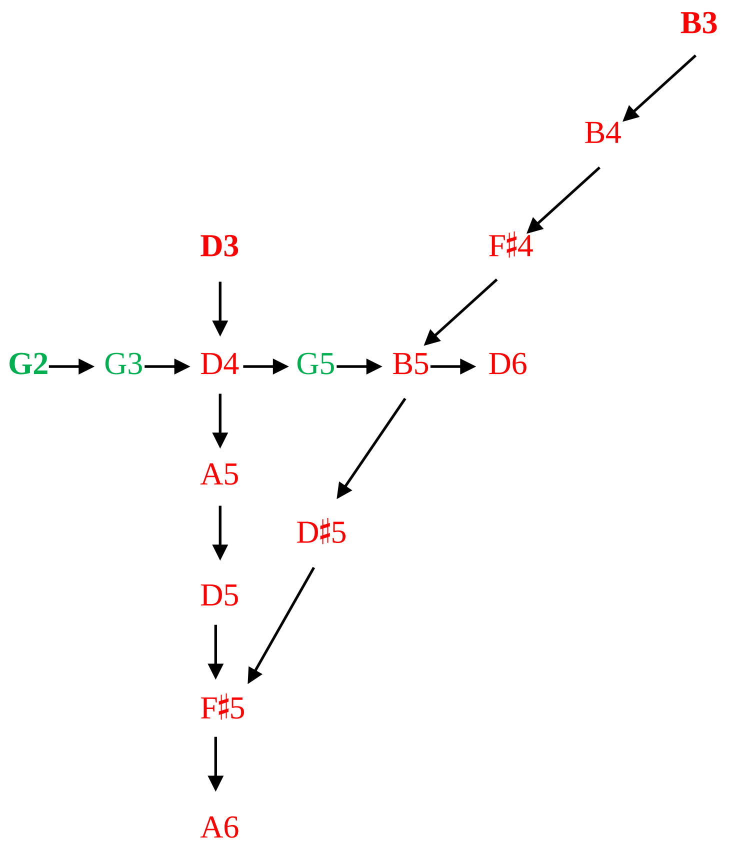
[4] The fundamental tones are printed in bold.
[5] Stable tones are coloured green in the example below.
[6] I will limit my discussion to the first five overtones of each fundamental tone.
[7] Unstable tones are coloured red in the example below.



Example 5-1

Overtones of the fundamental tones of a C major tonic triad in the context of C major

In these examples I only considered the overtones of triads without sympathetic strings to show the influence of overtones on how we hear tones. Our hearing of these effects is enhanced when sympathetic strings are involved. For example, when a C4 is played on a viola, the open C3 string will be the one to sympathetically react in the most prominent manner. But when a C4 is played on a piano with the sustain pedal down, we find that the strings of C1 to C3 and C5 to C8 will sympathetically react the most prominently of all the strings. In terms of overtones and sympathetic strings, the C4 on the viola is significantly different from the C4 on the piano. The fact that the same pitch can be heard differently and in different contexts due to overtones has an important influence on stability and how listeners hear the operation of musical forces.



Example 5-2

Overtones of the fundamental tones of a G major tonic triad in the context of C major

With regards to stability, overtones can explain in part the hierarchic levels of stability. In a context of G major, for example, the fundamental tones B and D that form part of the tonic triad have some unstable overtones where the G has only very stable, moderately stable and less stable overtones – see Example 5-3 below.[8]

[8] I followed the probe-tone profiles suggested by Krumhansl & Kessler (1982), Lerdahl (1988), Lerdahl (1996), and Margulis (2003) to label tones as very stable/unstable, moderately stable/unstable, and less stable/unstable.

G2 fundamental tone	very stable		B3 fundamental tone	less stable		D3 fundamental tone	moderately stable
G3 overtone 1	very stable		B4 overtone 1	less stable		D4 overtone 1	moderately stable
D4 overtone 2	moderately stable		F♯4 overtone 2	very unstable		A5 overtone 2	moderately unstable
G4 overtone 3	very stable		B5 overtone 3	less stable		D5 overtone 3	moderately stable
B5 overtone 4	less stable		D5 ovetone 4	moderately stable		F♯5 overtone 4	very unstable
D5 overtone 5	moderately stable		F♯5 overtone 5	very unstable		A6 overtone 5	moderately unstable

Example 5-3

Fundamental tones and overtones of the G major triad

Although the overtones are not as salient as the fundamental tones, the unstable overtones of B and D cause those tones to be perceived as less stable. In Example 5-4 below I show unstable tones F♯ and A. In the context of G major, the first five overtones of these two unstable tones do not contain any stable overtones, therefore they are heard as very unstable.

A3 fundamental tone		F♯3 fundamental tone
A4 overtone 1		F♯4 overtone 1
E4 overtone 2		C♯5 overtone 2
A5 overtone 3		F♯5 overtone 3
C♯5 overtone 4		A♯6 overtone 4
E5 overtone 5		C♯6 overtone 5

Example 5-4

Fundamental tones and overtones of unstable tones A and F♯ in the context of G major

With regards to the operation of musical forces, overtones do not amplify only the stability or instability of tones but also the tendency of those tones. This has an effect on musical gravity and on musical magnetism. This can be achieved by means of other tones that are combined with a specific tone and the interaction of their overtones, or by other strings that react sympathetically. The sympathetic reaction of strings depends on the instrument involved and a detailed discussion of overtones for specific instruments is not within the scope of this research project. For the purposes of this research project, it is important to know that overtones play a significant role in how we hear tones, the degree of stability of tones, and that the overtones produced by some music instruments cannot necessarily be provided by other music instruments. Therefore, the operation of musical forces has a direct link with overtones, even though it might be a subtle one.

Multiple Tones

Some instruments, especially wind instruments, can only produce one tone[9] at a time and other instruments, especially string and keyboard instruments, can produce more than one tone at the same time. The capability of a music instrument to produce more than one tone at a time[10] has a significant effect on the operation of both melodic forces and rhythmic forces.

- Melodic forces: Monophonic instruments cannot provide harmonic content in the same way as multiphonic instruments, and therefore contextualising stable and unstable tones is more difficult on monophonic instruments. Subsequently, the operation of melodic forces is affected, because the tonal context in which tones are presented has an important influence on their tendencies. For example, if we compare different material

[9] When I refer to a 'tone' I mean sound with a single and clear fundamental pitch. Thus, 'tone' as it is used here excludes the multiphonics and other rare exceptions of dyads that can be produced on wind instruments.
[10] For the remainder of this section I will refer to instruments that can produce only one tone at a time as 'monophonic instruments' and I will refer to instruments that can produce more than one tone at a time as 'multiphonic instruments'.

that is performed on a piano with material performed on a clarinet, the accompanying material that is possible on the piano is not possible on the clarinet. I assume here that the material is idiomatic for these instruments. The performer of the piano is thus able to provide a stronger tonal context and therefore the performer can support tendencies of unstable tones better. Ambiguous tones can thus be clarified within a harmonic context on the piano, and tones can clearly be heard as stable or unstable. In the case of the clarinet, it is possible that some stable and unstable tones are heard as ambiguous in terms of their stability and then the operation of melodic forces become unclear. We find this phenomenon in *Raga III* when the orchestra parts that provided the tonal context are absent in the version for viola solo. This is discussed in more detail in Chapter 6.

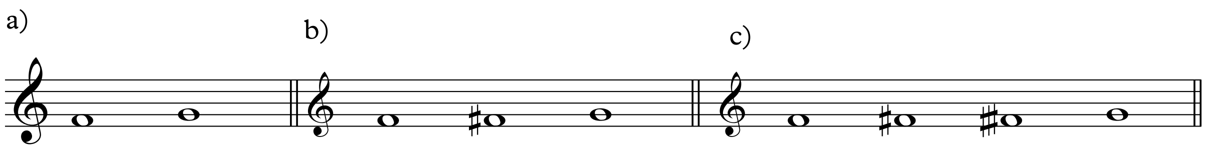
- Rhythmic forces. Multiphonic instruments can be employed to enhance listeners' perception of rhythm and metre when compared to monophonic instruments. A multiphonic instrument, like a piano, on which both melodic and harmonic content can be performed simultaneously, can be employed to clarify the strong, stable beats of the composition by means of rhythmic accompaniment patterns. Syncopated, anticipated, and suspended tones that are part of melodic material become clear because of the harmonic accompaniment that provides the strong beats and metre. The operation of rhythmic forces is thus potentially less clear on homophonic instruments. The operation of rhythmic forces, especially in terms of the melody, is thus potentially less clear.

Microtones and tempering

Larson (2012:124-125) claims in his theory of musical forces that the distinction between steps and leaps shape listeners' experiences of melodies and leads listeners to hear a passage of music in terms of step collections and/or leap collections. It is clear from Larson (2012:124-125) that the operation of melodic forces in step collections is limited to whole tones and semitones. Microtones in melodic forces are thus omitted from Larson's theory of melodic forces.

If we consider melodic magnetism, Larson (2012:88) writes that it is affected by distance. Therefore, the operation of melodic magnetism is heard differently when a musical passage that moves in whole tones is compared with a passage that moves in semitones. The tendency of unstable tones to move to the closest stable tone – governed by melodic magnetism – will also grow stronger when the stable tone is first approached in whole tones and then in semitones, because the tendency of unstable tones to resolve to a stable tone becomes stronger as it gets closer to the goal (the stable tone).

If there is a tendency, for example, of an unstable F to ascend to a stable G (see Example 5-5a), its movement is governed by melodic magnetism and that movement of the F to ascend to the G will be increased when the F first ascends to F♯ before it resolves to the stable G (see Example 5-5b). Because of the tendency of melodic magnetism to grow stronger as it gets closer to its goal stable tone, I speculate that it should have an even stronger tendency to resolve to the G if the F ascends to F♯ (semitone step) and then to F𝄰 (quarter tone step) before it resolves to the stable G (see Example 5-5c). However, it might be possible that there is a certain threshold here, and if a leading tone is too close to its resolution, it is simply heard as belonging to the pitch category of the resolving tone. As usual, this kind of matters are more complex in reality than in thinking.



Example 5-5

Unstable tones that move to a stable tone in whole tones, semitones, and quarter tones

The discussion above focuses on the operation of melodic magnetism when unstable tones approach a stable tone and microtones are present. I believe that microtones can influence the operation of melodic magnetism even more and that the inclusion of microtones in the theory of musical forces will also affect melodic gravity and musical inertia. For the purposes of this research project, I will not attempt to situate microtones fully within the theory of musical forces. My aim here is simply to show that they can and should be included in the theory.

On some instruments, like the piano for example, the pitches of tones cannot be altered by the performer once they are produced. On some other instruments, like the violin for example, a performer can alter the pitch of a tone while that tone is produced or after it was produced. This can be considered a kind of tempering. Performers of such instruments on which pitches can be altered are able to bend or change the pitches produced and that will enable them to amplify melodic magnetism. Melodic magnetism is specifically mentioned here because melodic magnetism gets stronger the closer a tone gets to its goal. Thus, if an unstable tone is produced and the pitch of that tone is changed in such a way that it is heard as moving closer to the stable tone, it will be heard as amplifying melodic gravity because the performer can sharpen or flatten unstable tones and increase their tendencies to resolve to stable tones.

Dynamic Range

The tendency of an unstable tone to resolve to a stable tone can be amplified when that unstable tone is performed with a crescendo (Hatten, 2012b). This tendency can be amplified even more by instruments with a broader dynamic range because they can produce a broad-ranging crescendo, whereas instruments with a limited dynamic range are less able to amplify these tendencies because they cannot produce such a broad-ranging crescendo. On some instruments, like the piano or harp, performers cannot amplify these tendencies with a crescendo on a single tone, because the sounds of tones on these instruments start to fade after they were produced. If performers wish to amplify a tone with a crescendo on instruments like a piano or harp, they have to invest new energy by means of repeated tones combined with a crescendo.

Pedalling and Sustain

Instruments with sostenuto and/or sustain pedal(s) can be employed to sustain specific tones during a performance. The sustain pedal also lifts dampers from strings and can be employed to let other strings react in a sympathetic manner. These functions of the pedals enable performers to amplify the operation of musical forces with the use of pedals. For example, if a low stable tone is sustained with the sostenuto pedal on a piano, that tone serves as a stable platform towards which other, unstable tones have a tendency to resolve. The unstable tone will not only be heard as dissonant with the sustained tone, but also be salient in terms of its inherent quality of an unstable tone. This will, however, only be possible for a short duration, because the tone will start to fade away (Sethares, 2005:29). Longer sustained tones, like a drone or tones produced on instruments that can sustain tones like the organ, will be discussed in more detail in Chapter 6. This effect of the pedals can be imitated by the orchestra and some other instruments such as string instruments, but it cannot be achieved by some instruments without pedals, like a flute.

1.3 Addition of Material for Percussion

In addition to the material for the solo percussionist, material for percussion was added to *Raga I* for percussion and concert band. The following percussion instruments were added: crotales, xylophone, marimba, medium cymbal, snare drum, two bongos, finger cymbals (percussionist 1); vibraphone, large Chinese cymbal, small cymbal, medium cymbal, three tomtoms, five temple blocks, tubular bells, triangle (percussionist 2); Glockenspiel, bass drum, large tamtam, medium cymbal, two bongos, claves, and tambourine (percussionist 3).

The added material for percussion serves some of the following significant functions, or a combination of these functions, in *Raga I* for percussion and concert band:

- They double existing material of other instruments.
- They elucidate the alternation of material between instrument groups.
- They create density in segments.
- They elucidate the beginnings and ends of segments.
- They amplify the rhythmic content of pitched material.
- They amplify new material found in *Raga I* for percussion and orchestra.
- They amplify glissandi.
- They amplify trills, key trills, and flatterzunge.
- They support the addition of instruments to existing material.
- They amplify crescendos at the end of segments.

Some of the functions served by the added percussion material – i.e. the doubling of existing material; the elucidation of the alternation of material between instrument groups; density; the elucidation of beginnings and ends of segments; the amplification of rhythmic content of pitched material; and the amplification of new material from *Raga I* for percussion and orchestra – are significant on an auditory level and they play, to some extent, a role in how musical forces operate. I will present one example only, which will be an instance of the functions listed here. Some other functions – i.e. the amplification of glissandi; the amplification of trills, key trills, and flatterzunge; the addition of instruments to existing material; and the amplification of crescendos at the end of segments – play a significant role in how musical forces operate and how musical forces are amplified. The latter also corresponds with significant differences found between *Raga I* for percussion and two pianos and *Raga I* for percussion and orchestra.

Doubling of existing material of other instruments

The added percussion instruments in *Raga I* for percussion and concert band double existing material of other instruments. The following instances of doublings are found in *Raga I* for percussion and concert band:

- part I, mm. 1-17 (crotales, percussion 1; vibraphone, percussion 2, Glockenspiel, percussion 3);
- part I, mm. 19-27^{2c} (marimba, percussion 1);
- part I, mm. 37^{3}-44 (marimba, percussion 1; vibraphone, percussion 2; Glockenspiel, percussion 3);
- part I, mm. 58^{3}-64 (marimba, percussion 1; Glockenspiel, percussion 3);
- part I, mm. 83^{2}-84^{3} (crotales, percussion 1; Glockenspiel, percussion 3);
- part II, mm. 5^{3}-10^{3c} (marimba, percussion 1; vibraphone, percussion 2);

- part II, mm. 16^{1b}-33 (marimba, percussion 1; vibraphone, percussion 2);
- part II, mm. 36^{2}-38^{2c} (marimba, percussion 1);
- part II, mm. 50^{1b}-61^{2a} (xylophone, percussion 1; vibraphone, percussion 2);
- part II, mm. 70^{2}-72^{2a} (xylophone, percussion 1);
- part II, mm. 80-82 (marimba, percussion 1; vibraphone, percussion 2);
- part II, mm. 87^{3}-90^{2} (marimba, percussion 1; vibraphone, percussion 2; Glockenspiel, percussion 3);
- part II, mm. 95-97 (marimba, percussion 1; vibraphone, percussion 2; Glockenspiel, percussion 3);
- part II, mm. 104-120 (tubular bells, percussion 2);
- part II, mm. 122-134^{2a} (marimba, percussion 1; vibraphone, percussion 2; Glockenspiel, percussion 3);
- part II, mm. 138-145^{4b} (xylophone, percussion 1; vibraphone, percussion 2; Glockenspiel, percussion 3); and
- part II, mm. 153^{2}-156^{1a} (marimba, percussion 1).

See Example 5-6 below. In *Raga I* for percussion and concert band, part I, mm. 37^{3}-44 the marimba (percussion 1) doubles the material of the solo clarinet 1, alto saxophone 1, and harp. The vibraphone (percussion 2) doubles the material of the solo clarinet 2, alto saxophone 2, and harp.

Example 5-6

Raga I *for percussion and concert band, part I, mm. 37-39*

Elucidation of the alternation of material between instrument groups

The added percussion instruments in *Raga I* for percussion and concert band were also employed to elucidate the alternation of material between instrument groups. Instances of these elucidations are found in *Raga I* for percussion and concert band in:

- part I, mm. 19-27 (marimba, percussion 1; large Chinese cymbal, percussion 2; bass drum, percussion 3);
- part I, mm. 54-58^2 (medium cymbal, percussion 1; small and medium cymbals, percussion 2);
- part II, mm. 127-134^2 (marimba, percussion 1; medium cymbal, percussion 3); and
- part II, mm. 138-145 (xylophone, percussion 1; vibraphone, percussion 2).

Example 5-7 below shows *Raga I* for percussion and concert band, part II, mm. 127-131. In this segment, which extends to m. 134^2, the marimba (percussion 1) doubles some of the chord material found in the three trumpets, four horns, and harp. This chord material is alternated with scalar material in the piccolo, two flutes, two oboes, E♭ clarinet, solo clarinets 1-2, and clarinets 1-3 which are amplified by a roll on the medium cymbal percussion 3). The material of the two bassoons, contrabassoon, bass clarinet, tenor saxophone, baritone saxophone, two euphoniums, bass, and contrabass does not alternate but continues throughout, and this material is not doubled in the percussion instruments. Because the marimba and medium cymbal alternates when the material in the orchestra alternates, the percussion instruments amplify the alternation of the chord material with the scalar material in the orchestra, described above.

Example 5-7

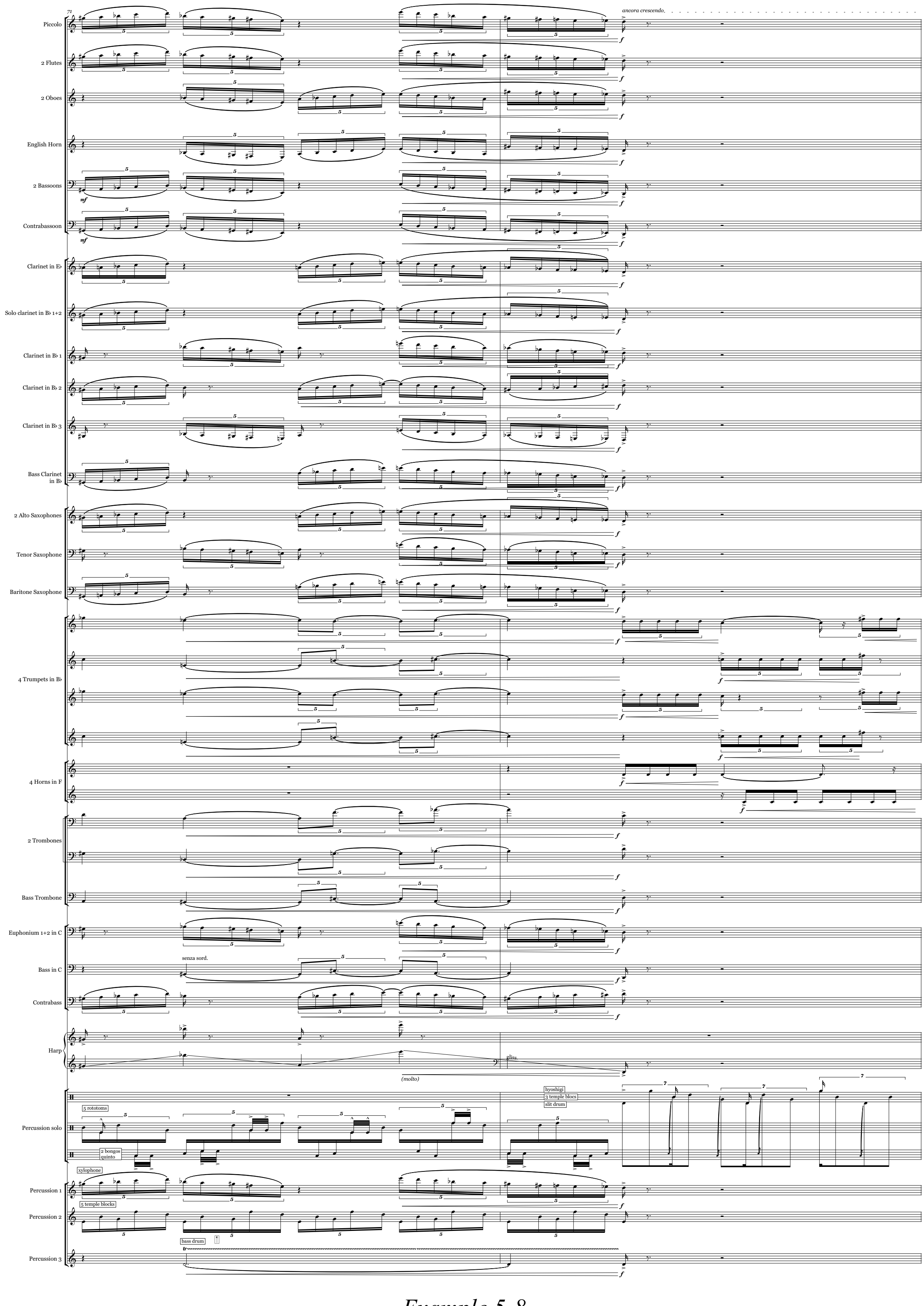
Raga I *for percussion and concert band, part II, mm. 127-131*

Density in segments

The added percussion instruments in *Raga I* for percussion and concert band create density in segments. Instances of increased density in segments are found in *Raga I* for percussion and concert band in the following places:

- part I, mm. 72^{4}-74^{1} (snare drum, percussion 1; small and medium cymbals, percussion 2);
- part II, mm. 35^{2b}-36^{2a} (small and medium cymbal, percussion 2);
- part II, mm. 62^{3b}-63^{1} (medium cymbal, percussion 1);
- part II, mm. 63^{2}-72^{2a} (xylophone, percussion 1; 5 temple blocks, percussion 2; bass drum, percussion 3);
- part II, mm. 133^{2}-134^{2} (small cymbal, percussion 2; bass drum, percussion 3); and
- part II, mm. 153^{2}-156 (marimba and medium cymbal, percussion 1; large Chinese cymbal and small cymbal, percussion 2; bass drum and large tamtam, percussion 3).

Raga I for percussion and concert band, part II, mm. 71-72 is shown in Example 5-8. The crescendo roll of the bass drum progressively adds density towards the end of the segment.



Example 5-8

Raga I *for percussion and concert band, part II, mm. 71-72*

Elucidation of the beginnings and endings of segments

The added percussion instruments in *Raga I* for percussion and concert band were employed to elucidate the beginnings and endings of segments. Instances of these elucidations are found in *Raga I* for percussion and concert band:

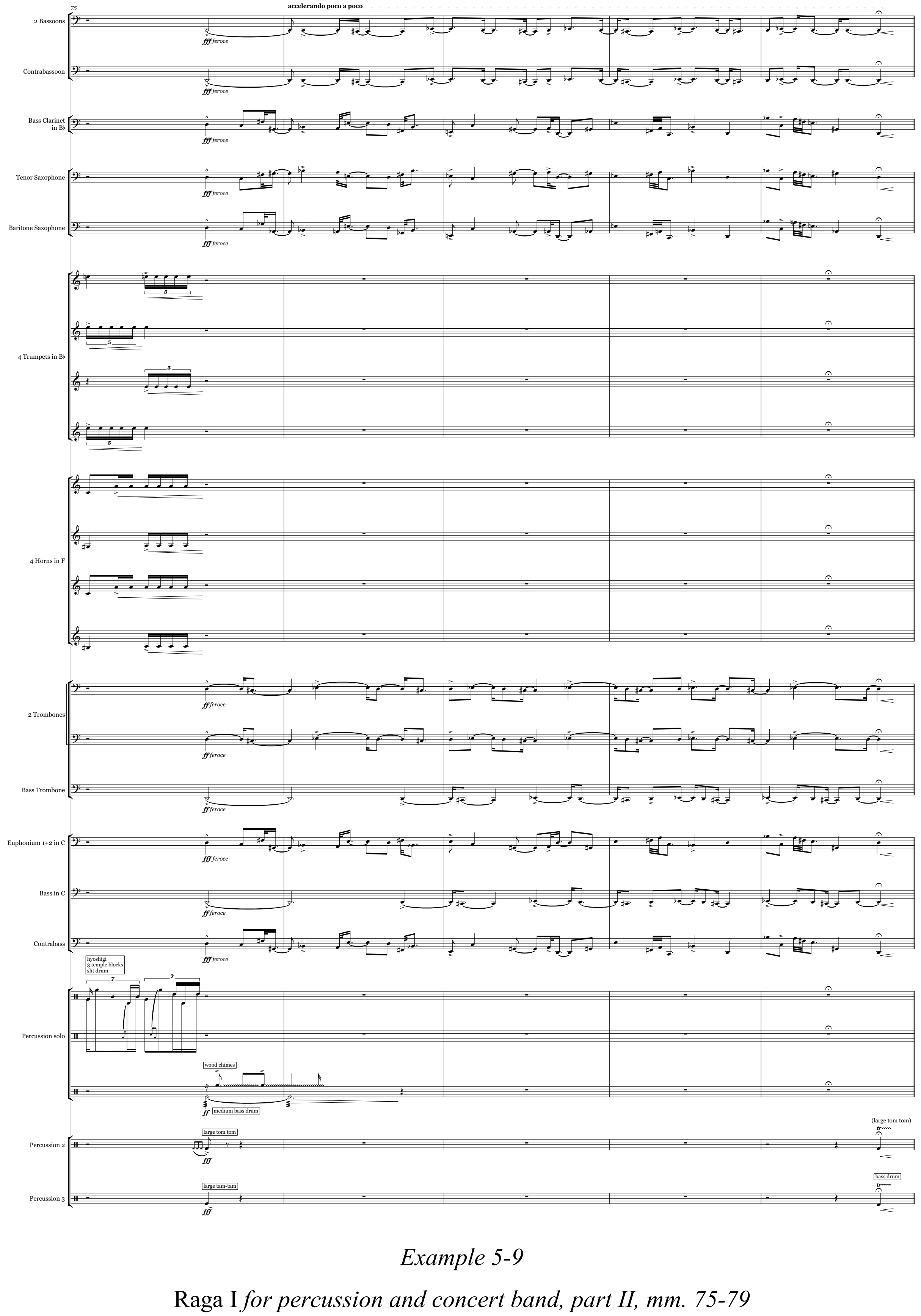
- part I, m. 27^{2b}-27^{4} (end: large Chinese cymbal, percussion 2; bass drum, percussion 3);
- part I, m. 33^{1} (beginning: large tamtam, percussion 3);
- part I, mm. 72^{4}-74^{1} (end: small and medium cymbal, percussion 2);
- part II, mm. 35^{2b}-36^{1a} (end: small and medium cymbal, percussion 2);
- part II, m. 40^{2d}-40^{3} (end: snare drum, percussion 1; large tomtom, percussion 2, bass drum, percussion 3);
- part II, mm. 62^{3b}-63^{1} (end: medium cymbal, percussion 1);
- part II, mm. 71^{2}-72^{2a} (end: bass drum, percussion 3);
- part II, mm. 75^{3}-79 (beginning and end: large tomtom, percussion 2; large tamtam and bass drum, percussion 3);
- part II, mm. 127-134^{2} (beginning and end: marimba, percussion 1; small cymbal, percussion 2; medium cymbal and bass drum, percussion 3);
- part II, m. 137^{3}-137^{4} (end: bass drum, percussion 3);
- part II, mm. 149^{3b}-149^{4} (end: small cymbal, percussion 2); and
- part II, mm. 153^{2}-156 (beginning and end: marimba and medium cymbal, percussion 1; large Chinese cymbal and small cymbal, percussion 2; bass drum and large tamtam, percussion 3).

Raga I for percussion and concert band, part II, mm. 75-79 is shown in Example 5-9. The beginning of this short segment is amplified by the large tomtom (percussion 2) and the large tamtam (percussion 3). In the middle of the segment there are no solo percussion or added percussion instruments, and we only hear the rolls on the large tomtom (percussion 2) and bass drum (percussion 3) at the end of the segment in m. 79^{4}. In this way the beginning and ending of the segment is elucidated.

Amplification of the rhythmic content of pitched material

The added percussion instruments in *Raga I* for percussion and concert band amplify the rhythmic content of pitched material. Instances of these amplifications of rhythmic content are found in *Raga I* for percussion and concert band:

- part I, mm. 19-27 (large Chinese cymbal, percussion 2; bass drum, percussion 3);
- part I, mm. 45-52 (large tamtam, percussion 3);
- part I, mm. 72^{2b}-73^{3d} (snare drum, percussion 1);
- part I, mm. 74^{2}-84^{3} (large tamtam, percussion 3);
- part II, mm. 15^{4b}-16^{1a} (medium tomtom, percussion 2; 2 bongos, percussion 3);
- part II, mm. 25^{1c}-34 (claves, percussion 3);
- part II, mm. 36^{2}-38^{2c} (small tomtom, percussion 2; 2 bongos, percussion 3);
- part II, mm. 54^{4}-63^{1} (tambourine, percussion 3);
- part II, mm. 63^{2}-72^{2a} (five temple blocks, percussion 2);
- part II, mm. 115^{2b}-121^{1a} (two bongos, percussion 1; 2 bongos, percussion 3);
- part II, mm. 137^{3}-137^{4} (bass drum, percussion 3);
- part II, mm. 150^{1b}-152 (three tomtoms, percussion 2; bass drum, percussion 3); and
- part II, mm. 153^{2}-156 (bass drum, percussion 3).



Example 5-9

Raga I *for percussion and concert band, part II, mm. 75-79*

Raga I for percussion and concert band, part II, mm. 25-28 is shown in Example 5-10. Claves (percussion 3) are used in this segment (mm. 25-36^{1}) to amplify the rhythmic content of the two euphoniums, bass, contrabass, harp, and later (m. 34) the two trombones and bass trombone.

Amplification of new material that was added to Raga I *for percussion and orchestra*

The added percussion instruments in *Raga I* for percussion and concert band amplify the new material that was added when the first alternation version of *Raga I* was created for percussion and orchestra. Instances of amplification of this material are found in *Raga I* for percussion and concert band:

- part II, mm. 35^{2b}-36^{1} (small and medium cymbal, percussion 2) and
- part II, mm. 127^{4}-134^{2} (medium cymbal, percussion 3).

Raga I for percussion and concert band, part II, mm. 35-36 is shown in Example 5-11. In Chapter 4, §3.3 I discuss how new material was added to horn 1 and horn 4 in mm. 35^{2c}-36^{1} and mm. 35^{4}-36^{1}. When we compare *Raga I* for percussion and concert band with *Raga I* for percussion and orchestra, this material is not heard as new material anymore. Nevertheless, this stable material is amplified by rolls on the small and medium cymbals (percussion 2).

Example 5-10

Raga I *for percussion and concert band, part II, mm. 25-28*

Example 5-11

Raga I *for percussion and concert band, part II, mm. 35-36*

Amplification of glissandi

The added percussion instruments in *Raga I* for percussion and concert band also amplify glissandi. Instances of amplification of glissandi are found in *Raga I* for percussion and concert band:

- part II, mm. 10^{4}-11^{2a} (medium cymbal, percussion 3);
- part II, mm. 71^{2}-72^{2a} (bass drum, percussion 3);
- part II, mm. 82^{4b}-82^{4c} (marimba, percussion 1; vibraphone, percussion 2); and
- part II, mm. 153^{2}-156^{1a} (large Chinese cymbal, percussion 2).

In *Raga I* for percussion and orchestra, various glissandi were employed to amplify the operation of musical forces (see discussion in Chapter 4, §2). In *Raga I* for percussion and concert band some glissandi and percussion sounds, as listed above, were employed to further amplify glissandi by means of the addition of material for percussion. The increased amplification of glissandi further elucidates the operation of musical forces. I will discuss in more detail one of the three instances (mm. 10^{4}-11^{2a}) identified above.

Raga I for percussion and concert band, part II, mm. 10-11, is shown in Example 5-12 below. In this example we hear an ascending glissando in the harp, and this glissando is amplified further by the roll and crescendo for the cymbal (percussionist 3). This roll with crescendo on the cymbal creates the expectation that it will increase in energy and culminate in a single beat. This single beat is heard in m. 11^{2a}, together with the unstable C♯s and E♭s in the two oboes, cor anglais, two solo clarinets, clarinets 1-3, bass clarinet, two alto saxophones, and harp. The arrival on the C♯ and E♭ is thus the culmination of the material and this culmination to the point of instability is amplified by the roll and crescendo in the cymbal.

Example 5-12

Raga I *for percussion and concert band, part II, mm. 10-11*

Amplification of trills, key trills, and flatterzunge

The added percussion instruments in *Raga I* for percussion and concert band amplify trills, key trills, and flatterzunge. Instances of amplified trills, key trills, and flatterzunge are found in *Raga I* for percussion and concert band:

- part I, mm. 65^{3}-70 (large tomtom, percussion 2);
- part II, m. 40^{2d}-40^{3} (snare drum, percussion 1; large tomtom, percussion 2; bass drum, percussion 3); and
- part II, m. 156^{1b}-156^{4} (medium cymbal, percussion 1; small cymbal, percussion 2; large tamtam, percussion 3).

Raga I for percussion and concert band, part I, mm. 65-69 is shown in Example 5-13. Short rolls of the large tomtom (percussion 2) corresponds with flatterzunge in the two bassoons and contrabassoon, as well as semitone trills in the bass and quarter-tone trills in the contrabass found in this segment (mm. 65^{2}-74^{1}. These rolls amplify the flatterzunge and trills found in the segment.

Example 5-13

Raga I *for percussion and concert band, part I, mm. 65-69*

Addition of instruments to existing material

The material added for percussion in *Raga I* for percussion and concert band is the most prominent of the additions to existing material. Instances where instruments are added to existing material are found in *Raga I* for percussion and concert band:

- part II, mm. 15^{4b}-16^{1a} (sudden addition of instruments at the end of the segment: medium tomtom, percussion 2; two bongos, percussion 3);
- part II, mm. 53^{4d}-54^{1} (sudden addition of instruments at the end of the segment: vibraphone, percussion 2);
- part II, m. 137^{3}-137^{4} (sudden addition of instruments at the end of the segment: bass drum, percussion 3);
- part II, m. 40^{2d}-40^{3} (gradual addition of instruments towards the end of segments: snare drum, percussion 1; large tomtom, percussion 2; bass drum, percussion 3);
- part II, mm. 70^{2}-72^{2a} (gradual addition of instruments towards the end of segments: xylophone, percussion 1; bass drum, percussion 3);
- part II, mm. 80-82 (gradual addition of instruments towards the end of segments: vibraphone, percussion 2); and
- part II, mm. 95-97 (gradual addition of instruments towards the end of segments: Glockenspiel, percussion 3).

Raga I for percussion and concert band, part II, mm. 38-40 is shown in Example 5-14. The addition of material for the snare drum (percussion 1), large tomtom (percussion 2), and bass drum (percussion 3) at the end (m. 40^{2d}-40^{3}) of the segment (mm. 38^{3}-40^{3}) amplifies the gradual addition of instruments at the end of the segment because it is heard as a further addition of instruments to the end of the segment.

Example 5-14

Raga I *for percussion and concert band, part II, mm. 38-40*

Amplification of crescendos at the end of segments

Percussion instruments in *Raga I* for percussion and concert band were added to crescendos at the end of segments. Instances of amplified crescendos at the end of segments are found in *Raga I* for percussion and concert band:

- part I, mm. 72^{4}-74^{1} (small and medium cymbal, percussion 3);
- part II, mm. 10^{4}-11^{1} (medium cymbal, percussion 3);
- part II, mm. 35^{2b}-36^{1} (small and medium cymbal, percussion 2);
- part II, m. 40^{2b}-40^{3} (snare drum, percussion 1; large tomtom, percussion 2; bass drum, percussion 3);
- part II, mm. 62^{3b}-63^{1} (medium cymbal, percussion 1; tambourine, percussion 3);
- part II, mm. 71^{2}-72^{1} (marimba, percussion 1; bass drum, percussion 3);
- part II, m. 79^{4} (large tomtom, percussion 2; bass drum, percussion 3);
- part II, m. 82^{2c}-82^{4c} (marimba, percussion 1; vibraphone, percussion 2);
- part II, mm. 89^{4c}-90^{2c} (marimba, percussion 1; vibraphone, percussion 2; Glockenspiel, percussion 3);
- part II, m. 97^{2c}-97^{4c} (marimba, percussion 1; vibraphone, percussion 2; Glockenspiel, percussion 3);
- part II, mm. 133^{2}-134^{2} (small cymbal, percussion 2; bass drum, percussion 3);
- part II, m. 137^{3}-137^{4} (bass drum, percussion 3);
- part II, m. 145^{2d}-145^{4b} (xylophone, percussion 1; Glockenspiel, percussion 3); and
- part II, m. 156^{1b}-156^{4} (medium cymbal, percussion 1; small cymbal, percussion 2; large tamtam, percussion 3).

Raga I for percussion and concert band, part II, mm. 75-79 is shown in Example 5-15. The addition of rolls for the large tomtom (percussion 2) and bass drum (percussion 3) with crescendos adds to the crescendos of the material at the end of the segment (m. 79^{4}) and amplifies the crescendo at the end of the segment.

Example 5-15

Raga I *for percussion and concert band, part II, mm. 75-79*

Addition of new material

Some of the segments to which percussion instruments were added can be heard as new material, especially when the function of the added percussion instruments is to amplify material. However, it is merely an addition of instruments and not an addition of new material. There are no additions of new material by the added percussion instruments in *Raga I* for percussion and concert band, but one of the segments calls for discussion. The five temple blocks that were added in part II, mm. 63^{2}-72^{2a} can be heard as a rhythmic amplification of the quintuplets of the solo percussion or the accompanying material in the orchestra of which every crotchet beat is subdivided into quintuplet semiquavers. However, the different indefinite pitches of the five temple blocks can be discerned by listeners and the clear repeating pattern for the temple blocks can cause listeners to hear it as new material – see Example 5-16. I heard the addition of the temple blocks as the rhythmic amplification of melodic content.

Glissandi in the marimba (percussion 1) of *Raga I* for percussion and concert band, part II, m. 82^{4b}-82^{4c} and mm. 153^{2}-156^{1a} amplify glissandi of the harp – see Example 5-17. Although they are heard as an amplification of the harp glissandi, they add new tones to those glissandi because the harp is tuned to the scale of the composition which will sound when glissandi are played. However, the glissandi on the marimba will result in a Dorian scale on D. Nevertheless, the marimba glissandi are heard as amplifying the harp glissandi and not as adding new tones or material.

Example 5-16

Raga I *for percussion and concert band, part II, mm. 63-66*

Example 5-17

Raga I *for percussion and concert band, part II, mm. 153-156*

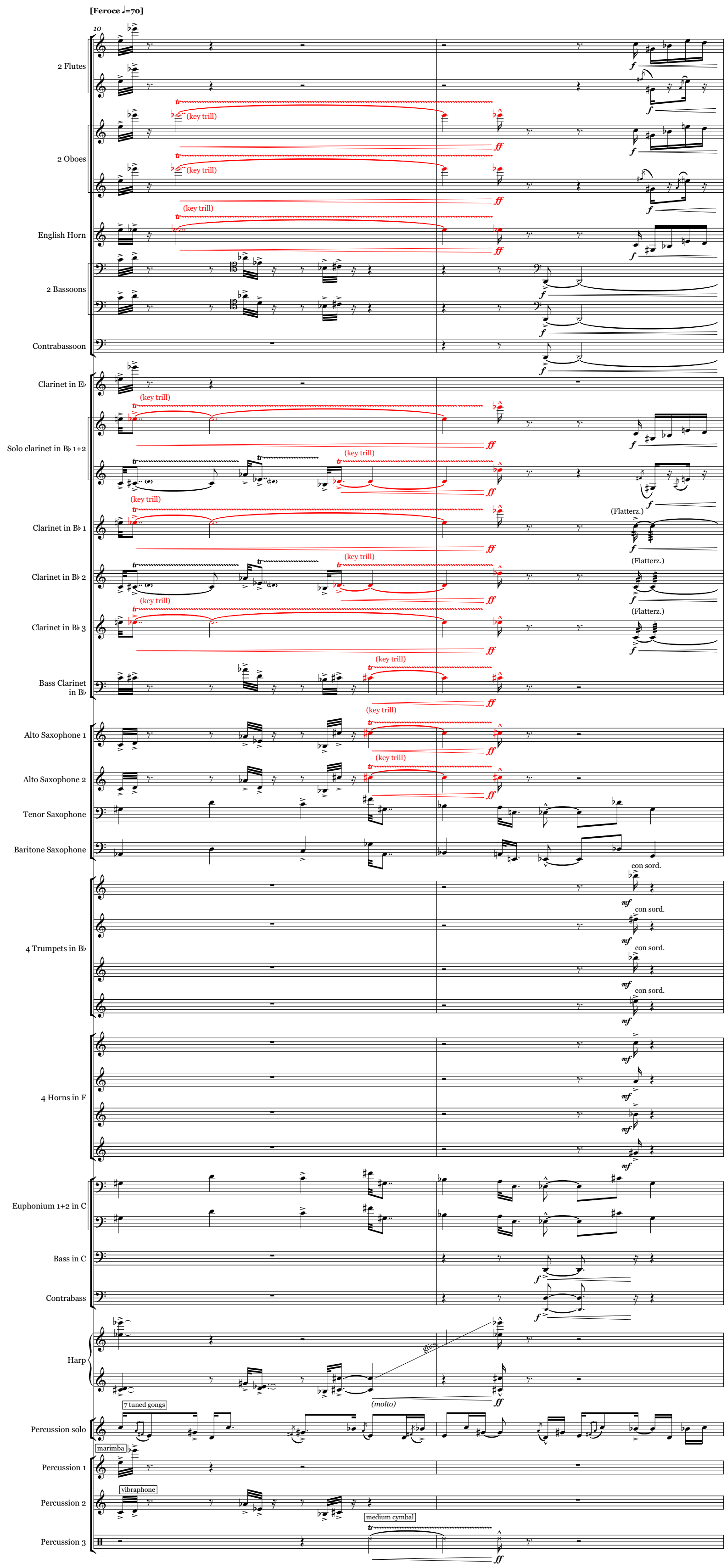
1.4 Other Differences in *Raga I* for Percussion and Concert Band

Trills and tremolos in *Raga I* for percussion and concert band, which were amplified by the addition of instruments, are considered significant when they are compared with trills and tremolos in *Raga I* for percussion and orchestra. These significant trills and tremolos are found in:

- part II, mm. 10^{1b}-11^{1} (key trills were amplified), and
- part II, mm. 11^{3d}-15^{1b} (spiccati, glissandi, and tremolos were changed to flatterzunge).

Amplified Key Trills

In *Raga I* for percussion and orchestra the key trills in the two oboes, cor anglais, two clarinets, and bass clarinet amplify the trills in the violins and culminate to amplify the unstable chord in m. 11^{2a} – see Example 5-18 below. In *Raga I* for percussion and concert band the key trills are found in the two oboes, cor anglais, two solo clarinets, clarinets 1-3, bass clarinet, alto saxophone 1, and alto saxophone 2. A significant difference between the key trills of *Raga I* for percussion and orchestra and *Raga I* for percussion and concert band is that the key trills in *Raga I* for percussion and concert band do not amplify the ordinary trills, they replace the ordinary trills. Significantly more instruments perform these key trills, and the addition of these instruments that perform key trills amplify the operation of musical forces in a similar way as the addition of instruments to existing material. In this specific instance, melodic magnetism is amplified because more instruments perform these key trills with crescendos and therefore the arrival on the point of instability in m. 11^{2a} is also amplified.



Example 5-18

Raga I *for percussion and concert band, part II, mm. 10-11*

Spiccati, Glissandi, and Tremolos change to Flatterzunge

The musical gestures in the woodwinds in *Raga I* for percussion and orchestra, part II, mm. 11^{3d}-15^{4b} are amplified by the violins with spiccati, glissandi, and tremolos. In *Raga I* for percussion and concert band the musical gestures were orchestrated for two flutes, two oboes, cor anglais, and two solo clarinets, and these musical gestures are amplified by clarinets 1-3. The clarinets amplify these musical gestures when they start with the first pitch classes of each musical gesture found in the woodwinds and sustain these tones with a flatterzunge until it concludes with the last pitch classes of the musical gestures. The tremolos were changed to flatterzunge. Although the spiccati and glissandi found in *Raga I* for percussion and orchestra are not present in *Raga I* for percussion and concert band, the shaping of the musical gestures and the operation of musical forces in these musical gestures are still amplified. These musical gestures are amplified because the outer tones of the musical gestures are emphasised by the clarinets. The emphasis is on the starting and ending tones of each musical gesture, and the starting tones are sustained and indicated to be performed with flatterzunge, thus continuously adding new energy and density to each musical gesture. These sustained beginning tones provide a tonal platform for each musical gesture that unfolds within the tonal environment provided by the sustained tones – see Example 5-19.

Example 5-19

Raga I *for percussion and concert band, part II, mm. 11-15*

In this example, the sustained Cs in the clarinets provide the tonal platform for the unfolding of the musical gestures in the woodwinds, mm. 11^{3d}-12^{1b}. The outer tones of the musical gesture are all heard in conjunction with the C of the clarinets. When the musical gesture ends on E, the sudden Es in the clarinets amplify the Es at the end of the musical gestures. The beginning, unfolding, and end of this gesture are heard in a context where D is the stable tone – the stable D is performed by the two bassoons and contrabassoon. The entire musical gesture is thus heard as unstable, especially due to the unstable Cs and Es that are neighbouring tones that have the tendency to resolve to the stable D due to the operation of melodic magnetism and melodic gravity.

Addition of New Material, Register Changes, and Changes in Dynamics

In my comparisons of *Raga I* for percussion and concert band with the earlier *Raga I* for percussion and orchestra, I did not find any new material added, nor any significant changes in register or dynamics.

2. <u>*Raga III* for Viola and Large Orchestra and *Raga III* for Viola and Smaller Orchestra</u>

2.1 <u>Introduction</u>

Raga III for viola and smaller[11] orchestra (2012) is a reduction of *Raga III* for viola and large orchestra (1995). As mentioned in Chapter 3, the version for viola and smaller orchestra replaced the version for viola and large orchestra in order to resolve problematic aspects of balance between the soloist and orchestra (Henderickx, 2015b).[12] Differences between these two versions are minor and, as is the case with *Raga I* – discussed above in the first part of this chapter – an exhaustive comparative analysis of the two versions of *Raga III* will not contribute to answering the research questions rigorously. I will therefore limit my discussion of these two versions to the following two topics: reduction procedures, and over-amplification or reduction of musical forces. The choice of topics was a pragmatic one: focusing on these two topics allowed enough scope for discussions that will contribute to observations and

---

[11] The reference to the 'smaller' orchestra of *Raga III* refers to the reduced version of *Raga III* for viola and orchestra, and is used here to distinguish this version from the original version of *Raga III*. Although the number of string performers is more, the number of woodwind and brass performers is less.

[12] "When I received the commission from the deFilharmonie to write a work for viola and orchestra, I [had] just composed *Raga I* (1994) for a soloist: the percussion player. So I did not experience any problems with balance until then. After they performed the premiere of *Raga III* (1995) I identified problems with the balance between the viola and the orchestra. The viola is not the same as a violin on the level of presence and therefore more difficult in a concerto. And I thought by myself that I had to work on this. I received a lot of support and assistance from the conductor, Martyn Brabbins, when revising the work in 2012 and I started to reduce the dynamics of the brass instruments. I have to say that I like the orchestration very much, and I like writing for a big orchestra – even when there is a solo instrument. But in this particular case the balance was a problem. In the meanwhile, I attended a performance of the piece *Voci* (1984) by Luciano Berio for solo viola and big ensemble (3, 2, 4, 2 / 2, 2, 2, 1 / perc (3 players) / keyb (synth) / str 12, 0, 5, 6, 4). The first thing that I saw was the viola player attach a microphone to the viola. And I was wondering whether this was the solution for the balance of the viola, but I decided that I did not want to do this. In 2012 the deFilharmonie wanted to do something with my Ragas again, and I suggested that they perform *Raga III*. That gave me the opportunity to revise and reduce the orchestra, and eliminate some of the brass instruments, instrument doublings and percussion parts. When they performed it again in March 2013 the performance was in perfect balance between the viola and orchestra. So it was a good choice to make the reductions. When you look at composers like Ludwig van Beethoven and Gustav Mahler, it is obvious that they were very aware of the balance in the orchestra. When I made the reduction (2012) I was very aware of balance between the different groups, and I did not want to overkill with percussion instruments or brass instruments. So my goal was to create a better balance. At the time I composed the first version in 1995 I was still a young composer who received this commission from a big orchestra, so I wanted to show what I could do as an orchestrator. I did show what I could do, and now I rather want to focus on the sound quality and the balance because I am a more experienced composer and orchestrator now." (Henderickx, 2015b.)

discussions. Discussions of these topics in terms of the two versions of *Raga III* for viola and orchestra enable me to suggest further expansions of Larson's theory of musical forces.

Before I discuss the two topics, a brief overview of the differences in instruments between the two versions of *Raga III* for viola and orchestra is presented.

2.2 Differences in Instrumentation

An exhaustive comparison of the instrumentation of the two versions of *Raga III* for viola and orchestra is presented in Addendum D. In Table 5-1 below I only highlight the differences in the forces employed. Percussion instruments that were added and omitted are listed below.

Table 5-1

Differences in instruments between Raga III *for viola and large orchestra and* Raga III *for viola and smaller orchestra*

***Raga III* for viola and large orchestra**	***Raga III* for viola and smaller orchestra**
3 Flutes (doubling 2 piccolos) 2 Oboes 1 Bassoon (+1 contrabassoon)	2 Flutes (doubling 2 piccolos) 2 Oboes (2nd doubling English horn) 2 Bassoons (2nd doubling contrabassoon)
4 Horns 3 Trumpets 3 Trombones	2 Horns 2 Trumpets 2 Trombones
4 Timpani 2 Cymbals on timpani 3 Suspended cymbals (2 sets) 1 Large tamtam	5 Timpani 2 Japanese temple bells on timpani 2 Suspended cymbals 3 Tamtams
Strings: 6.6.4.4.2	Strings: 12.10.8.6.4
Removed: tuba, 2 temple blocks, large Chinese cymbal, Indian bells, metal chimes, large African slit drum, 2 congas	Added: claves, finger cymbals, marimba, 4 bongos, xylorimba, 3 tuned Thai gongs.

2.3 Reduction Procedures

There are several reasons why composers would reduce orchestral material for smaller orchestras or ensembles. Depending on the instrumentation and reasons for reducing for a smaller orchestra or ensemble, material will be reduced using different procedures. In *Raga III*, the composer reduced material by applying the two procedures that were identified in the interview, given in the footnote above:

- omitting material and
- omitting doublings.

These procedures were necessary to create *Raga III* for viola and small orchestra: the material for the large orchestra could not be distributed similarly for the smaller orchestra. Henderickx employed the above-mentioned procedures when he reduced *Raga III*, not only in order to improve the balance between the soloist and the orchestra, but also to clarify some musical gestures and segments. I elaborate more on the operation of musical forces when these procedures are discussed below.

Omitting Material

Material for melodic instruments and for percussion instruments was omitted. The material of melodic instruments that was omitted is mostly harmonic material and orchestrated pedals, all falling in the background auditory stream. No foreground melodic material, motivic material, or musical gestures were omitted.

Instances of omitted material for melodic instruments in *Raga III* for viola and large orchestra are found in:

- mm. 1-3^{2} (three bassoons),
- mm. 7-10^{3} (flute 2, oboe 2, clarinet 2, two bassoons),
- mm. 25-26 (flute 2, oboe 2, clarinet 2, three bassoons, two trombones, tuba),
- mm. 37-38^{1} (flute 2, oboe 2, clarinet 2, three bassoons, three horns, one trombone, tuba),
- mm. 44^{2b}-49^{2a} (horn 1, horn 4, trombone 3, tuba), and
- mm. 106^{4}-109^{2a} (horn 2, horn 4).

Instances of the omitted material for percussion instruments are found in:

- mm. 6^{2}-9^{4} (vibraphone),
- mm. 37^{2b}-38^{1} (medium cymbal),
- mm. 43-49^{3} (large cymbal),
- mm. 133^{1c}-135^{2c} (4 bongos),
- mm. 143^{1d}-151^{3} (4 bongos),
- mm. 227^{4b}-228^{2b} (medium and small cymbal), and
- m. 260^{4} (three tuned gongs).

Providing reasons for omitting these specific instances would require a discussion of each instance individually, and this would not fall in the scope of this research project. I will, therefore, only list and briefly discuss the categories into which the instances, listed above, can be grouped.

- Orchestrated pedal or imitated resonance: orchestrated pedals are employed in *Raga III* for viola and large orchestra to imitate resonance by sustaining certain tones in other instruments. When initial tones of a musical gesture are sustained, the tones of the musical gesture that follow can be in friction with the sustained tone. In some instances, the sustained tone itself is in friction with other accompanying material. When the tones of orchestrated pedals are omitted, the remaining melodic material only interacts with the remaining accompanying material. For most instances, melodic gravity operates stronger than melodic magnetism because the most stable tones are heard in the accompanying material. The foreground melodic material is mostly unstable and the stable accompanying material pulls the unstable material downwards – see Example 5-20.[13]

- Density: instruments that are added to the end of segments create density at the end of those segments. Other instruments and material can be employed to create coherence in segments and connect segments. These instruments and material hinder the character of segments that unravel at the end. In these instances (where segments unravel at the end), the instability of the material becomes more prominent in the absence of the instruments and material that help listeners to retain their sense of stability – see Example 5-21.
- Auditory streams: in some cases, alternations of material between instrument groups was omitted, and this causes listeners to hear that material as part of other auditory streams and not as a separate auditory stream. This enables listeners to hear the interaction between the soloist and the orchestra, and the operation of musical forces, more clearly – Example 5-22.

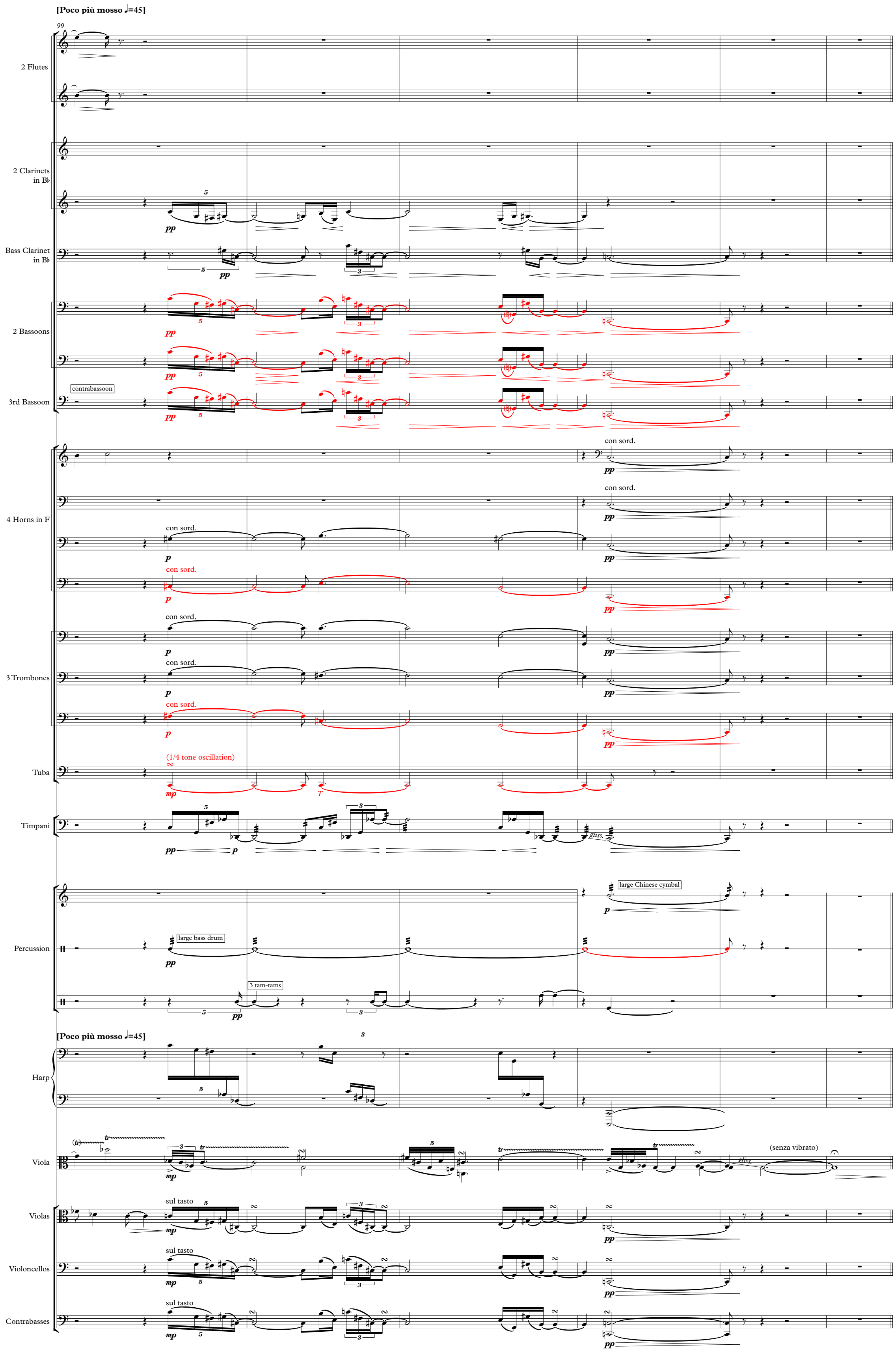
[13] In the examples that follow, I have coloured the material in the version for viola and large orchestra that was omitted in the version for smaller orchestra.

Example 5-20a

Raga III *for viola and large orchestra, mm. 1-3*

Example 5-20b

Raga III *for viola and smaller orchestra, mm. 1-3*



Example 5-21a

Raga III *for viola and large orchestra, mm. 99-104*

Example 5-21b

Raga III *for viola and smaller orchestra, mm. 99-104*

Example 5-22a

Raga III *for viola and large orchestra, mm. 145-148*

Example 5-22b

Raga III *for viola and smaller orchestra, mm. 145-148*

These observations enable me to argue that all material – in certain kinds of compositions, compositions similar to this one – has an influence on the operation of musical forces and that omitting any material will influence the operation of musical forces. Although I highlighted three categories above, and discuss them as ways in which the operation of musical forces is influenced in *Raga III* for viola and orchestra, they are not the only categories that can be applied to a wider repertoire of similar music. I will not elaborate on these other potential categories. It is for another study to determine the categories that influence the operation of musical forces when material is omitted. Instead, recommencing my argument above that all material influences the operation of musical forces, we can inquire whether doublings in specific instruments are included in the category of material of which the omission influences the operation of musical forces.

Omitting Doublings

Because fewer instruments were available in *Raga III* for viola and smaller orchestra, the material of some doubling instruments, either passages or tones of chords, was omitted in the following instances:

- mm. 99^{4}-103^{1a} (three bassoons),
- mm. 117^{2}-123^{4b} (bassoon 2),
- mm. 124^{3b}-131 (oboe 2, clarinet 2, bassoon 2),
- mm. 124^{2}-103^{1a} (xylorimba),
- mm. 132-138 (contrabassoon),
- mm. 135^{3c}-136^{1a} (piccolo, cor anglais, bass clarinet, trumpet 2),
- m. 140 (clarinet 2, bass clarinet, bassoon 2),
- mm. 140-142^{3b} (xylorimba),

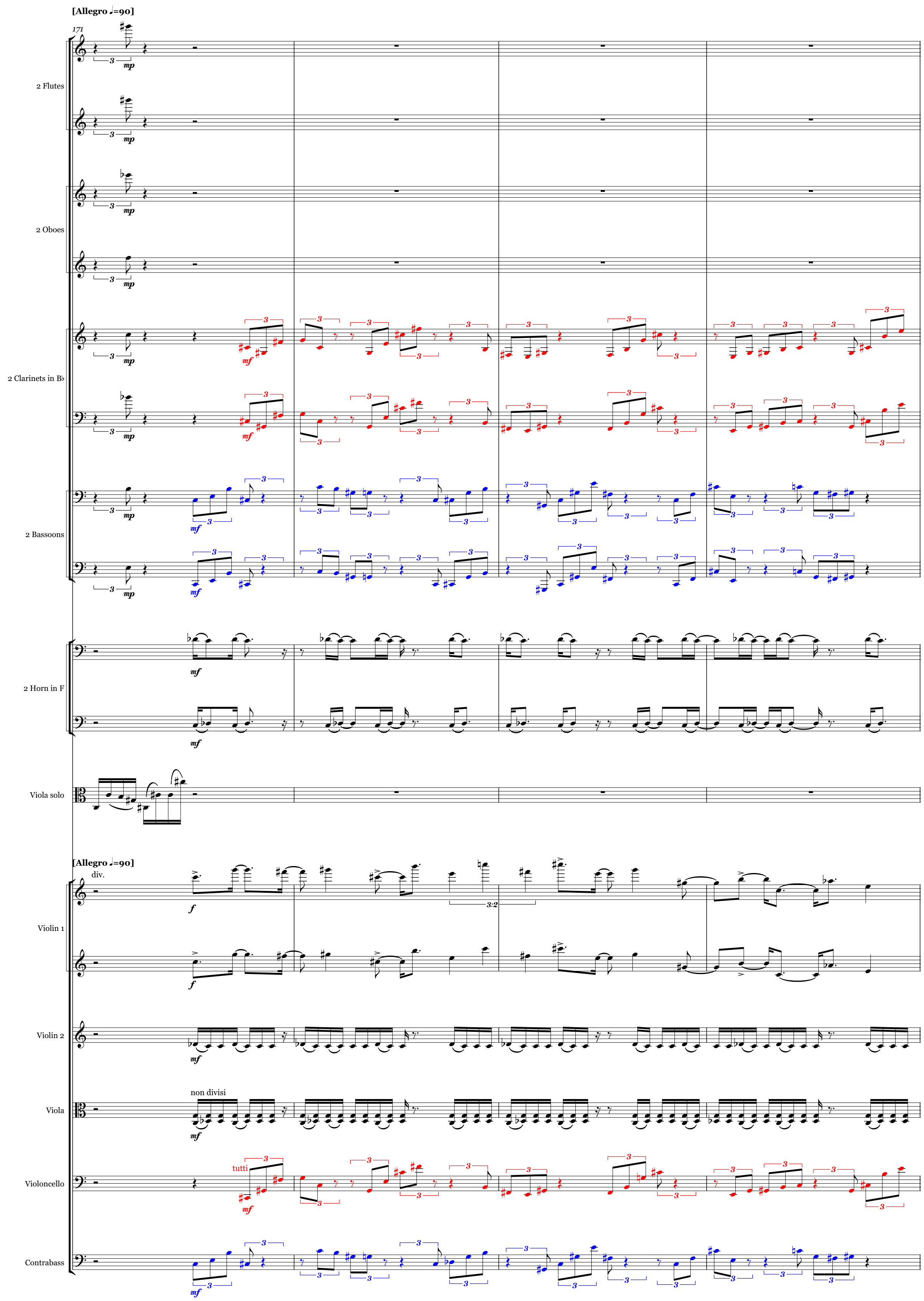
- mm. 143^{3}-152^{1} (cor anglais, bass clarinet, two bassoons, contrabassoon, horn 3, horn 4, trumpet 3),
- mm. 168-171^{1c} (piccolo, oboe 2, clarinet 1, two bassoons, four horns, tuba),
- mm. 171^{1c}-174 (clarinet 2, bass clarinet, bassoon 2, horn 2, horn 4),
- mm. 175-185^{3a} (piccolo, oboe 2, clarinet 1, bassoon 2, horn 1, horn 4, trombone 2, tuba),
- mm. 190^{1c}-202 (clarinet 2, horn 2, horn 4, trombone 2, trombone 3, tuba),
- mm. 220^{3}-228^{2a} (flute 2, cor anglais, clarinet 2, horn 2, horn 4, trombone 2, trombone 3, tuba),
- m. 228^{2c}-228^{4a} (flute 2, cor anglais, clarinet 2, contrabassoon, three trumpets, trombone 2, tuba),
- mm. 235-244 (bass clarinet, bassoon 2, horn 3, trombone 3),
- mm. 257^{2}-258 (bassoon 2, horn 3, trombone 1, trombone 3, tuba), and
- mm. 259^{4b}-262^{2} (flute 2, oboe 2, clarinet 2, bass clarinet, bassoon 2, horn 3, trombone 2, trombone 3, tuba).

Doublings of material can be employed in orchestration in both significant and insignificant ways in terms of how musical forces operate. Doubling material can be significant in terms of musical forces when the material of the doubling instrument is heard as a salient addition to the material it doubles. This was achieved effectively in *Raga III* for viola and orchestra by

- doubling fragments, instead of entire segments (see Example 5-23),
- doubling material with instruments of which the tone colour is significantly different from the tone colour of the instruments they double (see Example 5-24), and
- doubling material using multiple instruments that are suddenly or gradually added to a segment (see Example 5-25).

Example 5-23

Raga III *for viola and smaller orchestra, mm. 220-224*



Example 5-24

Raga III *for viola and smaller orchestra, mm. 171-174*

Example 5-25

Raga III *for viola and smaller orchestra, mm. 175-177*

Adding and omitting doublings influence the tone colour and the dynamic levels of segments as well as the operation of musical forces. Timbre and the operation of musical forces are discussed in §1.2 above, and dynamics and the operation of musical forces are discussed in Chapter 4 §6. Doubling material can be insignificant when listeners hear the material of the doubling instruments and the material they double in an entire large segment as a single auditory stream that is not expanded or condensed at certain points.

Doubling instruments can, however, play a significant role in the operation of musical forces when they change tone colour, register and/or dynamic, and subsequently amplify or reduce the operation of musical forces. The operation of musical forces is in most cases amplified when doublings are added and they are most often reduced when doublings are omitted.

2.4 Over-Amplification and Reduction of Musical Forces

Up to this point of the thesis I mainly discussed possibilities in which musical forces can be amplified, especially in orchestration. But can the operation of musical forces be over-amplified or reduced?

The operation of musical forces can be over-amplified when

- the amplification techniques are employed excessively,
- the amplification methods are extended to such an extent that they become predictable and redundant, or
- the amplification methods become inapposite in relation to the structure of the composition.

When the operation of musical forces is over-amplified, the amplification technique is futile because listeners will not necessarily hear the amplification as it was intended – they might be aurally overwhelmed by all the instruments that were employed in the amplification. Thus, the amplification of musical forces has specific limits in order to be aurally salient and have optimal effect on listeners. A detailed discussion of these limits will be suitable for training or enriching composers, but is not within the scope of this research project. For the purposes of this research project, we can argue that some of the instances of *Raga III* for viola and orchestra that were omitted are instances in which the operation of musical forces was over-amplified in the original, and reduced in the newer version.

It is clear that operation of musical forces is not always amplified in composition and in orchestration. Composers can also reduce the operation of musical forces. The operation of musical forces can specifically be reduced in segments where a clear resolution of unstable tones to stable tones is avoided, or where material unravel at the end of the segment. In such instances the clear operation of musical forces is disguised, and musical forces are not amplified at all.

The operation of musical forces can intentionally be reduced in the following ways. These ways stand in contrast to the individuated elements identified in Chapter 4.

- Avoiding glissandi, avoiding trills and tremolos, not adding instruments to existing material, and not adding new material. These individuated elements add energy and density to material and should thus be avoided when reducing material. In contrast with the addition of instruments to existing material, instruments can be suddenly or gradually reduced.[14]
- Changes in register. Registers can be expanded or reduced to influence the way in which listeners will hear the stability or instability of tones. When reducing registers, there is a close interaction of stable and unstable tones which allows listeners to hear strong dissonances between those tones. When registers are expanded, stable and unstable tones can be moved to different registers to create weaker dissonances. Strong dissonant chords create density, and therefore weaker dissonances in expanded registers can be employed better to reduce the operation of musical forces.[15]
- Crescendos add energy and decrescendos reduce energy. Crescendos should not necessarily be avoided, but should be employed effectively, especially in expending the energy accumulated by the crescendo. Decrescendos can be employed effectively to reduce energy in segments, which will influence the understanding of the operation of the forces.

[14] One instance is found in *Raga III* for viola and smaller orchestra where the vertical amplification of horizontal material was omitted: mm. 133-135 (three trombones and tuba).
[15] The interaction between register changes, density, and dissonance is more complicated than presented here. In this part I only focus on the possibilities that register changes offer composers to transpose stable and unstable tones up or down in order to reduce density and dissonance.

3. <u>Conclusion</u>

3.1 <u>What is moving? – Motion</u>

In contrast to my work in Case 1, I did not code all the significantly different phenomena in terms of the comparison of the two versions of *Raga I* and the two versions of *Raga III* in Case 2. In Case 2 I analysed entire compositions according to specific topics. The approach I followed in Case 2 relates strongly to the second class of agency that Monahan describes, namely the work-persona. **Critical characteristics** of this class are highlighted by Monahan (2013:328) when he writes about Theodor Helm's (1994) analysis of Beethoven's String Quartet in A minor, op. 132: "[T]he work-persona's consciousness will always span a movement's entire duration, but not everything that happens *within* the work needs to be understood as its direct or voluntary action". Two critical characteristics highlighted by Monahan are reflected in my analytic strategy: firstly, the work-persona as an agent needs to be understood in terms of an entire composition or movement; secondly, some phenomena do not have to be interpreted as the work of an agent. It is for these reasons that I analysed entire compositions for Case 2, and did not analyse as exhaustively as in Case 1.

The work-persona is similar to the individuated element in the sense that it dwells in an "intramusical world" (Monahan, 2013:328). Monahan (2013:328) writes that "[i]ts awareness is limited to the musical past and the present; it, too, 'lives' in the moment, without any foreknowledge of how things will turn out. However, unlike the individuated element, the work-persona is necessarily both unitary and continuous. It is a single unbroken consciousness, unique to a movement and extending throughout its duration". Monahan summarises the work-persona as a personification of a composition itself. **Four criteria** for the work-persona can be deduced from this quote: the work-persona is 1) intramusical; 2) part of the unfolding of a work; 3) unitary and continuous; and 4) a personification of the composition.

I am able to situate my findings of Case 2 within the two critical characteristics and the four criteria. In this way my findings can be interpreted in terms of the work-persona class of agents. The crucial aspects of my argument in this discussion centre on the idea that the work-persona is different in the different versions of each Raga, because the material moves differently in the different versions. Because the material moves differently, we hear it as meaningful in different ways, and that implies that our way of making the meanings will be different, albeit related. Although the material of each movement moves differently, it remains clear that the different versions are versions of the same composition. This last statement applies, however, in different degrees to *Raga I* and to *Raga III*.

Four central topics are discussed in Case 2: change of instruments, addition of material for percussion, reducing material, and the over-amplification or reduction of musical forces. These four topics meet the characteristics of the work-persona class of agents in the following ways. The change of instruments between *Raga I* for percussion and orchestra and *Raga I* for percussion and concert band took place for the entire composition and not only for parts or for certain segments. Not all the phenomena – specifically register changes, swapping material for other instruments, and doublings – have to be interpreted as the work of an agent. The material that was added for percussion was added to the entire composition, and some of the material includes silences. In *Raga III* for viola and smaller orchestra, material was reduced and instances of over-amplification and reduction of musical forces can be found in the entire composition.

The two topics of *Raga I* – i.e. change of instruments and addition of material for percussion – are intramusical, because these changes are contained in the music and are not connected to extramusical aspects or reasons. They are a personification of the composition because they are an integral part of the unfolding of the composition, shaping the entire composition. Because they contribute to creating a uniform entity, they are also considered as unitary and continuous. The topics of *Raga III* – i.e. reduction of material and over-amplification or reduction of musical forces – are also intramusical. The reduction of material was also not done in an arbitrary way, but in terms of how the composition unfolds. These reductions support the reduction of musical forces and prevent the over-amplification of musical forces, making them unitary and continuous. Because *Raga III* for viola and smaller orchestra is considered a reduced version of *Raga III* for viola and large orchestra, the reductions are a personification of the version for viola and smaller orchestra. These two topics clearly meet the two critical characteristics and four criteria of the work-persona class of agents, and I will refer to them as work-personae for the remainder of this chapter.

The work-personae of compositions are often described in programme notes of compositions. I present some programme notes below in which the work-personae of *Raga I* for percussion and orchestra and *Raga III* for viola and large orchestra are described. Of the many programme notes of this composition, I chose these specific programme notes, because they are the most comprehensive, they were written by leading Belgian musicologists, and/or they were published in the CD booklets of the compositions. Because authors focus on different aspects when they write programme notes – and also when the work-personae of compositions are described – it would not contribute constructively to my arguments here to compare these programme notes with the programme notes of *Raga I* for percussion and concert band or *Raga III* for viola and smaller orchestra. Instead, I rather discuss how the work-personae described in the programme notes are influenced or changed in the other versions. I take the programme notes as point of departure, and then add my own interpretation.

Raga I for Percussion and Orchestra

The work-persona of *Raga I* for percussion and orchestra is described by Yves Knockaert (1998) as follows: "The solo percussionist in Raga I has an immense number of instruments at his disposal, the components of which originate from all over the world: the dobachi (Japanese temple bell), the hyoshigi (Japanese log with a very high sound), Indian bells, Pekinese gongs, finger cymbals and crotales; these Asian instruments are often combined with African drums [e.g. djembe] and classical European percussion. The opening note betrays the expert touch of a true connoisseur: two Chinese cymbals are brought together, after which one of them performs a slow circular motion, creating the distinct impression that the opening note 'moves'. One morning raga is connected with an evening raga: one scale consisting of seven notes is in tune with seven gongs and an equal number of crotales. The composition begins with the horizontal raga-keynote, which is doubled by the superimposed percussion instruments. This motif, however, immediately turns into a fluctuation produced by a combination of the dobachi with timpani glissandi that develop into trills and narrow chromatic clusters on the one hand, and the exploration of the raga notes on the other hand. The fluctuating tone may remind the listener of the sound of the sitar, where the actual pitch the player intends to use carries the same weight as the fluctuation around that note: lapsing deviations travel back and forth in an endless variety of pitch fluctuations. Various improvising Indian bells and carillons are another reference to the 'alapa'. Rhythmic tala's and virtuoso tabla skills are an 'inciting' example for the solo part. Henderickx has the presence of mind to punctuate the 'alapa' with sharp, rhythmic grace notes and short, rhythmic figures. The pace at which this music evolves combined with the immediate introduction of the rhythmic cadence, constitute irrefutable evidence of the composer's Western origins. Subsequently, certain phenomena, such as acceleration, increasing complexity and fierceness of expression come to the fore. Several sound sources join forces in order to obtain this effect, creating an exciting dialogue between soloist and orchestra which is typical of the 'gata'."

Knockaert's programme notes entail many individuated elements as agents of the work-persona, specifically focusing on the percussion parts. This is understandable because the percussionist is the soloist, because *Raga I* is considered a concerto for percussion (François, 2015; Henderickx, 2015b), and because the aspects of tāla (rhythmic structures) are the most prominent in this composition (Henderickx, 2015b). The material for the percussion instruments, the rhythmic structures of the accompaniment (Knockaert highlights the punctuation of the alap), and the structure of the composition (morning rāga followed by an evening rāga) remain the same between the two versions. An aspect relating to the work-persona that is highlighted by Knockaert is the "fierceness of expression" that is created by "several sound sources" to create the "dialogue between soloist and orchestra". The "several sound sources" of the composition are not the same sources of sound in the version for percussion and concert band than in the version for percussion and orchestra because of the change of instruments. Although there is still a dialogue between the soloist and orchestra, the work-persona of the orchestra is different: the philharmonic orchestra was replaced by the concert band, and – as argued in the observations upon which I based my interpretations – the timbre, density, and the ways in which the patterns move were affected. Because both works still exist, they are considered as two compositions, each with their own work-persona.

The different instrumentation of *Raga I* for percussion and concert band is also supported visually, not only by the different instruments visible but also the uniforms of the performers in the concert band – see Image 5-1.

Image 5-1

Belgian Royal Music Band of the Guides, Wim Henderickx (left), conductor Yves Segers (middle), and Gert François (right) – Photo: Facebook

***Raga III* for Viola and Orchestra**

The work-persona of *Raga III* for viola and orchestra is described by Knockaert (1998) as follows: "Raga III – based upon a 'Shri'-raga (a midday raga) – is characterized by an atmosphere of [despondency] and spirituality. The viola in this Raga is marked by Indian melodic configuration in its use of micro-intervals and quarter-tone trills, that hint at the division of the Indian scales in shruti (22 micro-intervals of varying length). The capriciousness of the ornaments alternates with sustained notes that form the keynotes of the lyrically carried melody. The viola clearly symbolizes the Indian sarangi (Indian violin), while the orchestra fulfils a double function. It will imitate and intensify the atmosphere created by the viola but it also symbolizes the rhythmic table with its comprehensive percussion section. Henderickx draws upon his impressive percussion repertoire and selects several mutually diverging cymbals, tubular bells, Japanese temple bells, Thai-gongs and tuned rototoms. The atmosphere of this composition is determined by the phrases added to the score. The piece progresses from a [misterioso] 'half-awake' to a 'sad but spiritual'-passage [sic]. Shortly thereafter the pace picks up in order to sound 'lively with inner joy' in the swift allegro. In this part, the viola produces a rhythmically pulsing melody, with repeated trills that remind us of the quarter-tones trill of the languid part. The slow coda is entitled 'an evening prayer' which, in its turn, refers directly to the raga, as the latter is assigned to a specific time of day."

The work-persona of *Raga III* for viola and orchestra is described by Hubert Culot (1999) as follows: "In Raga III for viola and orchestra, based on a mid-day raga, the viola evokes the Indian fiddle sarangi while the orchestra supports the soloist in tabla-like fashion. The first part begins dreamily, though in a somewhat darker mood. The first entry of the viola clearly has an improvisatory character (repeated notes, quarter-tone glissandi) before taking flight in long melodic lines. The mood becomes more impassioned and the first part then fades into the second one. Thus music now dances along with much energy and rhythmical vitality. After a long cadenza, the music briefly regains its impetus before reaching the peaceful, ecstatic coda Evening Prayer."

These programme notes by Knockaert and Culot also entail descriptions of individuated elements as agents, but they reflect more on the work-persona of the composition. Many aspects of the work-persona did not change in the reduced version of the composition, such as the structure and the "atmosphere of despondence and spirituality" and the orchestra that "supports the soloist in tabla-like function". Aspects of the work-persona that are not the same in the reduced version is the way in which the orchestra "imitate and intensify the atmosphere created by the viola" and the first part that begins "dreamily" but in a "darker mood". These observations are directly linked with the reduction of the original version and the over-amplification or reduction of musical forces: because the material and musical forces were reduced, the role of the orchestra to imitate and intensify is less pronounced in the reduced version. Because some material was omitted in the first part, and the operation of musical forces is less clear, the first part is more "dreamily", but still in a "darker mood". Wim Henderickx's replacement of the original version by the reduced version – and considering the original version as a "musicological document" (Henderickx, 2015b) – has an adverse implication for the work-persona of this composition, because the work-persona of the original work (the composition for viola and large orchestra) does not exist in the same way as the work-persona of the other versions.

Another feature of the work-persona is mentioned by Monahan and reflected in my observations. The work-persona can contain individuated elements that act against its unitary nature: "Many, perhaps most, analyses that feature a central work-persona also mark off one or more individuated elements as antagonists acting in opposition to that central subjectivity." (Monahan, 2013:328.) The addition of material for percussion in *Raga I* for percussion and concert band, and the over-amplification and reduction of musical forces discussed in terms of *Raga III* for viola and smaller orchestra meet the criteria for individuated elements. On the one hand, the over-amplification and reduction of forces are antagonists, because they directly oppose the work-persona. The material for percussion added to *Raga I* for percussion and concert band, on the other hand, is part of the unfolding of the composition in protagonistic ways, because it supports some individuated elements discussed in Case 1 and compensate for the loss of timbral variety incurred when the ensemble was reduced from full orchestra to concert band. The addition of this material for percussion compensate for the loss in timbre. This observation adds another insight to Monahan's interpretation of the relationship between the work-persona and individuated elements in the composition.

Monahan's ideas about protagonism and antagonism are based on the **presence** of individuated elements, but my discussions in this chapter about material that was omitted when *Raga III* for viola and smaller orchestra was created indicate that individuated elements can also act in antagonistic ways when they are omitted, and in this way they are acting through **absence**. The instances of material that was omitted in *Raga III* for viola and smaller orchestra are all examples of individuated elements that were omitted and act as antagonists to the work-persona. Understanding the actions of agents in terms of presence and absence links to the notion of avatars, as discussed by Monahan. However, this new distinction of presence/absence is not to be confused with the notion of the avatar.

Avatars of the work-persona are often programmatic fictional characters, the composer[16], and the naive listener (Monahan, 2013:349-350). Monahan (2013:351) summarises these avatars of the work-persona by arguing that "the work-persona and the fictionalized naive listener may both be projections of the analyst's own ideal experience of the work". I agree with Monahan on this statement, but these avatars are not relevant to my conclusions and will thus not be discussed in depth in this chapter.

It is evident in the programme notes above that the work-persona and individuated elements that act as avatars are personifications of the compositions that describe how those compositions are heard. Knockaert (1998) writes, for example: "The opening note betrays the expert touch of a true connoisseur…" The four topics discussed in this chapter are significant agents that determine the work-persona and the way in which we create meaning of the compositions discussed here. The four topics are not avatars, because they are not described as imaginative or fictionalised agents, but as sound patterns that can be listened to, and heard.

3.2 How do we listen? – Meaning

The work-persona of *Raga I* for percussion and concert band – i.e. change of instruments and addition of material for percussion – and the work-persona of *Raga III* for viola and smaller orchestra – i.e. reduction of material and aspects of over-amplification and reduction of musical forces – are an integral part of composers' tools to create versions for other instrumentation or to reduce orchestral works. But these tools were not tools that were merely available and utilised by the composer, or used to improve the compositions in a way – they were necessary to create the other versions of *Raga I* and *Raga III*.

[16] Monahan (2013:350) writes that "this agent is not the fictional composer we encountered above, the planning, revising, controlling agent who devised the work's dramatic structure in all its details. Rather, this is the work-persona disguised as the composer, a projection of the music's own abstract and continuous experience back onto its author".

Creating *Raga I* for percussion and concert band by using *Raga I* for percussion and orchestra would not have been possible without a change of instruments because there are few common instruments between the orchestras that perform the two different versions, and those instruments that are common play different roles in the two versions. Because the majority of instruments are wind instruments, important tone colours of the orchestra are lost. This loss is compensated for by adding the material for percussion. This influences the ways in which we we listen, and more specifically the ways in which we interpret the operation of musical forces. Creating *Raga III* for viola and smaller orchestra would also not have been possible without reducing material and reducing the operation of musical forces, especially where the operation of musical forces was over-amplified. Through the lens of the theory of musical forces, these agents play an important role in how musical forces operate, and thus in the ways in which we listen to this version of the composition.

Change of Instruments

The change of musical instruments from orchestra to concert band highlighted the limitations of the instruments of the concert band: unlike most of the instruments in the orchestra, most instruments in the concert band cannot perform double stops, various alternative performance techniques, microtones, artificial harmonics, or continue to ring after played. We simply cannot hear the two versions of the work in the same way. This influences our understanding of aspects of the work-persona, such as the "increasing complexity" and "fierceness of expression" that are described by Knockaert. I argue that the meaning that we find in the version for orchestra would, for example, have more of this fierceness of expression. Our hearing of this composition changes on many levels, because our conceptualisation of the work-persona influences the ways in which we listen to individuated elements, and because individuated elements influence the way in which we hear musical forces.

Other aspects of differences between instruments, such as overtones, timbre, tempering, pedalling, and sustain also influence our understanding of the work-persona and are agents that play a role in the operation of musical forces, and thus in the ways in which we can hear this composition.

Double stops, ringing or sustain, overtones, and the use of the sustain pedal are agents that amplify the operation of gravity and magnetism by adding an additional tone(s). Added tones of double stops are the most salient of these agents. The added tone(s) contextualises the stability or instability of the tone it is added to and makes the gravitational and magnetic tendencies of unstable tones more salient. Ringing or sustain and pedalling are less salient agents because the added tone(s) starts to fade. The extension of tones through these agents causes them to remain in listeners' perceptual present for longer. However, when they fade they lose their function in providing this salience. Overtones are the least salient of these agents. They influence listeners' perception of stability and they are active agents when tones are combined, supporting or counteracting the operation of musical forces. Overtones are the only agents of the those discussed in this paragraph that are significantly present in *Raga I* for percussion and concert band.

The alternative performance techniques, microtones, and artificial harmonics are agents that relate to the timbre of instruments and have a significant influence on the tone colour of the music and the operation of musical forces. Some alternative techniques cause the sound patterns to which they are added to be more salient than when those sound patterns are performed in conventional ways. Some alternative techniques can also cause the sound patterns to be less salient. Whichever effect they have on the sound patterns, to be more salient or less salient, the material that is on the foreground auditory stream will be the most salient in terms of how the musical forces operate. Microtones can be employed to increase the gravitational or magnetic tendencies of unstable tones to resolve to stable tones, and the artificial harmonics can be employed to transpose stable or unstable tones higher in chords that consist of stable and unstable tones in order to respectively amplify the instability or stability of chords. These agents are not present in *Raga I* for percussion and concert band.

Omitting the agents discussed in the two paragraphs above affects the experiences of listeners, not only in terms of these agents as individuated elements, but also in terms of the work-persona of the two compositions. The different work-personae of *Raga I* for percussion and orchestra and *Raga I* for percussion and concert band are thus not caused only by mere changes in instruments, but also by the way in which multiple individuated agents influence the work-personae. In *Raga I* I identified multiple individuated elements that influence the work-persona, but it is also possible that a single individuated element can influence the work-persona, as something that can be heard in terms of musical forces.

Addition of Material for Percussion

I identified six individuated elements in Case 1 that act as agents in *Raga I* for percussion and orchestra. Although this is not highlighted in Case 1, these individuated elements are central to the work-persona of *Raga I* for percussion and orchestra. These individuated elements, and the functions they served in *Raga I* for percussion and orchestra, were identified as central to the addition of material for percussion in *Raga I* for percussion and concert band (Case 2). This is because the added material for percussion further amplifies the operation of musical forces, amplifying it more than the individuated elements amplified the operation of the forces in the version of *Raga I* for percussion and orchestra. As mentioned above, one can argue that this further amplification is an aural compensation for the loss of tone colour in the version for percussion and concert band. The further amplification also plays a significant role in the differentiation of the work-persona of *Raga I* for percussion and concert band because it is not part of the work-persona of *Raga I* for percussion and orchestra. As already argued above, a change in the work-persona causes new listening experiences in terms of individuated elements and the ways in which musical forces are heard.

Reducing Material

When material is reduced, there are fewer individuated elements that participate in the operation of musical forces. The operation of musical forces is not necessarily more vague, because less material can allow for a clearer operation of musical forces. However, the operation of gravity and magnetism in sound patterns is influenced significantly when the participants in the musical forces are omitted as part of the reduction technique. We hear the operation of gravity less clearly when the material that provides the stable platform is omitted in the reduction process, and the operation of magnetism is less clear when stable material that provides stable attractive points is omitted in the reduction process.

Over-amplification and Reduction of Musical Forces

The over-amplification and reduction of musical forces are agents antagonistic to the amplification of musical forces, described in Case 1. The over-amplification of musical forces inhibits listeners' creation of meaning in music, because the operation of musical forces becomes unclear when they are 'unrealistic' to listeners. But the reduction of musical forces, on the other hand, enhances listeners' creation of meaning in music, because the operation of musical forces is unclear to listeners. Although the operation of musical forces is unclear in both the over-amplification and reduction of musical forces, the reduction of musical forces enables listeners to create meaning because it is a purposeful reduction. The over-amplification of musical forces, on the other hand, is arbitrary and is thus not constructive in creating meaning.

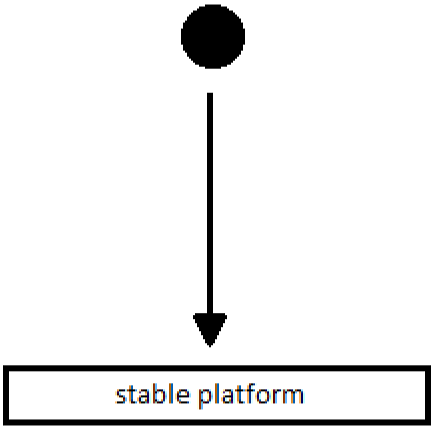
3.3 How do we understand? – Metaphor

In this section I expand further on the work-persona of *Raga I* and *Raga III*, and I discuss how we understand them in terms of cross-domain mapping and metaphor.

Change of Instruments

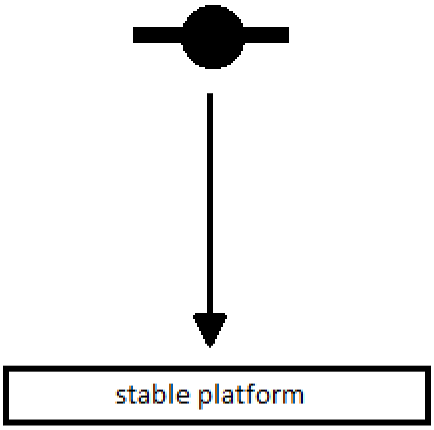
Although the change of instruments in *Raga I* for percussion and concert band influences the operation of musical forces, the operation of musical forces is not changed in significant ways – in some instances the way in which musical forces operate is not changed at all. These influences of the change of instruments are also within the specific musical forces – musical forces are thus not swapped, omitted, or added.

In terms of physical movement, I consider the operation of gravity the same in the two versions, but the object that is pulled down is slightly different. In Example 5-26 I illustrate the downward movement of a ball to a stable platform, caused by the operation of gravity. The ball in Example 5-27 looks slightly different with an orbit around it. This orbit allows the ball to resist the operation of gravity to some extent (when the orbit is horizontal to the stable platform) or to support the operation of gravity to some extent (when the orbit is vertical to the stable platform). Both are balls that are pulled down by the operation of gravity, but the balls are slightly different and the operation of gravity is slightly different.



Example 5-26

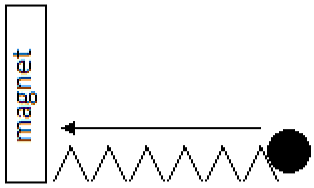
Ball 1 pulled to a stable platform by the operation of gravity



Example 5-27

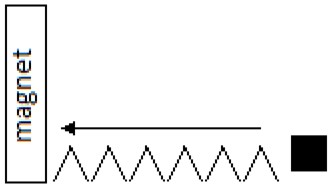
Ball 2 pulled to a stable platform by the operation of gravity

The operation of magnetism in the two versions of *Raga I* is similar to the metaphors of gravity, discussed above. If we change the object that is attracted by the magnet, the way in which that object is attracted – as well as the way in which the object moves – will be different. In Example 5-28 I use the example of a metal ball that is attracted by a magnet with a rough surface in between. When the object that is attracted is not a ball but a metal cube, the way in which the square is attracted by the magnet, and the way in which it will move over the rough surface, is different from the metal ball – see Example 5-29.



Example 5-28

Metal ball attracted by a magnet over a rough surface



Example 5-29

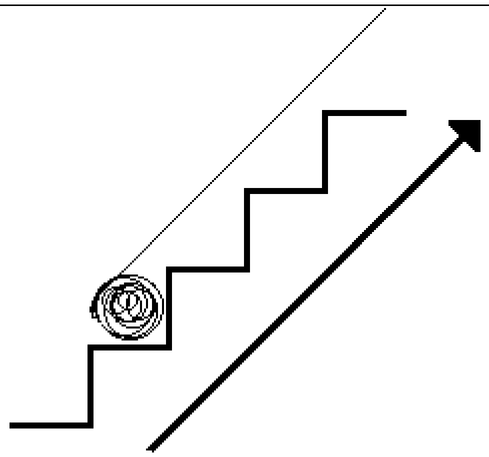
Metal cube attracted by a magnet over a rough surface

Addition of Material for Percussion

The addition of material for percussion in this case is the same as the addition of instruments to existing material, discussed in Case 1, Chapter 4, §5. Although the purpose and functions of this added material for percussion are to further amplify the operation of musical forces, they are the same agents as the individuated elements discussed in Chapter 4. I will thus not repeat that discussion here.

Reducing Material

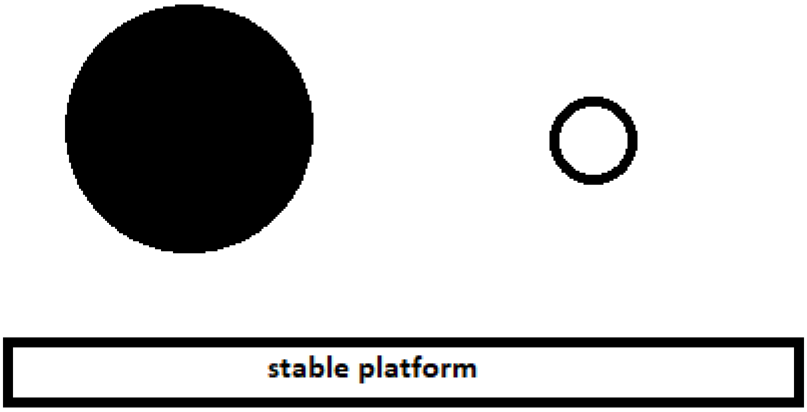
When material is reduced, there are fewer participants in the operation of musical forces. This can be understood in terms of physical movement as a ball of wool that moves down a set of stairs while one end of the wool is attached to something on the top edge of the stairs. The ball of wool becomes smaller as it moves down the stairs, and at some point it will become too small to continue to descend down the stairs. Gravity will not stop to act on the ball of wool, but it will not cause any movement – see Example 5-30.



Example 5-30
A ball of wool moving down a set of stairs

Over-amplification and Reduction of Musical Forces

The over-amplification and reduction of musical forces can be understood in terms of physical forces, using the mass of an object as a metaphor of that aspects of the music that participate in the over-amplification or reduction. When a very heavy ball is dropped from the same point – not far from the stable platform – as a much lighter ball, the result of gravity reaching the platform and the impact of the heavy ball will not be as well defined as the effect of the lighter ball. This is because the movement of the large ball is not clearly visible because it does not move far and it is likely to hit the stable surface with a splat – see Example 5-31. The lighter ball, on the other hand, will travel further, and we can anticipate its contact with the platform.



Example 5-31
The difference in movement of a heavy ball versus the movement of a lighter ball when pulled down to a stable platform by the operation of gravity

The reduction of the operation of musical forces is the opposite of the example provided above. Instead of increasing the mass, the mass of the ball that represents the reduction of the operation of musical forces that can be decreased. This decrease in mass will affect the operation of gravity on the lighter ball, and it will have a softer arrival on the stable platform than the other ball.

CHAPTER 6

Case 3: Wim Henderickx's *Raga III*

In this chapter I discuss the third case of my research project. This case is divided into two parts. In the first part I compare *Raga III* for viola and orchestra, *Raga III* for viola solo, and *Raga III* for viola solo and electronics. In the second part I compare *Raga I* for percussion and orchestra, *Raga I* for percussion and two pianos, and *Raga I* for percussion solo. The two versions of *Raga III* for viola solo – one version without electronics and the other version with electronics – are the points of departure in this chapter. I discuss specific differences between these two versions of *Raga III*, most importantly the addition of a drone, and develop thoughts on the operation of musical forces around aspects that become clear from the comparisons. *Raga I* for percussion solo is discussed in terms of the operation of rhythmic forces and how these forces operate among unpitched percussion instruments. I use relevant segments of *Raga III* for viola solo and also *Raga I* for percussion solo as exemplars for the theoretical work presented in this chapter.

The first section of this chapter provides context and background on the two versions of *Raga III* for viola solo, and in this part I also identify and discuss problematic aspects in *Raga III* for viola solo without electronics. The first section concludes with discussions about the compositional approach that Wim Henderickx followed to address these problematic aspects. The second section of this chapter is based on my analyses through which I compare and discuss significant differences between *Raga III* for viola solo with *Raga III* for viola solo and electronics. My critical discussions of the analyses of *Raga III* for viola solo, combined with extended discussions of aspects and how they feature in *Raga I* for percussion solo, enable me to interpret my observations and gain new insights into the operation of musical forces, on aspects such as the functions of a drone, the operation of musical forces in the presence of a drone, the collaboration of rhythmic forces and melodic forces, structure and segmentation, and fading. This enables me to suggest changes and additions to the theory of musical forces in order to expand Larson's theory of musical forces.

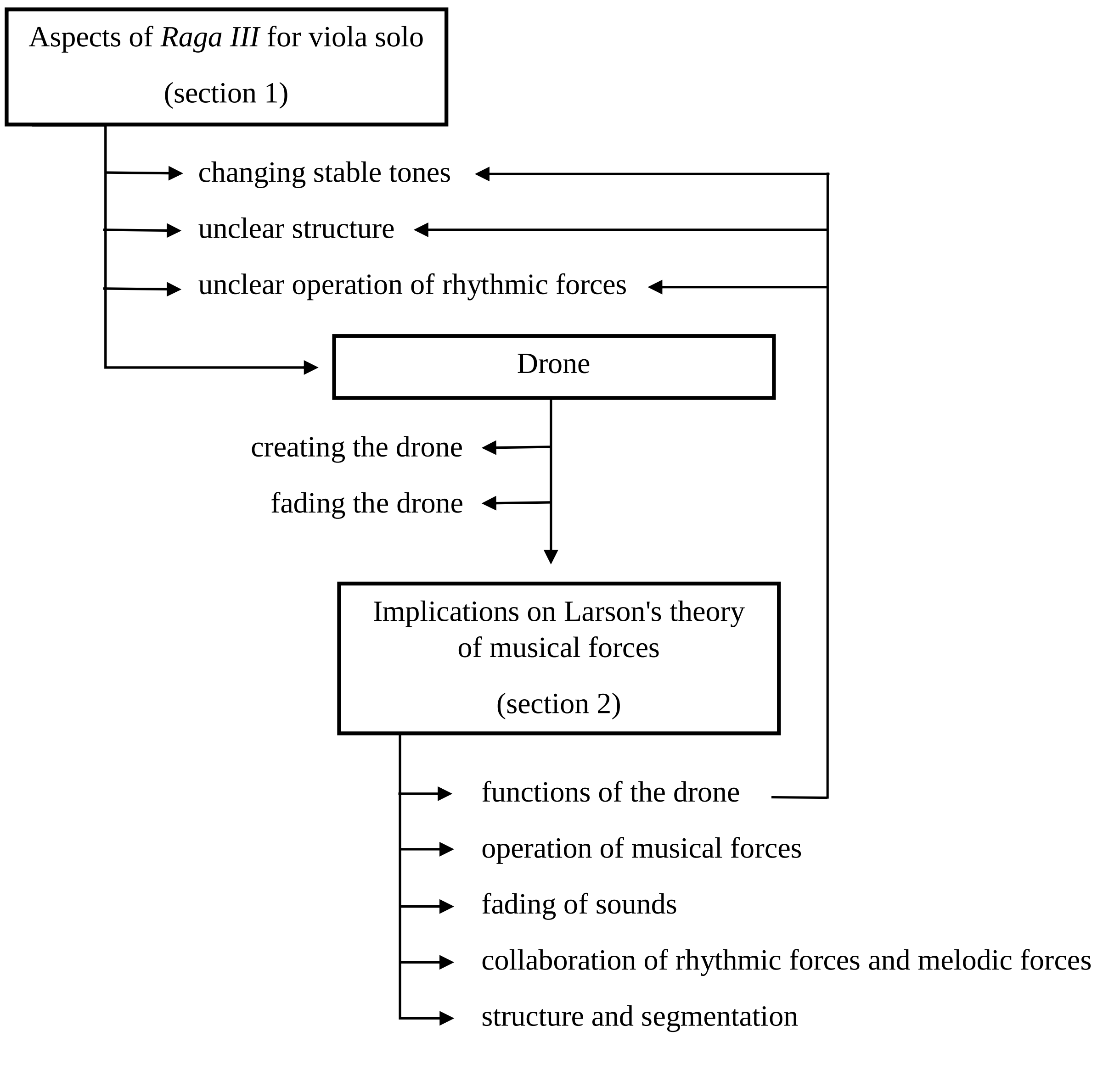


Diagram 6-1

Chapter 6 overview

1. The Drone in *Raga III* for Viola Solo and Electronics

My analyses and comparisons of *Raga III* for viola solo and *Raga III* for viola solo and electronics show that the difference between the two versions extends beyond the addition of a drone. I observed how listeners hear stability and instability differently, how musical forces operate differently in the presence of a drone, and aspects of segmentation and structure in the presence of a drone. This section is divided into four parts. I start in the first and second part with a cursory discussion of *Raga III* for viola solo without electronics and the problematic aspects that influenced Wim Henderickx's decision to create a version for viola and electronics. In the third and fourth parts I discuss, more specifically, how the electronic part was created, how musical forces operate differently in the version for viola and electronics, and how the electronic part is started and ended by fading the electronics at the beginning and end of *Raga III* for viola and electronics.

1.1 Aspects of *Raga III* for Viola Solo without Electronics

In an interview with Wim Henderickx (2015b), I asked about the different versions of *Raga III* – viola and large orchestra, viola solo, viola solo and electronics, and viola and smaller orchestra – and he replied as follows: "After I composed the piece for viola and orchestra (1995), and after discussions with Leo De Neve, there was always the urge to do something with this piece. I had two options. The first option was to make a reduction of the composition for viola and piano, but I did not consider this option. [...] The other option was electronic music, but first I had the idea of making a solo version." The version of *Raga III* for viola solo was composed in 2003, and the version for viola and electronics was composed in 2010.

The version of *Raga III* for viola solo generated problematic aspects and the version for viola and electronics was created in order to solve these problematic aspects. These problematic aspects became clear when I made an aural analysis of the composition by listening to a simulated version of the composition while following the score. The most prominent problematic aspects are as follows:

- The point of stability is heard as constantly changing: the C – which is supposed to be the most stable tone – becomes aurally less prominent while some other unstable tones become aurally stable.[1] The stability and instability of tones subsequently become unclear, and the consequence of this is that the operation of musical forces is unclear and ambiguous. This is because the listeners' sense of stability is determined by the surrounding horizontal material of the viola part and not by vertical accompanying material.
- Some structural levels of the composition are unclear. On a meso-level the musical gestures are not clear, and that has an impact on the macro-level of the composition. This is because listeners cannot clearly hear how structures are shaped when they do not have a clear sense of stability.
- The operation of rhythmic forces is unclear and ambiguous: metric stability is not clear in the composition, and therefore listeners cannot clearly hear the operation of rhythmic forces as they are shaped in metre. This is also due to the absence of accompanying material that supports how we hear metric stability.

[1] The stable and unstable qualities of tones that I refer to here are how these tones are heard as stable or unstable in terms of contextual stability in *Raga III* for viola solo, and not necessarily how they were contextualised in the version for viola and orchestra, or how the point of stability was intended by the composer.

These three aspects are the most prominent problematic aspects of *Raga III* for viola solo, and they form the basis of my discussions below.

Changing Stable Tones

Henderickx (2016) and Tamminga (2016) specifically mention the pitch class C as the most stable in *Raga III* for solo viola without electronics, and two other important pitch classes, D♭ and G, are also mentioned.[2] Henderickx employed several techniques to amplify the C as a stable tone with a tonic function in the viola part of *Raga III* for viola and orchestra. This viola part formed the basis of the material for *Raga III* for viola solo.[3] The techniques to amplify the C as a stable tone include

- the placement of Cs on strong metrical beats;
- targeted placements of Cs in other registers than surrounding material;
- accents on Cs;
- trills on Cs;
- ornaments on unstable tones that move to Cs because of the shape of the ornament;
- dyads with sustained Cs, combined with unstable material by placing the Cs below the unstable material;
- employing Cs as pedal tones so that other tones continuously alternate with the stable Cs, those Cs are then reiterated; and
- significantly extending durations of Cs.

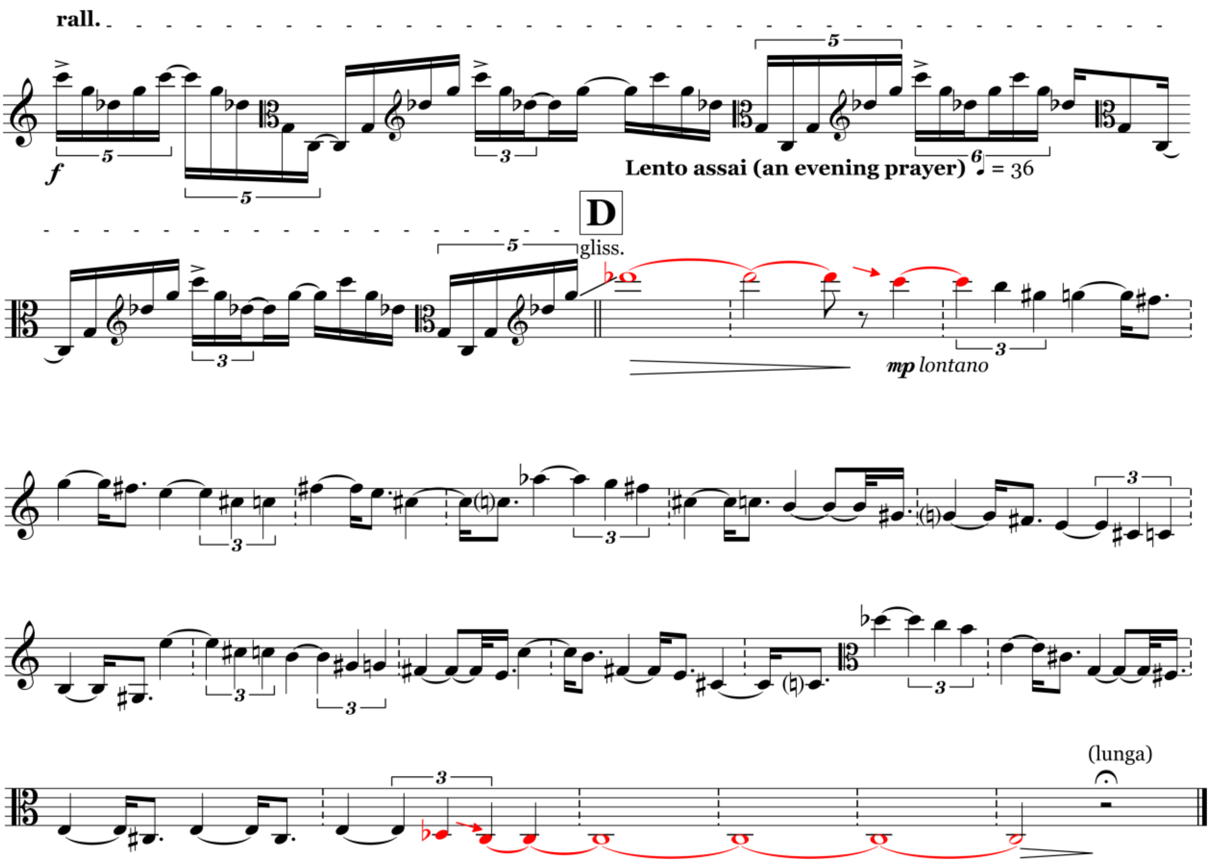
[2] The importance of these tones is also specifically mentioned in short programme notes on Henderickx's website (Henderickx, 2017).
[3] Most material of the viola part of the version for viola and orchestra formed part of the version for viola solo without electronics. The conjunction of these parts is different, because the dialogue between the soloist and orchestra does not feature in the solo version. The viola material in mm. 60^4-99^3 of *Raga III* for viola and orchestra was omitted in the solo version.

Despite the composer's efforts to employ the above-mentioned techniques in order to establish the C as the most stable tone of the composition, the absence of the orchestra in the solo version causes the quality of the Cs as stable tones and the tendencies of the unstable tones to resolve to the stable Cs to be unclear. The two unstable tones in the scale of the composition with the strongest tendencies to resolve to the stable Cs are B and D♭, but their tendencies to resolve to C cannot be heard clearly in this version and therefore some of the resolutions of the unstable Bs and/or D♭s to the stable Cs sound inapposite. This challenge for listeners in perceiving the stability and instability of tones – and subsequently the way in which unstable tones are governed by melodic forces to resolve to stable tones – can be ascribed to the complexity of the melodic (pitch and rhythmic) material that causes listeners to lose their sense of the C as the most stable tone of the composition.

Although we find this difficulty in hearing tones as stable and unstable, and the unclear operation of musical forces also early in the composition, I considered the end of the composition the best example to illustrate my observations described above – see Example 6-1.

This example starts with an arpeggiated pattern that is constructed of the three most important tones of the composition: C, D♭, and G. The Cs are amplified in these arpeggios because they start and end the descending and ascending arpeggios; the Cs are the highest and lowest pitches of the arpeggios; the top Cs are accentuated; and the top Cs are placed on strong metric beats. The last arpeggio, at the end of Segment C, does not end on a C but moves past the C with a glissando to the D♭ at the beginning of Segment D.

This long unstable D♭6 resolves downwards to the stable C6, although this resolution is weakened by the relatively short duration of the C6. At this point in the composition, the unstable D♭ is heard as a stable tone and the operation of melodic gravity and melodic magnetism – the melodic forces that govern the unstable D♭ to resolve to the stable C – is unclear. We also find an unstable D♭3 that resolves to a stable C3 at the end of the composition.[4] The resolution to the stable C sounds inapposite at first, because the C is not heard as a stable tone, nor as resolution of an unstable D♭ to a stable C that was governed by the operation of melodic gravity and melodic magnetism.



Example 6-1

Raga III *for viola solo, part II, end of segment D (end of composition)*

[4] I respelled the last C♯3 at the end of the composition as D♭3 to highlight similarities with the D♭6 discussed earlier.

The aspects highlighted above might not seem problematic when the music is only analysed on the score, but when it is analysed aurally – and specifically through the lens of musical forces – those aspects become prominent and problematic. The unclear distinction between the quality of tones as stable or unstable, and subsequently the unclear operation of melodic forces, causes difficulties for listeners to such an extent that unstable tones can be heard as stable tones and vice versa. This aspect has further implications for the structure of the composition, and the operation of rhythmic forces. These aspects stem partly from the notion of a changing stable tone, discussed in this section. I discuss these two aspects individually in the sections below – the relations between these three aspects are discussed at the end of this section.

Unclear Structure of the Composition

The structure of *Raga III* for solo viola is unclear, specifically on a meso-level and a macro-level. On a meso-level, some of the musical gestures are unclear and ambiguous: it is difficult to aurally determine where they start, how they are shaped, and how they end. These unclear and ambiguous musical gestures have further implications on how listeners will aurally divide the composition in segments that combine gestures. This can be ascribed at least partly to the unclear distinction between stable and unstable tones, described above. Musical gestures are shaped by the operation of musical forces (Larson, 2006), and the operation of musical forces is mainly shaped by a distinction of stable and unstable tones. The macro-level of the composition is also unclear: listeners cannot clearly hear how meso-level structures, such as musical gestures and segments, are grouped into larger sections. This unclear macro-level is the result of an unclear meso-level. The result of the unclear meso-level and macro-level is that listeners perceive an unclear structure throughout the composition.

Example 6-2 is an extract from *Raga III* for viola solo without electronics that shows some musical gestures (meso-level) that are difficult to hear.

The last musical gesture in the opening segment (before segment A) starts on the second bar, second beat of the example. This musical gesture ends on a natural harmonic – sounding the pitch C6 – and is immediately followed by the start of a new musical gesture and a new segment (segment A). The starts and ends of the musical gestures and segments are unclear because the Cs are not heard as stable endings and beginnings of the musical gestures and segments. However, the open string C that sounds just after the fast triplet brings this pitch class again to the foreground, somewhat decreasing the weakening.

Example 6-2

Raga III *for viola solo, part I, first segment and start of segment A*

Unclear and Ambiguous Operation of Rhythmic Forces

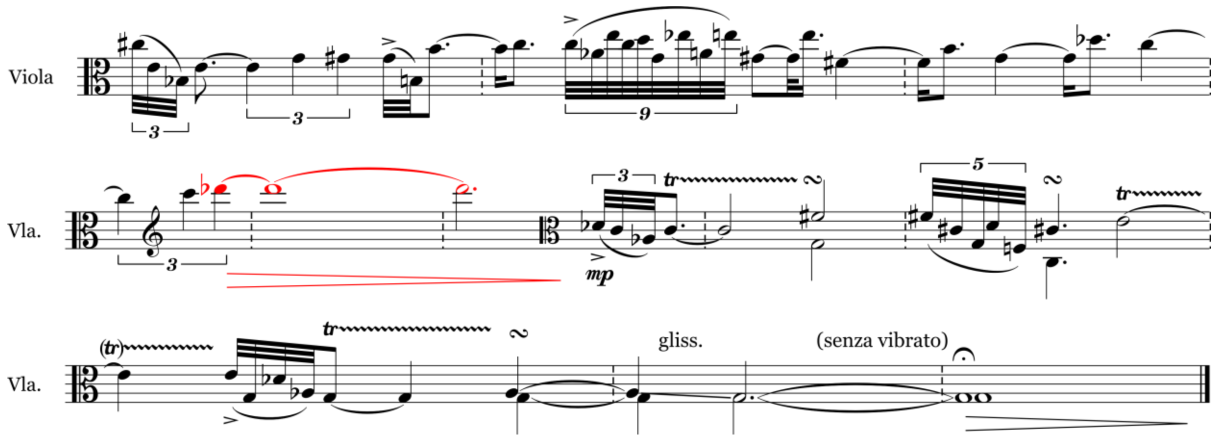
The operation of rhythmic forces in *Raga III* for viola solo without electronics is unclear and ambiguous. This lack of clarity and the ambiguity can be ascribed at least partly to three aspects of the composition.

Firstly, the unclear structure of the composition. Because the structure of the composition is unclear, listeners cannot be led by the musical gestures or segments to gain a sense of metric stability or to ascribe stable points in the music for the solo viola. Listeners would expect that the operation of melodic forces and rhythmic forces agree and in many ways elucidate aspects of the structure, but the unclear melodic forces do not enable listeners to hear how they agree or disagree with rhythmic forces.

Secondly, the significantly longer duration of some tones influences listeners' sense of metric stability. Some tones with significantly long durations hamper listeners' perception of metre, and become metrically stable. Example 6-3 below is an example of how tones with extended durations can hamper listeners' sense of metric stability.

Thirdly, Henderickx specifically wants soloists to interpret this composition with more autonomy and freedom than when performing with orchestra, without a strict differentiation between stronger and weaker beats, for example, and therefore he first made a score without bar lines, and later a score with dashed bar lines (Henderickx, 2015c). Although the material of the composition is mostly placed in groups of crochet beats and the dashed bar lines demarcate four crotchet beats per bar, the complexity of the durational and rhythmic material makes it difficult to hear the rhythmic placement of the material in terms of a metre. The free interpretation of this composition in terms of rhythmic material does not allow performers to change the durational and rhythmic content of the material to a great extent, but it is an attempt to prevent performers from placing metric emphasis on tones that should not be metrically emphasised. The notion of metric stability and instability is thus vague and this does not allow for a clear operation of rhythmic forces. However, it is of course true that a thoughtful soloist would be able to ameliorate the problematic aspects. Another factor that contributes to metric instability and an unclear operation of rhythmic forces in this version of the composition is the absence of other instruments that can help to clarify metric stability, such as the orchestral instruments that are present in the version for viola and orchestra.

In this example we find that an unstable D♭ hampers listeners' sense of metric stability: its attack is metrically unstable and we could continue to hear it as unstable, but the extended duration of that tone allows it to become metrically stable.



Example 6-3

Raga III *for viola solo, part I, final segment*

Conclusion: Summary of Problematic Aspects

In this section I highlighted the problematic aspects of *Raga III* for viola solo without electronics as individual aspects. However, these aspects are closely related when viewed through the lens of musical forces. The distinction between stable and unstable tones does not only influence the way melodic forces operate, but also has an influence on how the structure of the composition is heard, and how rhythmic forces operate in the composition. These aspects hint toward a reciprocal interaction between tonal stability, the operation of melodic forces, musical structures, metric stability, the operation of rhythmic forces, and durations of tones. I do not interpret my observations of these aspects here, because this will be done later. To clarify my discussions in the next section, I show the reciprocal relation of these aspects in Diagram 6-2 below.

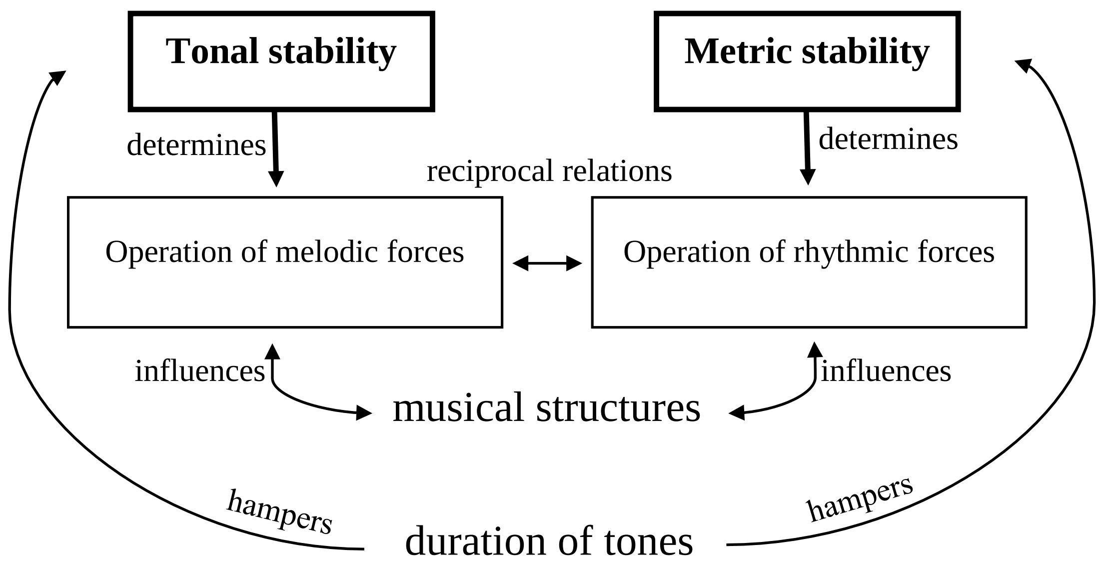


Diagram 6-2

The reciprocal relation between aspects of Raga III *for viola solo and musical forces*

These aspects – and the reciprocal relations between them – that were observed in *Raga III* for viola solo without electronics, hold other implications for trained and experienced listeners and analysts: they could hear this composition as a work in which the choices of the composer are to some extent arbitrary choices, especially if the work is not performed by a thoughtful soloist. Although *Raga III* for viola without electronics can be heard as a composition that was constructed through arbitrary choices due to the aspects discussed above, it is not the case – especially if we take in account that the original version displays a careful selection of sound patterns and compositional choices. However, the significant change in the work-persona of the composition enables us to understand why the orchestral parts – and their musical functions – were omitted. This aspect of the work-persona and the orchestra as agent is discussed later in this chapter.

In the next part of this section, I show how Wim Henderickx was aware of these problematic aspects in *Raga III* and how he addressed these aspects.

1.2 Addressing the Aspects of *Raga III* for Viola Solo without Electronics

Wim Henderickx (composer) and Leo De Neve (performer) were aware of some of the aspects that I identified in §1.1. Their understanding of these aspects is specifically related to tonal aspects of the composition. Diagram 6-2 shows how these tonal aspects of the composition are related to the other aspects identified in the section above. In this part of the section I give an overview of their thoughts on *Raga III* for viola solo without electronics and how they addressed the problematic issues.

Leo De Neve (2015) found that "the solo version without electronics (2003) is the less efficient [version] of the three, because you do not have anything 'under' the viola." De Neve (2015) refers here to tonal stability and accompaniment. Henderickx (2015b) made a more authoritative judgment: "Later on I discovered that a solo version is not enough." In order to address the problematical aspects of the composition – also observed by Henderickx and De Neve – Henderickx (2015b) had drawn on his inspiration and knowledge of Indian music, and he decided to create a drone to accompany the solo viola version (see Example 6-4 below): "I did not want to replace the orchestra, but add something to give the atmosphere of the rāga. And then I got the idea of creating a tampura-like drone with electronics. I started to collaborate with Jorrit Tamminga, and that is how the solo version turned into a version for solo viola and electronics." An electronic drone was created in order to maintain the concept of a solo instrument composition, but without requiring the cooperation of other instrumentalists.

Tamminga (2016) recalls two objectives for creating the drone: "Firstly, to create a solid ground that the viola player could stand on. Although it is not necessarily the case in this composition, a solo performer can sometimes feel lost in a sound space. But the drone helps to fill that space and create that solid ground. Secondly, he [Wim Henderickx] wanted to bring the sound and atmosphere closer to the Indian rāga where there is always a drone created by the tampura. The drone thus functions as an electronic tampura." The 'solid ground' that Tamminga (2015) mentions also relates to tonal stability and to De Neve's statement quoted above.

Henderickx (2015b) motivated his decision to create a drone during an interview. He mentioned that he had always been fascinated by drones and how they stabilise harmony, in a way contrasting with the idea of having harmonies that move and change. He felt that the version of *Raga III* for viola solo with electronics best represents the sound ideologies of the

Indian rāga because the function of the electronic drone is closely related to the function of the tampura or śruti box in Indian music.[5]

It is clear from the discussion above that, for Henderickx, the addition of a drone to *Raga III* for solo viola serves mainly two significant functions: to provide tonal stability and to create the atmosphere of an Indian rāga – as accurately summarised by Tamminga (2016). In the next section, I discuss how the drone for *Raga III* for viola solo was created, how it should be used in performances, and how the addition of the drone in *Raga III* for viola and electronics solves the problematic aspects that were observed in the version for viola without electronics.

1.3 Creating the Drone for *Raga III* for Viola Solo

Wim Henderickx collaborated with Jorrit Tamminga to create the drone for *Raga III* for viola solo and electronics (Henderickx, 2015b). Tamminga (2016) described their collaboration and planning of the drone in an interview: "Wim [Henderickx] was sitting next to me when we made the first version [of the electronics], and he suggested a drone. The first thought that came to my mind was synthetic strings, so we decided to make use of synthesizer sound which has the same behaviour as sympathetic strings. I made a comb filter, which is a harmonic resonator, and it behaves in the same fashion as a string. We were both satisfied with the sound and started to explore the sound in different registers in order to find the right register. One of the problems with a synthesizer is that it always makes a very static sound. We wanted to change that so that the sound is not static in amplitude, without getting a tremolo-effect. Then I created a formula that creates a more random wave behaviour. The drone will thus be slightly different on a micro-level as it progresses." Although the concept of a drone is simple, this

[5] In addition to this statement, Henderickx (2015) reiterated that he does not attempt to imitate Indian music but merely uses it as inspiration for his own music.

drone was not created in a simple way. The micro-changes draw the listeners' attention to the drone, and to the stability that it provides, and this imitates the micro-changes we experience when listening to a tampura player.

The drone was created with SuperCollider and is mainly based on specific pitch classes, i.e. C, D♭, and G which are the most prominent tones of the composition (Tamminga, 2016; Henderickx, 2017). Tamminga's (2016) comment on the use of these specific tones is as follows: "Wim gave me the mode of the composition and I asked him to tell me which notes are important. We started with the most important notes. The C was the most important note, not only in amplitude but also in behaviour. The other notes, such as the D♭ [and G] are also in the drone, but they are much softer in the drone and occur less frequent than the C. At times [the other tones] will become louder, but then decrease in volume again. They are there all the time. Based on the information that Wim provided me [with], I programmed the behaviour of each note." The drone of *Raga III* is a full pre-recorded track and not a short track that loops to continuously repeat the same material. Although the entire track was planned and created in broad detail, it was not created with the intention that the material of the viola should correspond in a predetermined manner with exact parts of the drone, as is convention in electronic music where a pre-recorded audio track is combined with live performance.

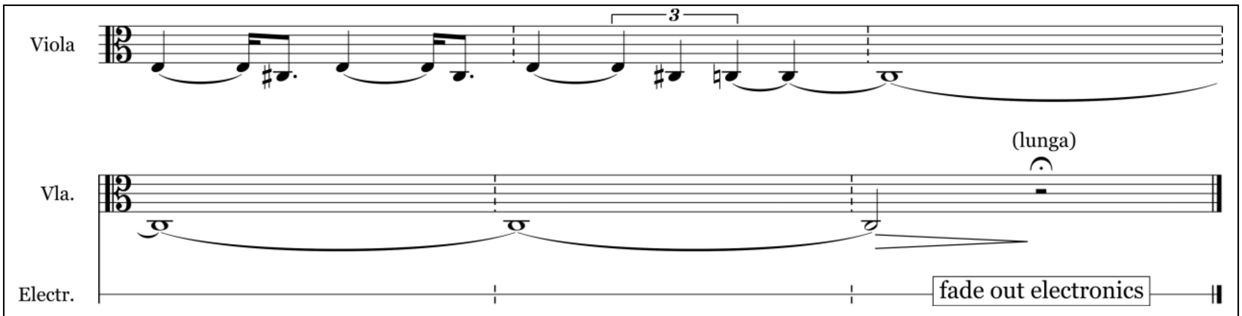
Henderickx (2015b) mentioned that *Raga III* for viola solo without electronics has been retracted from his worklist after he created the version of *Raga III* for viola solo and electronics, and he now considers the score of *Raga III* for viola solo as a "musicological document". I could also not find any information with regards to performances or recordings of *Raga III* for viola without electronics, because this version was replaced by the version for viola and electronics.

1.4 Fading of the Drone at the Start and End of the Composition

Jorrit Tamminga (2016) explained how performers should start and end the drone when they perform *Raga III* for viola solo and electronics: "We [Jorrit Tamminga and Wim Henderickx] made a long audio track of the drone so that performers can easily play the drone when they perform: you turn it on, fade it in and [start to] perform." At the end of the performance the drone should be faded out again. Because certain parts of the drone do not have to correspond with certain material of the viola part at a certain given time, the addition of the drone did not cause significant changes to the notation of the composition. The fade-in and fade-out of the electronic drone is only indicated at the beginning and end of the composition, respectively – shown in Example 6-4a and Example 6-4b.

Example 6-4a

Raga III *for viola solo and electronics, beginning of part I*



Example 6-4b

Raga III *for viola solo and electronics, end of part II*

The result of the fade-in at the beginning and end of the composition is that the continuous stability provided by the drone comes to the foreground of listeners' aural perception at the beginning of the composition before the viola starts to play, and fade out from their aural perception after the viola ended at the end of the composition.

1.5 Conclusion

Thinking about the functions of the drone through the lens of musical forces enabled me to identify a larger number of significant functions that are found on a deeper conceptual level. The lens of musical forces and my analyses are thus valuable tools to inquire further into the functions of a drone. In the next section that follows I discuss topics of further inquiry that were led by the operation of musical forces in the presence of a drone.

2. Implications of the Drone on Larson's Theory of Musical Forces

Identifying the aspects in *Raga III* for viola solo without electronics in §1, and the addition of a drone by Henderickx to resolve these aspects, enabled me to compare analyses of the version of *Raga III* for viola solo without electronics with the version for viola solo with electronics. In this section I employ observations of *Raga III* for viola solo as starting point for discussions of broader concepts, and I discuss how these concepts can be applied to *Raga I* for percussion solo. When these concepts are applied to *Raga I* for solo percussion, new concepts come to the foreground and these concepts are then discussed further. This enables me to deepen my observations and explain how those concepts influence the operation of musical forces. I structure my discussions of this section according to the following topics that were prominent in §1 above: the functions of the drone in *Raga III* (see §2.1); the operation of musical forces with a drone (see §2.2); fading sounds and the operation of musical forces (see §2.3); the collaboration of melodic forces and rhythmic forces (see §2.4); rhythmic forces in *Raga I* (see §2.5); and structure and segmentation and (see §2.6).

2.1 The Functions of the Drone in *Raga I*: an Overview

In this section I focus on the functions of the drone in *Raga III* and how it resolves the problematic aspects that I identified in §1.1. I structure this section to be in line with the three problematic aspects, discussed above, and I discuss these, and other, aspects in the sections that follow.

Raga III for Viola Solo and Electronics

Although the objectives for the addition of the drone to *Raga III* for solo viola and electronics were to create tonal stability and create an atmosphere that is closely related to the Indian rāga (Henderickx, 2015b; Tamminga, 2016), the drone also resolved the problematic aspects of the version for viola without electronics as follows:

- Changing stable tones. The drone provides a stable tonal platform for the composition. The stable C is the most prominent tone of the drone, and it is also intended to be the most stable tone of the viola material in the composition. Because the C of the drone continues to sound saliently throughout the composition, it serves as a constant 'reminder' of the C as the most stable tone. This sustained C prevents listeners from hearing the stable tone as constantly changing, and it helps listeners to be able to perceive the quality of tones as stable or unstable better because tones are constantly heard in concurrence with the stable C in the drone. The concurrence of unstable tones in the viola part causes friction with the drone, and this friction will cause listeners to hear these unstable tones as tones with a strong tendency to resolve to other, more stable tones that cause less friction with the drone. In this way it is clear throughout the composition which tones are stable tones and which tones are unstable tones. This causes the operation of melodic forces to be clear, because listeners can hear the tendencies and resolutions of unstable tones – governed by the operation of melodic gravity, melodic magnetism, and musical inertia – more clearly.
- The drone helps listeners to hear the structure of the composition better. The meso-level and macro-level structures of *Raga III* for viola solo and electronics become clearer, because listeners can hear how musical gestures are shaped in the larger structures (segments) of the composition through clear operations of melodic forces. The elucidation of structures in the presence of a drone is discussed further in §2.6.

- Although metric stability does not become clearer with the addition of the drone that does not provide a sense of metre, the operation of rhythmic forces is clearer because it is supported by the operation of melodic forces. Listeners' perception of tones as stable or unstable can also not be hampered easily – it rather becomes amplified –when the duration of tones is extended. This is because the continuous friction between an unstable tone, for example, and the stable tone(s) of the drone will enable listeners to clearly hear the unstable tone as causing friction with the stable tone in the drone, until it resolves to a stable tone. The operation of rhythmic forces is discussed further in §2.4.

The addition of a drone to *Raga III* proved to be a better-than-expected solution for solving the problematic aspects of *Raga III* for viola solo without electronics. A rather simple element of texture proves to serve a surprisingly large number of important structural functions. The relations of the ways in which the drone solves the problematic aspects are summarised in Diagram 6-3 below.

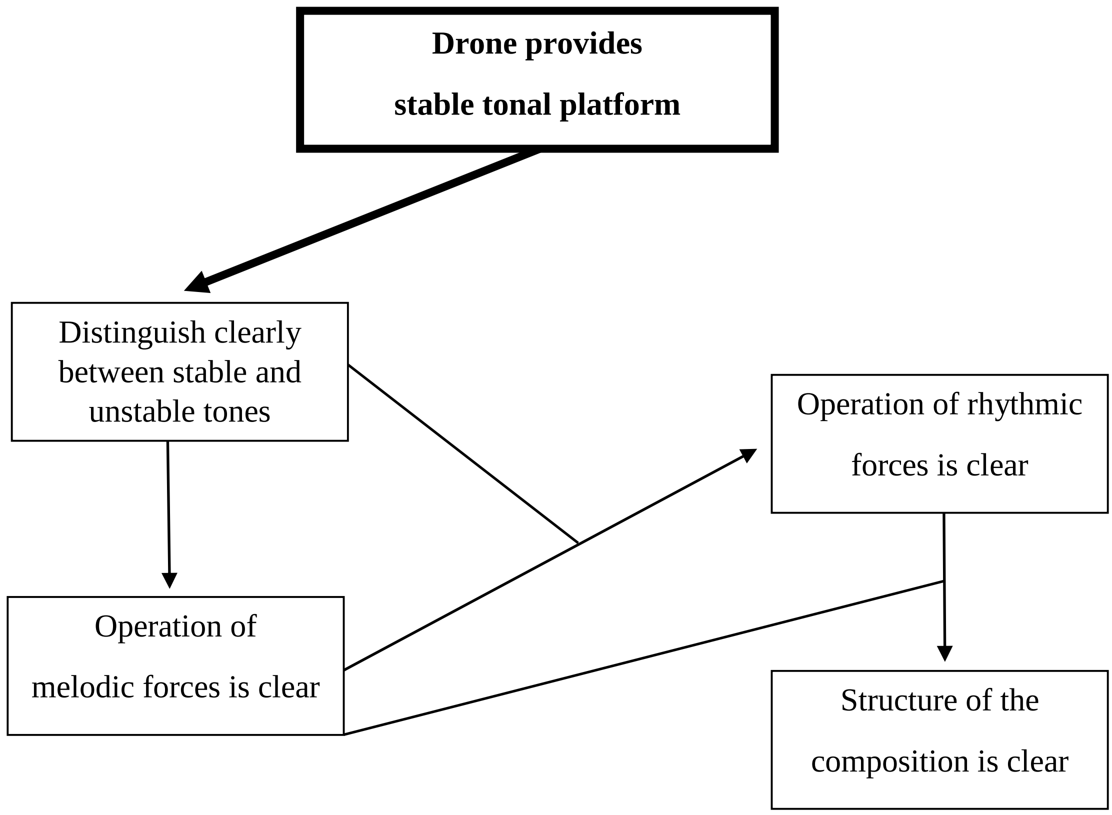


Diagram 6-3

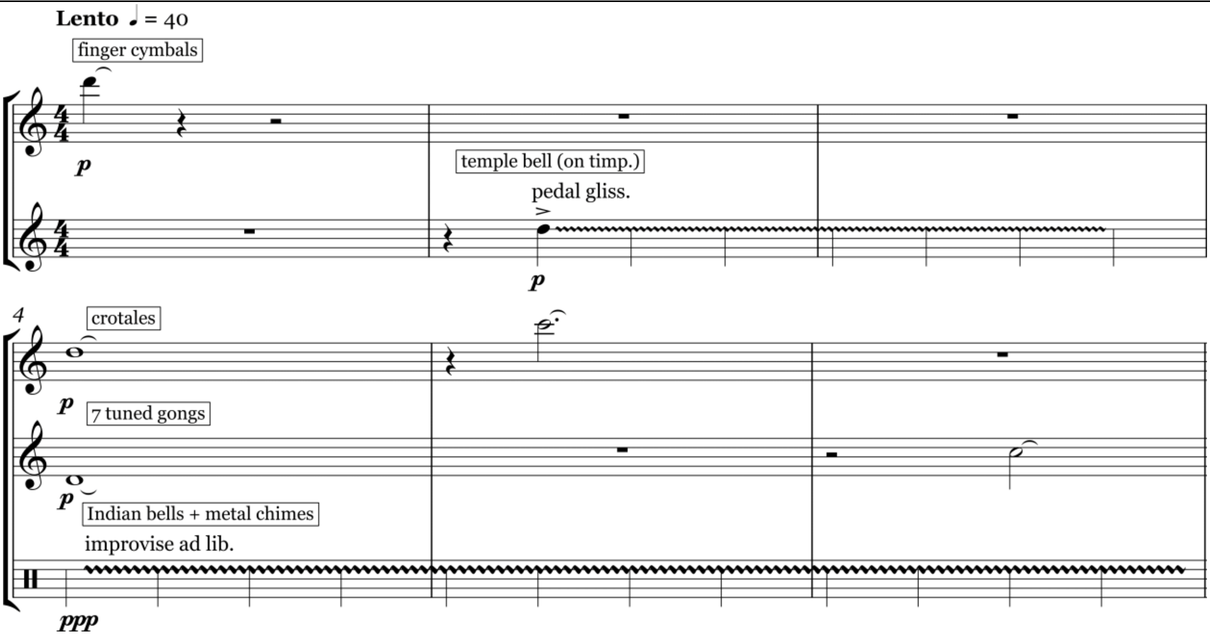
Significant functions of the drone in Raga III *for viola solo and electronics*

Although the addition of a drone to *Raga III* for viola solo was an effective compositional decision that resolved the problematic aspects of the version without electronics, the addition of a drone to compositions in which problematic aspects surface will, of course, not be a universal solution to all problems in all compositions. A drone that provides a tonal platform will also not have a significantly different effect on how rhythmic forces operate in music for unpitched percussion instruments. *Raga I* for percussion solo is an example of such a composition where the addition of a drone will not have a significant effect on the operation of rhythmic forces. I discuss this topic further in the paragraphs below.

Raga I for Percussion Solo

From the interviews with Wim Henderickx (2015b) and Gert François (2015), it was clear that *Raga I* for percussion solo is considered a composition in its own right, and – unlike in the case of the solo version of *Raga III* – no particular problematic aspects were identified. Henderickx (2015b) compared the three versions of *Raga I* as follows: "[T]he version for percussion and two pianos (1994) is like chamber music, the version for percussion and orchestra (1996) is really a concerto, and the version for percussion solo (1996) is a solo piece." A similar compositional approach was followed to compose *Raga I* for percussion solo and *Raga III* for viola solo: both are solo versions created from versions for soloist and orchestra in which the material for the solo version is derived mainly from the soloist's part in the other versions. We can therefore ask: why is the version of *Raga I* for percussion solo considered as a substantial composition without problematic aspects, and *Raga III* for viola solo not? This question becomes even more thought-provoking when we take into consideration that *Raga I* for solo percussion is mostly for unpitched percussion instruments, whereas *Raga III* for viola solo is for an instrument that can produce different pitches and rhythms. I discuss this question below in terms of the aspects that I identified in *Raga III* for viola solo, i.e. tonal stability and the operation of melodic forces, the structure of the composition, and the operation of rhythmic forces.

My discussion of these aspects is only applicable to the first part, and to m. 1-11 of the second part, of *Raga I* for percussion solo: the remainder of the second part (mm. 12-145) are for unpitched percussion instruments. The melodic material of the parts for pitched percussion instruments is different from the melodic material of *Raga III* for viola solo: the melodic material is not as complicated[6] and the D features clearly as the most stable tone. This is partly because it is the first tone of the tone series on which this composition is based. The beginning of each segment that contains pitched material in *Raga I* for percussion solo is shown in Example 6-5.



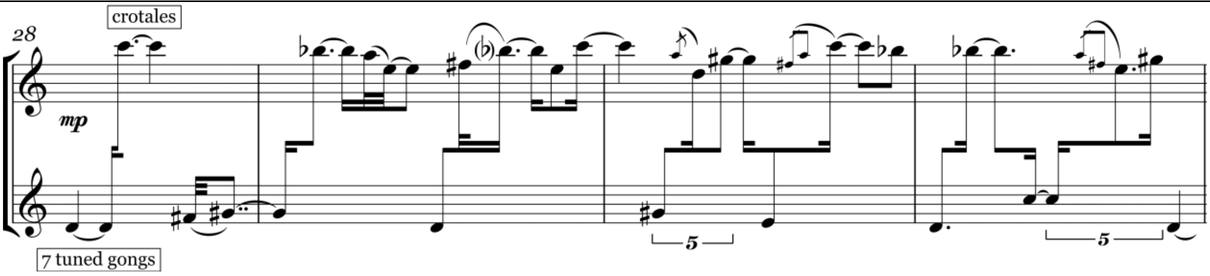
Example 6-5a

Raga I *for percussion solo, part I, mm. 1-6*

Example 6-5b

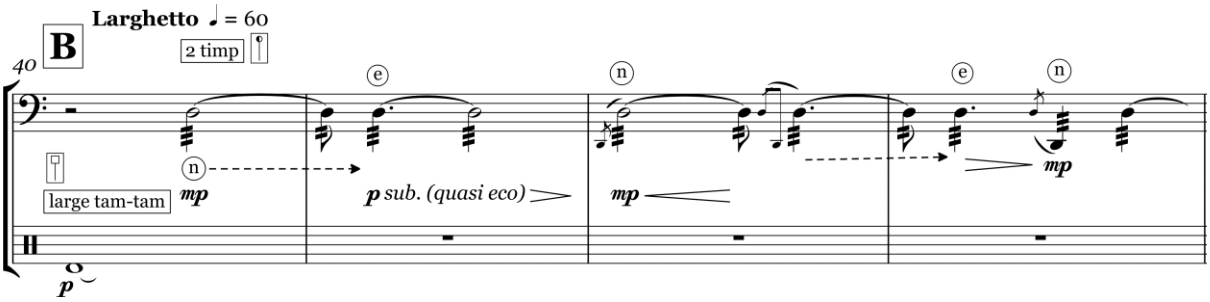
Raga I *for percussion solo, part I, mm. 16-20*

[6] The melodic material is not considered to be complicated because it is based on a pitch class series that start on D and only one tone is produced at a time – there are no dyads like in *Raga III* for solo viola to create complexity.



Example 6-5c

Raga I *for percussion solo, part I, mm. 28-31*

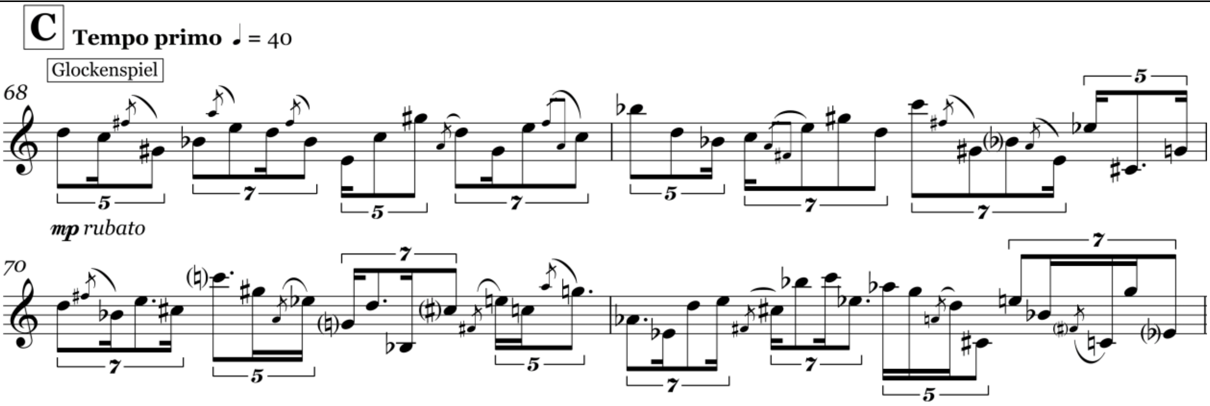


Example 6-5d

Raga I *for percussion solo, part I, mm. 40-43*

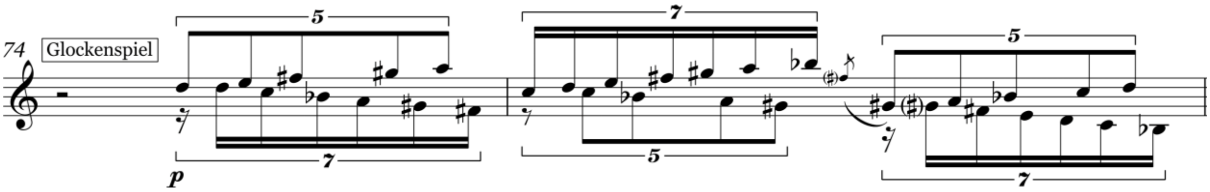
Example 6-5e

Raga I *for percussion solo, part I, mm. 54-58*



Example 6-5f

Raga I *for percussion solo, part I, mm. 68-71*



Example 6-5g

Raga I *for percussion solo, part I, mm. 74-75*

Example 6-5h

Raga I *for percussion solo, part II, mm. 1-3*

These examples show that the D is clearly established as the most stable tone in the melodic parts. This is due to its placement, accent, recurrence, and use as a pedal tone. The operation of melodic forces is thus clear in these segments. The addition of a drone is therefore not necessary. Should a drone be added in spite of the suggestion that it is not necessary, we will encounter two noteworthy problems:

- The largest part of the composition is for unpitched percussion instruments, and the addition of a pitched drone will not play a significant role in how listeners hear the operation of rhythmic forces in unpitched percussion instruments.
- The tone colours of the different instruments that are used – i.e. finger cymbal, Indian bells, metal chimes, tamtam, and bass drum – might conflict with the tone colour of the drone because of the complex harmonic spectra of the unpitched percussion instruments.

Conclusion

As mentioned above, the addition of a drone will not be an instant solution to a vast array of problematic aspects that composers experience, but it can be a helpful tool for composers with valuable advantages for listeners. When viewed through the lens of musical forces, the addition of a drone is an effective way to amplify the operation of musical gravity and musical magnetism because the operation of these forces becomes clearer in the presence of a drone. A drone should also rather be combined with a limited number of pitched instruments with similar tone colours, than with unpitched instruments or ensembles that consist of instruments with different tone colours.

A drone can be employed in compositions for a solo instrument with problematic aspects – similar to those of *Raga III* – unless

- the composer deliberately wants to maintain a lack of clarity in terms of melodic forces, rhythmic forces, and structure for conceptual reasons;
- the composition modulates to a key that is not complemented by the tone that is sustained in the drone; or
- stable tones, and subsequently the operation of musical forces, are not prominent aspects in the composition and should remain unclear.

2.2 The Operation of Musical Forces in the Presence of a Drone

In this section I specifically discuss aspects of drones, stability, and the operation of melodic gravity and melodic magnetism. I start with a short overview of literature, followed by a discussion on how musical forces operate in the presence of a drone.

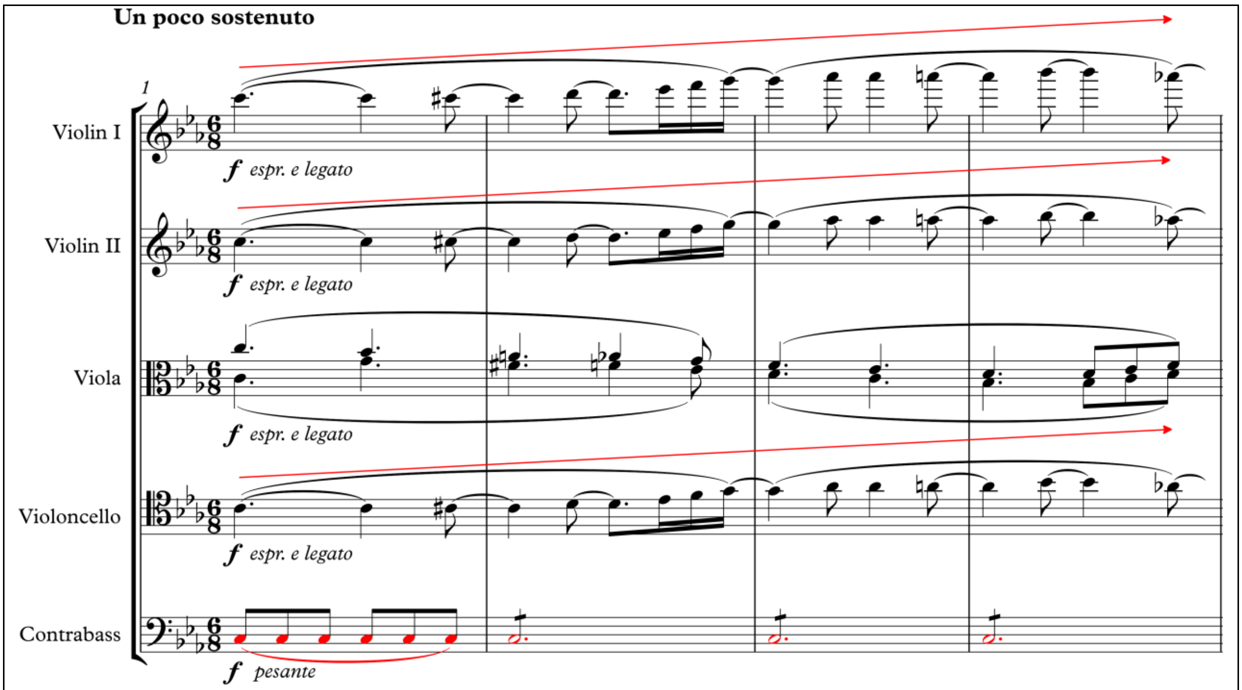
Listeners' Sense of Stability: Literature

Without a drone, listeners can lose their sense of stability. Cook (1994:73-75) conducted research in terms of tonal closure in order to determine whether listeners can maintain their sense of stability from the beginning to the end of a composition. Cook (1994:75) writes that "the tests indicate that tonal closure only has a direct effect on listeners (even musically trained listeners) when the time scale involved is well under a minute." But with a drone there is no such restriction on time scale because of the temporal duration of the drone, which is a 'constant reminder' of the most stable tone throughout the entire composition. This ensures that listeners can clearly hear stability, instability, and the operation of melodic forces – or tonal closure in Cook's terms – throughout a composition.

Pedal Points and the Operation of Musical Forces: Literature

There is no literature available on the interaction of musical forces when a drone is present, but Hatten (2012b) writes about pedal points in his expansion of Larson's theory of musical forces. The pedal point in Hatten's example is discussed as an isolated instance of only a few bars of a composition: the string section from the opening (mm. 1-4) of Brahms's First Symphony in C minor, Opus 68 (see Example 6-6). In this example the pedal point in the contrabasses consists of repeated quaver tones that are reiterated at the same time in which the material in the other members of the string section unfolds. The concept of a pedal point and a drone is different in terms of their temporal duration: a pedal point is often heard for a short duration and it can change or transform into melodic material; a pedal point is not as persistent as a drone, which usually lasts for the entire composition[7]. However, the functions of a pedal point are similar to a drone on a single tone: to provide a platform that influences the motion of the material it is combined with. Therefore, I believe that writings about pedal points – including those of Hatten (2012b) – can also be applied to drones.

[7] On some instruments – such as the bagpipes and the hulusi – a drone (pipe) can be activated or deactivated on the instrument, but it is more conventional to play with an activated drone throughout. Activating a drone on an instrument can also be compared with sympathetic strings of other instruments. This is discussed in Chapter 5.



Example 6-6

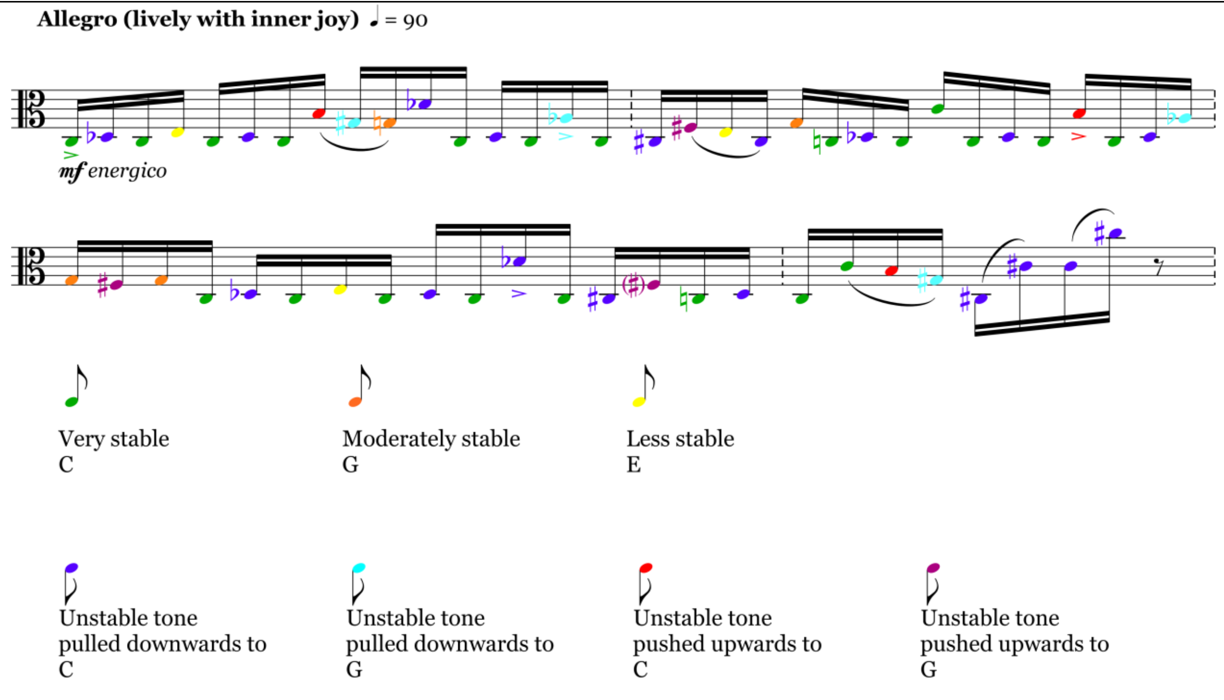
Mm. 1-4 of the string section from Brahms's First Symphony in C minor, Opus 68 (Hatten, 2012b)

The Operation of Musical Forces with a Drone in Raga III *for Viola Solo and Electronics*

Hatten (2012b) states that a pedal point, and in terms of my argument here similarly a drone[8], has its own 'pull' and that tones – such as the tones of the first violins, second violins, and violoncellos in the example above – can "struggle to free themselves" from the pull of the stable platform because friction exists between those (unstable) tones and the stable drone. Friction between tones and drones is at a minimum when those tones are of the same pitch class as the drone or create consonant intervals (stable tones) with the drone – see my discussion of vertical and horizontal dimensions in the operation of musical forces in Chapter 2, §5.5. Dissonant intervals cause friction between the tones and the drone – they are thus heard as tones that are pushed or pulled by the drone in order to reduce friction. When unstable tones, which cause

[8] For the purposes of my discussions here, the terms 'pedal point' and 'drone' can be used interchangeably. For the remainder of this section I will use the term 'drones', and that includes pedal points.

friction with the drone, are pushed by the drone, we can ascribe that push to the operation of magnetic repel, and when unstable tones are pulled by the drone we can ascribe that pull to the operation of melodic magnetism and/or melodic gravity. I provide an example of the interaction between tones and the drone of *Raga III* in Example 6-7 below.



Example 6-7

Interaction between tones and the drone in Raga III, *part II, first segment*

Conclusion

The addition of an electronic drone to *Raga III* for solo viola does not only add that 'something under the viola' that De Neve (2015) mentioned, but also plays an important role in how listeners hear the stability of tones, and how melodic gravity and melodic magnetism operate in the composition. Due to the addition of the drone to *Raga III* for viola solo, listeners can clearly hear the difference between stable tones (no friction with drone) and unstable tones (friction with drone). Listeners can hear unstable tones as being pushed upwards or being pulled downwards to the stable platform provided by the drone. These metaphors of push and pull are what define the musical force that operates on those unstable tones: unstable tones that are pushed upwards are governed by melodic magnetism – by either attraction, repulsion, or both – and unstable tones that are pulled downwards are governed by melodic gravity, and melodic magnetism to a certain degree.

2.3 Fading of the Drone in *Raga III* for Viola Solo and Electronics

My discussion about fading in this section is mainly in terms of the drone in *Raga III*, but it is not limited to drones only: it also includes other musical events that are faded in or faded out.

Fading the Drone in Raga III *for Viola Solo and Electronics*

The instructions for the drone in *Raga III* for viola solo and electronics indicate that the drone should be faded in at the beginning and faded out at the end (Tamminga, 2016).[9] Because the drone consists mainly of a single sustained tone, it is not heard as changing material that consists of stable and unstable tones. Listeners thus hear the drone – which is the first musical event they hear – as stable. When the drone is faded out, listeners retain their sense of stability, but the stable platform created by the drone fades away from their perception. When the drone fades out after approximately 13 minutes, listeners hear this event as concluding the composition.

[9] Also see Example 6-4.

Fading and Listeners' Sense of Stability and Finality

When music – here I expand my discussions beyond drones – is faded in, listeners are aurally challenged to determine the degree of stability of the music. It might be slightly more difficult for listeners to determine stability when music is faded in than when listening to the music from the beginning, because they can compare the tonal processes better. This is because listeners might hear fade-ins of complete music textures, and not drones, as material with an unclear stability. I am vague in my statement here, because there are many factors – such as the tonal structure of the music and the point in the music where the fade-in is performed – that can influence the way in which listeners hear the music and determine stability. In whichever manner listeners determine or perceive stability after a fade-in, this sense of stability/instability influences the way in which they hear the operation of musical forces. Fade-outs, on the other hand, end music in which listeners possibly already determined the stability and operation of musical forces. However, they will not necessarily be able to hear how the tendencies created by the operation of musical forces are resolved when that material is faded out.

When fade-outs are discussed, a central point of discussion is listeners' sense of completion when the fade-out takes place: do listeners experience a sense of finality or incompleteness when music is faded out? When a fade-out is performed on unstable material were musical forces are still operating, we retain a sense of instability – and incompleteness – even though the material faded from their perception. When a fade-out is performed on stable material where no musical forces are operating, we experience finality and a fade of stable tones from our perception. In both instances – a fade-out on stable material and a fade-out on unstable material – listeners will hear the material that is faded out as a concluding, similar to the end of a segment, but they will retain their sense of stability/instability or finality/incompleteness of the material. A fade-out can thus be employed as a way to create a sense of conclusion among listeners, even on unstable material.

In terms of musical forces, fade-outs can agree and disagree with the operation of musical forces. When a fade-out is performed on stable material, the fade-out supports the operation of musical forces because the operation of musical forces on unstable tones was resolved when the stable tones were reached. In such an instance the stable tones disappear from listeners' perception without perceiving further tension. When a fade-out is performed on unstable material, the fade-out disagrees with the operation of musical forces because the operation of musical forces on unstable tones creates tendencies to resolve. But these tendencies are not resolved and listeners do not reach a point of stability. However, listeners reach a point of conclusion due to the material that fades out and fade from their perception.

Conclusion

A fade-in can be employed in order to slowly introduce stability, or create initial ambiguity with regards to stability. Fading-out can be employed to agree and support or disagree and counteract the operation of musical forces, and still achieve a sense of conclusion among listeners.

2.4 Collaboration of Melodic Forces and Rhythmic Forces in *Raga III*

In my discussions of observations in §2.1 – where I compare *Raga III* for viola solo with *Raga III* for viola solo and electronics – I identified two noteworthy aspects with regard to melodic forces and rhythmic forces:

- Listeners' sense of tonal and metric stability and/or instability and the operation of musical forces can be hampered or amplified when the duration of tones is changed significantly – discussed in §2.4.1.
- There is a reciprocal relation between the operation of melodic forces and the operation of rhythmic forces – discussed in §2.4.2.

2.4.1 Hampering and amplifying Tonal and Metric Stability

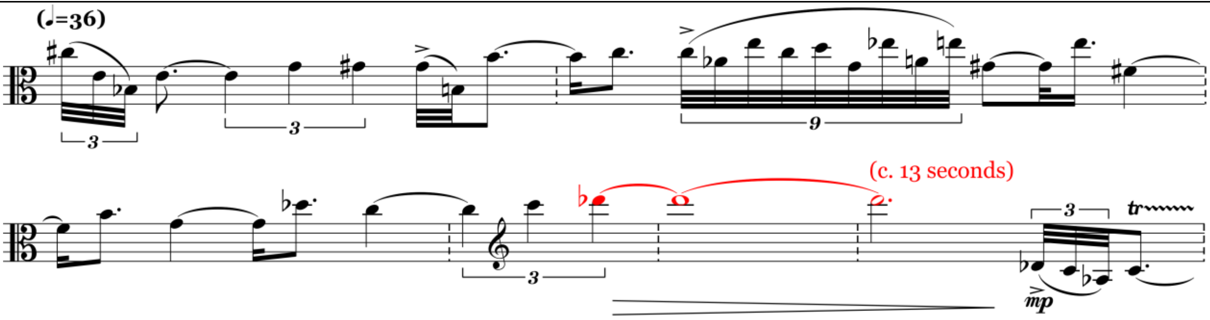
Extended Durations

I briefly indicated in the first section of this chapter that stable tones can be heard as unstable, and unstable tones can be heard as stable. This notion was observed in *Raga III* for viola without electronics: unstable tones of long durations became stable because the long durations hamper listeners' sense of stability/instability. When the duration of an unstable tone is extended significantly[10], both tonal and metric stability or instability can be hampered, and that tone can become tonally and metrically stable to listeners. There are four instances of this phenomenon in *Raga III* for viola solo without electronics. These instances are found in

- part I, segment B (middle) – shown in Example 6-8;
- part I, segment B (end) – shown in Example 6-9;
- part II, segment D (beginning) – shown in Example 6-10; and
- part II, segment D (end) – shown in Example 6-11.

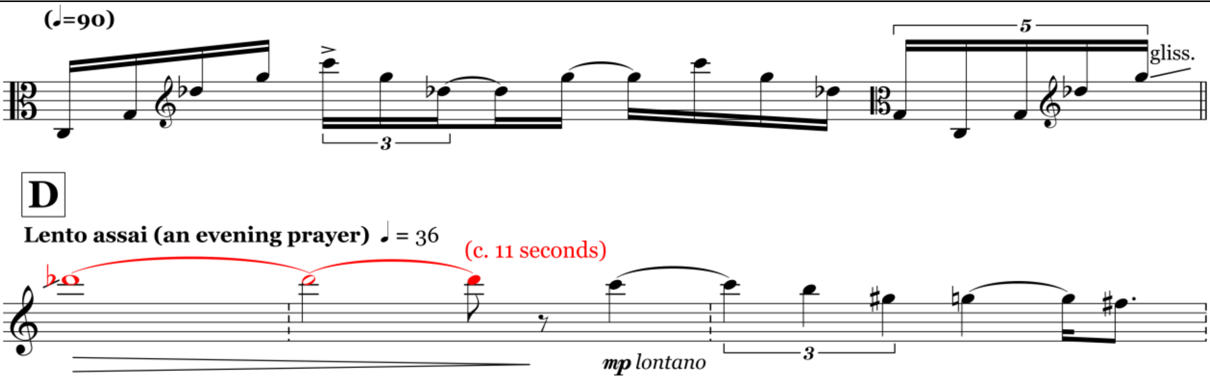
[10] In this section I use the term 'significantly' in a broad sense and I consider durations of tones as significant when they are notably longer than the duration of other tones in the same musical segment.

In each example I show the approximate durations of the extended tone in seconds. The calculations of these tones are based on the metronome marks and the note values on the score. In two of these instances we find unstable tones (D♭s) that are tonally and metrically unstable, but they become tonally and metrically stable – see part I, segment B (middle) in Example 6-8 and part I, segment D (beginning) in Example 6-9. The instance shown in part II, segment B (end) in Example 6-10 is a moderately stable tone (G) that has the tendency to resolve further to the most stable tone (C), but the G becomes a tonally stable tone when its duration is extended significantly. The instance shown in Example 6-11 is a metrically unstable and tonally stable tone which is, at first, not heard as a stable tone but later becomes stable when its duration is extended. For clarification, I reiterate that I refer here to observations from *Raga III* for viola solo without electronics.



Example 6-8

Raga III *for viola solo, part I, middle of segment B*

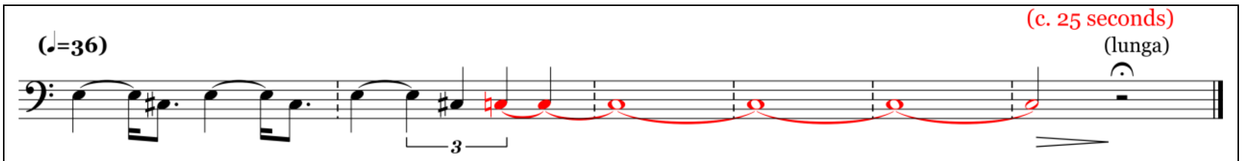


Example 6-9

Raga III *for viola solo, part II, beginning of segment D*

Example 6-10

Raga III *for viola solo, part I, end of segment B*



Example 6-11

Raga III *for viola solo, part II, end of segment D (end of composition)*

My argument above – that listeners' perception of instability can be hampered – can be validated by work on the perceptual present of listeners, which is argued to be 3-5 seconds (Snyder, 2000:5) or 5-6 seconds (London, 2006:128).[11] I employ work on the perceptual present here because I already indicated that listeners experience challenges with regard to tonal memory – see §2.2.[12]

[11] Similar findings were recorded by James (1950), Michon (1978), and Fraisse (1984).
[12] The concept of the perceptual present should not be confused with the concept of tonal memory.

With these challenges of tonal memory in mind, listeners' perception of metric and tonal stability and/or instability is further challenged from a perspective that includes the notion of the perceptual present: an extended duration of a tone can cause that tone to be heard as a stable tone when it moves out of the limits of a perceptually present time interval. A longer duration has the result that listeners find it difficult to contextually compare tones and distinguish stable tones from unstable tones. The four instances in *Raga III* for viola solo where listeners' sense of unstable tones is hampered, and they hear these unstable tones as stable tones, are all longer than the perceptual present interval of Synder (3-5 seconds) or London (5-6 seconds): part I, segment B (middle) is c. 13 seconds; part I, segment B (end) is c. 15 seconds; part II, segment D (beginning) is c. 11 seconds; and part II, segment D (end) is c. 25 seconds. When a drone is present, the consonance or dissonance that the unstable tone forms with the stable drone influences listeners' perception of stability or instability to such an extent that they can hear the opposite of what is described above: extended tones can be employed to amplify listeners' perception of tones as stable or unstable. In such a case, listeners determine stability or instability inherently (or vertically) and they are thus not challenged to remember surrounding tones. Listeners' perception of stability can thus be amplified when a tone of an extended duration forms a consonant interval with the drone, and their sense of instability can be amplified when a tone of an extended duration forms a dissonant interval with the drone. This does not mean that consonance is stability or dissonance is instability – I discuss their relationships in more detail in Chapter 2, §5.4 – but these concepts influence listeners' perception greatly.

Shortened Duration

Just as a significant extension of duration can inhibit listeners' perception of instability, significantly short durations can hamper the perception of stability. An instance of significantly short durations in a musical gesture is illustrated in Example 6-12. This example is similar to the example used by Hatten (2012b) to describe the 'splat' impact of a descending musical gesture. Although the outer tones of the musical gesture in this example are salient tones and the operation of musical inertia – that governs the continuous descent of the musical gesture in the same direction – is clear, it is difficult to hear the discrete pitches of the descent as well as the discrete operation (tendencies and resolutions) of melodic gravity and melodic magnetism due to the short durations of the tones.[13] It will thus be difficult for listeners to determine whether the last tone of the descent is a stable or unstable ending and whether it gave in to the operation of musical forces or not. This is because the short durations did not allow listeners to determine stability, instability, and how musical forces operated. Listeners will experience the same difficulty when they listen to a musical gesture, such as the one shown in Example 6-13, where both the outer tones are stable.

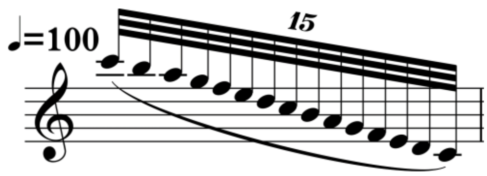
When a tone with a longer duration is added at the end of the musical gesture of Example 6-12, listeners hear the musical gesture as ending tonally stable (Example 6-14). When they hear the musical gesture as ending tonally stable, the stability at the end can be partly ascribed to the significantly extended duration of the last tone, and not necessarily its quality as a contextually stable tone. In order to investigate the notion of shortened durations of tones, I altered the Fs and Cs (Example 6-14) in the descent to F♯s and C♯s. Listeners are misled when they hear the end of such a musical gesture – shown in Example 6-15 – as tonally stable. In

[13] Not to be confused with a glissando. See Chapter 4, §2 for a discussion of glissandi.

this example the pitch of the extended tone at the end of the musical gesture is tonally inapposite, but it is also influenced by listeners' perception duration. Thus, the short durations of tones in the descent make it difficult for listeners to clearly distinguish the interval of one tone to the next, and therefore they rely on the tone with the longer duration and not on the short tones to determine what is stable and what is unstable.[14]

Example 6-12

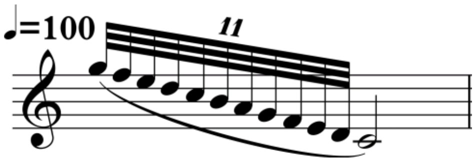
Fast descending scalar musical gesture



Example 6-13

Fast descending scale in two octaves

[14] Note that this is more prominent when aural analyses are performed.



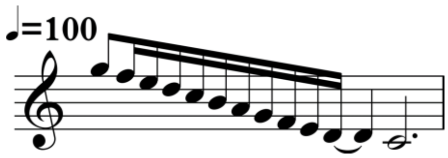
Example 6-14

Fast descending scalar musical gesture 1

Example 6-15

Fast descending scalar musical gesture 2

I critically explored my observations further in order to validate my argument. When the durational values of the musical gesture of Example 6-14 are altered by extending them, shown in Example 6-16, the discrete tones and intervals between tones can be heard clearly, as well as the operation of melodic forces in the musical gesture. Similarly to the musical gesture in Example 6-14, the final C in Example 6-16 will be heard as tonally stable. When the durational values of the musical gesture in Example 6-15 is altered in a similar way as in Example 6-16, shown in Example 6-17, the discrete tones and intervals between tones can also be heard clearly, as well as the operation of melodic forces in the musical gesture. The difference between the musical gesture in Example 6-16 and the musical gesture in Example 6-17 is that the tendencies of tones in Example 6-16, created by the operation of melodic forces, correspond with what listeners will expect. The tendencies of tones in Example 6-17 do not correspond with what listeners expect, because the operation of musical forces in that context is counteracted by the altered tones and, as a result, the final C is heard as tonally unstable.



Example 6-16

Descending scalar musical gesture

Example 6-17

Altered descending scalar musical gesture

The ways in which listeners hear stability and the operation of musical forces differently, ways that we can understand when Example 6-15 is compared with Example 6-17, can primarily be ascribed to the duration of the tones of the descending musical gesture. In Example 6-15, the durations of the descending tones are too short for those tones to be comprehended by listeners in terms of musical forces, but the longer durations of the descending tones in Example 6-17 enable listeners to comprehend those tones clearer in terms of musical forces.

It is not my aim to quantify or determine temporal durations for the interactions of durational values and melodic forces, but to show how the durational values of tones – and subsequently the operation of rhythmic forces – influence the operation of melodic forces. The relationships between duration, rhythmic forces, and melodic forces point toward a reciprocal relation between melodic forces and rhythmic forces that will be discussed in the section below.

2.4.2 Reciprocal Relation between Melodic Forces and Rhythmic Forces

Cognitive researchers Serafine, Glassman, and Overbeeke (1989:405) write that "metric accent is a major determiner of the structural importance given to tones". This suggests a reciprocal relation between rhythm and tonality, related to my arguments above. Although my initial discussions above might have given the impression that I only make a link between duration of segments and the operation of musical forces – which is partly what I do – the notion of duration extends further to rhythm, because rhythm is constructed of durations. Accentuation is also an aspect of the metric-rhythmic construct. In this section I discuss rhythmic forces and their reciprocal relation with melodic forces. Before I discuss this reciprocal relation between melodic and rhythmic forces, I summarise some of Larson's ideas on rhythmic forces, discussed in more detail in Chapter 2, §11.

Larson's Writings on Melodic Forces and Rhythmic Forces: A Summary of Literature

Larson introduced, developed, and presented his theory of musical forces in all his publications prior to the publication of his book, *Musical Forces* in 2012, without including rhythmic forces at all. When he includes rhythmic forces in his theory of musical forces (Larson, 2012), he discussed melodic forces (*Musical Forces,* Chapter 4) separately from rhythmic forces (*Musical Forces,* Chapter 6), but he did not discuss these reciprocal relations clearly. This might explain why Larson (2012) started to use the terms 'melodic forces' and 'rhythmic forces', and moved away from the term 'musical forces'. I believe that when the reciprocal relation between melodic and rhythmic forces is clearly contextualised, a return to the term 'musical forces' can be justified.

Larson's focus on melodic forces and his omission of rhythmic forces in his analyses can be partly justified:

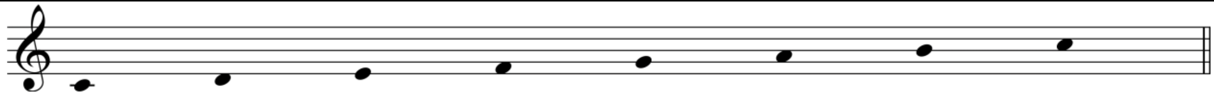
- The rhythmic material of the examples he analyses is not complex and does not influence the operation of melodic forces significantly or in intricate ways that needs to be explained.
- I believe that Larson's aim was in fact to introduce rhythmic forces to his theory of musical forces. It is likely that detailed discussions of how melodic forces and rhythmic forces relate would have been related to quantitative data – similar to the quantitative data of melodic forces – which was probably part of Larson's thwarted plans.

Larson's work on rhythmic forces draws attention to important aspects that he neglects. Three of these aspects are stated in the following questions.

- Do melodic forces influence listeners' sense of stability or instability more than rhythmic forces, or vice versa?
- Should discussions of melodic forces and rhythmic forces remain two separate discussions, or can they be discussed concurrently?
- How do rhythmic forces operate in material for unpitched percussion instruments?

The Reciprocal Relation between Rhythmic Forces and Melodic Forces in Analyses

I start my discussion on the reciprocal relation between melodic and rhythmic forces with the example of a scale with and without durations. If we look at the scalar passage, shown in Example 6-18, which consists of pitch material only, it is clear that it ends on a stable tone. However, when certain durational values are added, the metric placement and duration of the last stable C is unstable and short. Thus, some listeners can describe it as unstable – see Example 6-19.



Example 6-18

C major scale without durations

Example 6-19

C major scale with durations

Similarly to Larson's (2012) examples, the musical gestures shown in Example 6-16 and Example 6-17 above are examples in which the operation of melodic forces can be discussed without a discussion of the operation of rhythmic forces, because a discussion of rhythmic forces will not contribute to a better understanding of how melodic forces operate in these examples. This is because the durations of tones are longer than in the previous examples and the tones follow each other slower in Example 6-16 and Example 6-17 – this allows listeners to hear the individual tones more clearly, instead of using the first and last tones as reference points.

In musical gestures, such as those in Example 6-13 and Example 6-15 on the other hand, it is vital to incorporate the operation of rhythmic forces when the operation of melodic forces is discussed. In these cases the operation of melodic forces can be understood only when the operation of rhythmic forces is also discussed. Without a discussion of how rhythmic forces influence the operation of melodic forces in Example 6-14 and Example 6-15, a discussion of how melodic forces – which include[15] the duration of tones – operate in these examples will be inadequate.

[15] Melodic forces include rhythmic forces, but rhythmic forces do not include melodic forces.

It is important for analysts to take into account the reciprocal relation between melodic forces and rhythmic forces, and to determine whether the music they analyse in terms of musical forces can be discussed adequately in terms of only melodic forces, only in terms of rhythmic forces, or whether both melodic forces and rhythmic forces should be included for an adequate discussion.

These examples presented above show that melodic forces and rhythmic forces should be discussed concurrently when necessary in order to make their reciprocal relation clear. In the sections that follow, I use the terms 'metrically stable', 'metrically unstable', 'tonally stable', and 'tonally unstable'. In cases where both the melodic and rhythmic forces agree, I use the terms 'stable' and 'unstable'. In cases where rhythmic and melodic forces disagree, I will also use the terms 'stable' and 'unstable' to describe what is heard – see further discussions of terminology to describe stability in §2.5 below.

Conclusion

My discussion above of the reciprocal relation between melodic forces and rhythmic forces is an addition to the theory and a first step to reinstate the concept and the use of the term 'musical forces', rather than working with 'melodic forces' and 'rhythmic forces' separately. This was a shortcoming that needed to be addressed, and in this way I can constructively contribute to the theory of musical forces to include aspects of how listeners hear and comprehend the operation of gravity, magnetism, and inertia. The interaction of both melodic and rhythmic forces can be quantified further, but it is not within the scope of this research project to quantify the interaction of these forces.

2.5 Rhythmic Forces in *Raga I*

Up to this point of this research project I discussed *Raga I* in terms of pitched patterns that were observed in the two pianos and the orchestra, even though the percussion parts – which are mostly music for unpitched percussion – are in the foreground in terms of visuals, sound, and structure. The percussion parts play a central role in the work-persona of *Raga I*, and discussions on the work-persona of *Raga I* were thus incomplete until now. In this section I focus more on the percussion part, and because there are almost no differences in the percussion parts of the different versions of *Raga I*, the discussions here contribute to a more complete discussion of the work-persona of all four versions of *Raga I*. Understanding the work-persona of *Raga I* better will enable listeners to create meaning through listening and have a better understanding of the composition.

When *Raga I* for percussion solo is analysed in terms of melodic forces, rhythmic forces, or the reciprocal interaction of melodic and rhythmic forces described above, one finds that an aspect that is conspicuously neglected in Larson's theory of musical forces – specifically rhythmic forces – is discussions of the operation of musical forces in sound patterns for unpitched percussion instruments.[16] I believe that the application of the rhythmic forces only is not adequate to discuss phenomena created by performances on unpitched percussion instruments. The reasons for my statement are as follows:

- The tone colours of the unpitched percussion instruments are disregarded.
- Combinations of different unpitched percussion instruments are excluded.
- Discernible indefinite pitches of unpitched percussion instruments are disregarded.

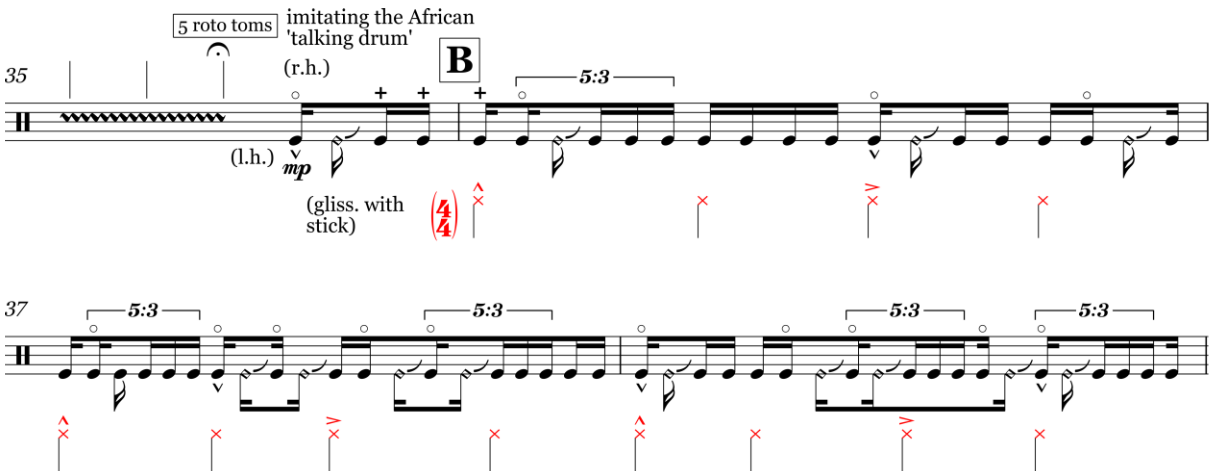
[16] Larson (2012:136-139) discusses aspects of unpitched – or undefined – clicks, but he does not discuss unpitched percussion instruments under his discussions of rhythmic forces.

I discuss this topic in the section below and I use *Raga I* for percussion solo as example to illustrate my discussions.

2.5.1 Observations on Stability and Musical Forces in Material for Unpitched Percussion Instruments in *Raga I* for Percussion Solo

When the material for unpitched percussion instruments in *Raga I* for percussion solo is analysed in terms of rhythmic forces, the metric stability of the complex rhythmic material is clear because the strongest beats are clearly grouped in crotchet beats (see Example 6-20) and the strong beats of some material for unpitched percussion instruments are accompanied by other unpitched percussion instruments that amplify the crotchet beats (see Example 6-21).

The time signature of this example is four crotchet beats per bar. The divisions of bars in crotchet beats, as well as their natural accents, are shown below the material for the unpitched percussion instruments.



Example 6-20

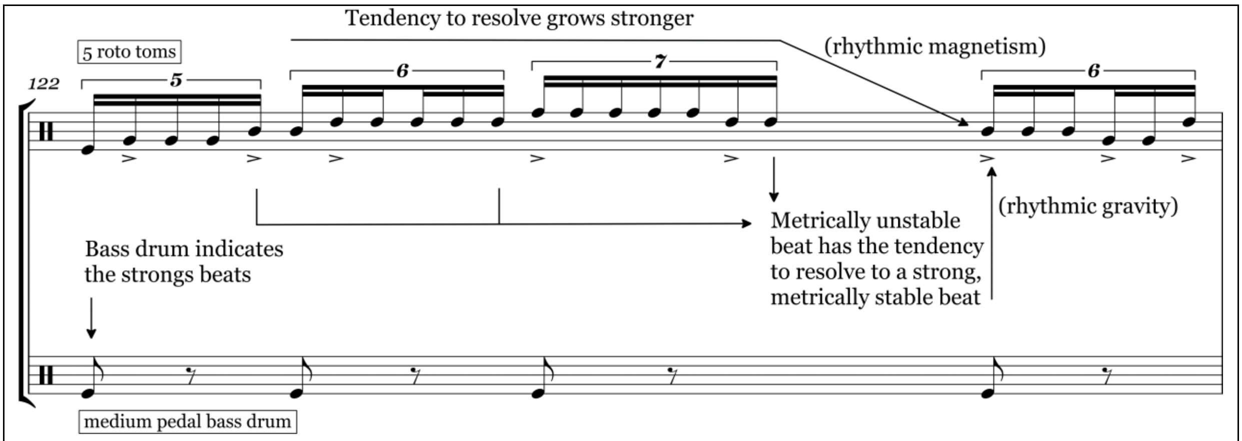
Raga I *for percussion solo, part II, mm. 35-38*

Example 6-21

Raga I *for percussion solo, part II, mm. 115-123*

The large pedal bass drum plays the crotchet subdivisions of each bar as quavers separated by quaver rests. The crotchet beats of each bar – as well as further subdivisions of each crotchet beat by the rototoms – are thus clear because of the material in the bass drum.

The clear metric stability in the two examples above supports the operation of rhythmic forces in this composition. For this reason, the operation of rhythmic gravity, rhythmic magnetism, and musical inertia can be heard clearly due to clear metric stability. The first bar of the example discussed above (Example 6-21) is discussed again, in more detail, in Example 6-22 where I show how metric stability is clear, and rhythmic gravity and rhythmic magnetism operate in that bar.



Example 6-22

The operation of rhythmic gravity in Raga I *for percussion solo, part II, m. 122*

This example shows how the subdivision of crotchet beats in the rototoms – with quintuplets, sextuplets, and septuplets – is governed by rhythmic magnetism, and how the tendency of these metrically unstable points to resolve to metrically stable points grows stronger: the first crotchet beat is subdivided by a quintuplet, the second beat a sextuplet, and the third beat a septuplet. Thus, increasingly more energy is added in each beat, and ideally these beats will culminate in a single, metrically stable, point. This expectation to culminate is not satisfied here because new energy is added by the tones that further subdivide the beat, and these tones exert new tendencies to resolve.

The last subdivision of each crotchet beat by the rototoms is also governed by rhythmic gravity because each one is a metrically unstable beat with the tendency to resolve to a metrically stable beat. In order to clarify my explanations of this example, I made the fourth crotchet beat the goal of the preceding material in the example. The fourth crotchet beat is a weak beat in comparison with the other crotchet beats in the bar, and the material in the rototoms does not culminate in that beat because new energy is invested by further semiquavers of the sextuplet. Therefore, I show the tendencies of beats and which beats they have their tendencies towards, and not how these tendencies are ultimately satisfied.[17]

The continuous addition of energy on metrically stable beats causes the groove of the composition to continue because there are few points where the accumulation of the rhythmic energy culminates. Although listeners do not hear the operation of rhythmic gravity and rhythmic magnetism as tendencies with a single specific goal, it does not restrain listeners from hearing the tendencies of metrically unstable beats to resolve to metrically stable beats, as governed by the operation of the rhythmic forces. In such instances, listeners hear the operation of these rhythmic forces as being extended by new operations of rhythmic forces. Furthermore, the hierarchies of metric stability are unclear in this example and therefore listeners do not necessarily hear the first crotchet beat as stronger than the other beats – they hear the crotchet beat as a stable rhythmic element because it is the only one constantly articulated in the rototoms.

[17] I am aware that these issues are more complex than presented in this discussion, but a more detailed discussion is not within the scope of this research project.

The operation of musical inertia in the example above is not as clear as the operation of rhythmic gravity and rhythmic magnetism. On the one hand, musical inertia requires that the rhythmic patterns are more salient, or easier to comprehend, in order to be clearly represented internally by listeners. Clearer patterns can be achieved by clearer segmentation such as rhythmic variety or dividing patterns with rests. However, musical inertia is indeed operating in this example: listeners hear the continuous investment of energy as a pattern that will continue and that the effect of rhythmic forces on every rhythmically stable beat will be followed by an immediate investment of energy.

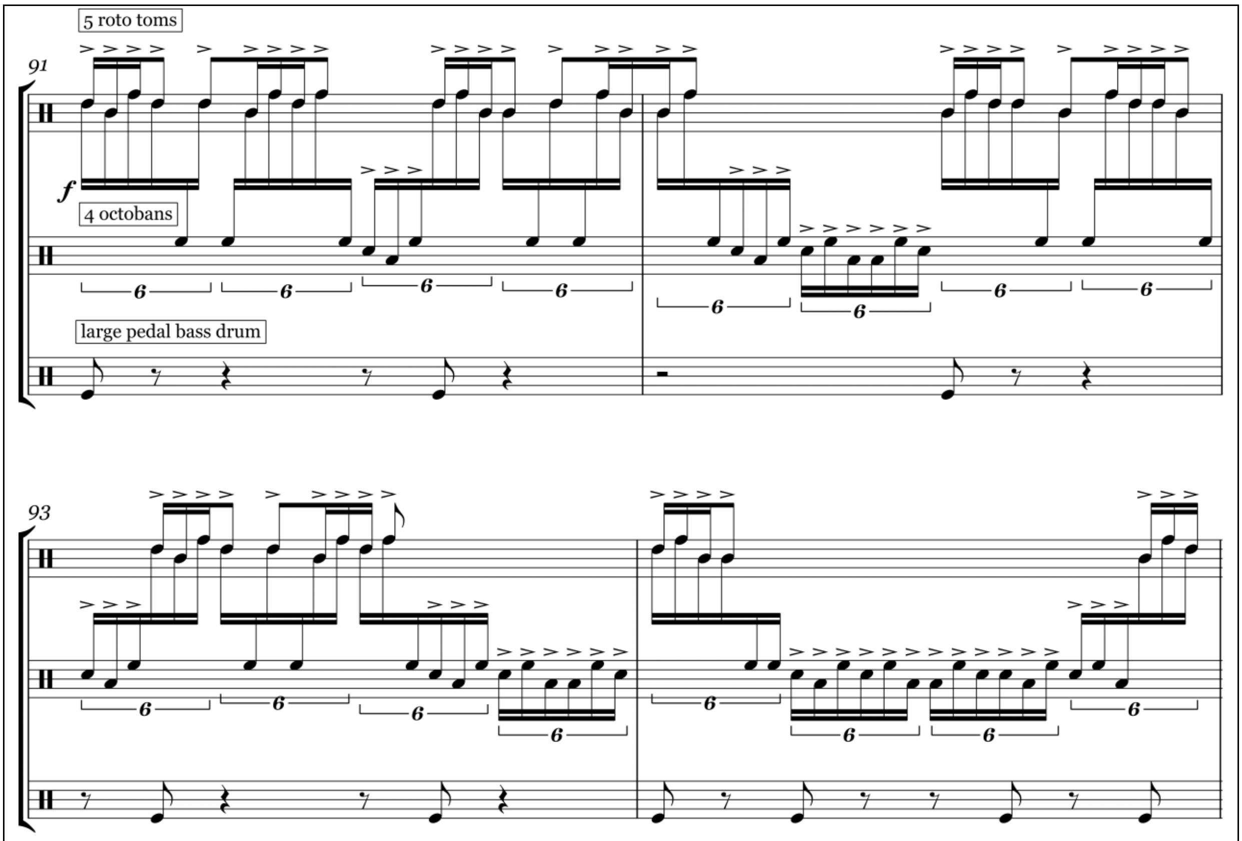
In the examples it is clear that listeners do not hear metric stability or the operation of rhythmic forces as they operate from bar to bar, but rather from crotchet beat to crotchet beat. The crotchet beats played by the bass drum play an important role in this phenomenon, and it led me to further inquiries into stability of material for unpitched percussion instruments – discussed below.

If Larson's writings about rhythmic forces are approached naively, one will limit discussions of the material for unpitched percussion instruments to rhythmic forces only. However, my more critical approach of this topic highlights another dimension of stability that is possible: some unpitched percussion instruments can influence the way in which listeners hear stability significantly more than some other unpitched percussion instruments. I vaguely refer here to 'stability' because it is not a sense of stability that relates to tonal or metric stability – I will make suggestions in terms of terminology below.

When I steered some interview questions with Gert François in this direction, he (François, 2015) commented as follows: "We can all experience high and low. Since you have those five rototoms from low to high, and you have the two bongos, djembe, the two bass drums, tomtoms, and the octobans – you still have this relation of high and low [discernible indefinite pitches]. So people do not experience doh or soh, they experience high and low. I had a discussion with Kee-Yong Chong, a Malaysian composer, who was in one of my classes in Brussels. After he heard the solo version of *Raga I* (1996), he composed a piece for non-pitched instruments, but in fact they all have some reference to a specific pitch."[18] Unpitched percussion instruments with discernible indefinite pitch, or definite pitch, is already a topic under discussion in music history, but it is not yet part of the theory of musical forces. Some percussion instruments were identified and discussed by jazz percussionist, Andrew Hare (2015). Hare (2015) specifically refers to jazz percussionists who were known for performing and experimenting with quasi-melodic material on percussion instruments. These percussionists mentioned and discussed by Hare (2015) are Baby Dodds, Papa Jo Jones, Max Roach, Roy Haynes, and Elvin Jones.

Mm. 91-94 in part II of *Raga I* for percussion solo serves as an exemplar of how a low instrument, like the bass drum, provides a sense of stability when combined with other, higher sounding, instruments (rototoms) – see Example 6-23. In this example the bass drum does not play steady crotchet beats that are equally distributed like in the previous examples, but the distribution of beats is irregular.

[18] The composition by Kee-Yong Chong, *Wu Yan (Black Flame)*, was composed in 2003 for six percussionists and was commissioned by the Brussels Conservatory percussion class.

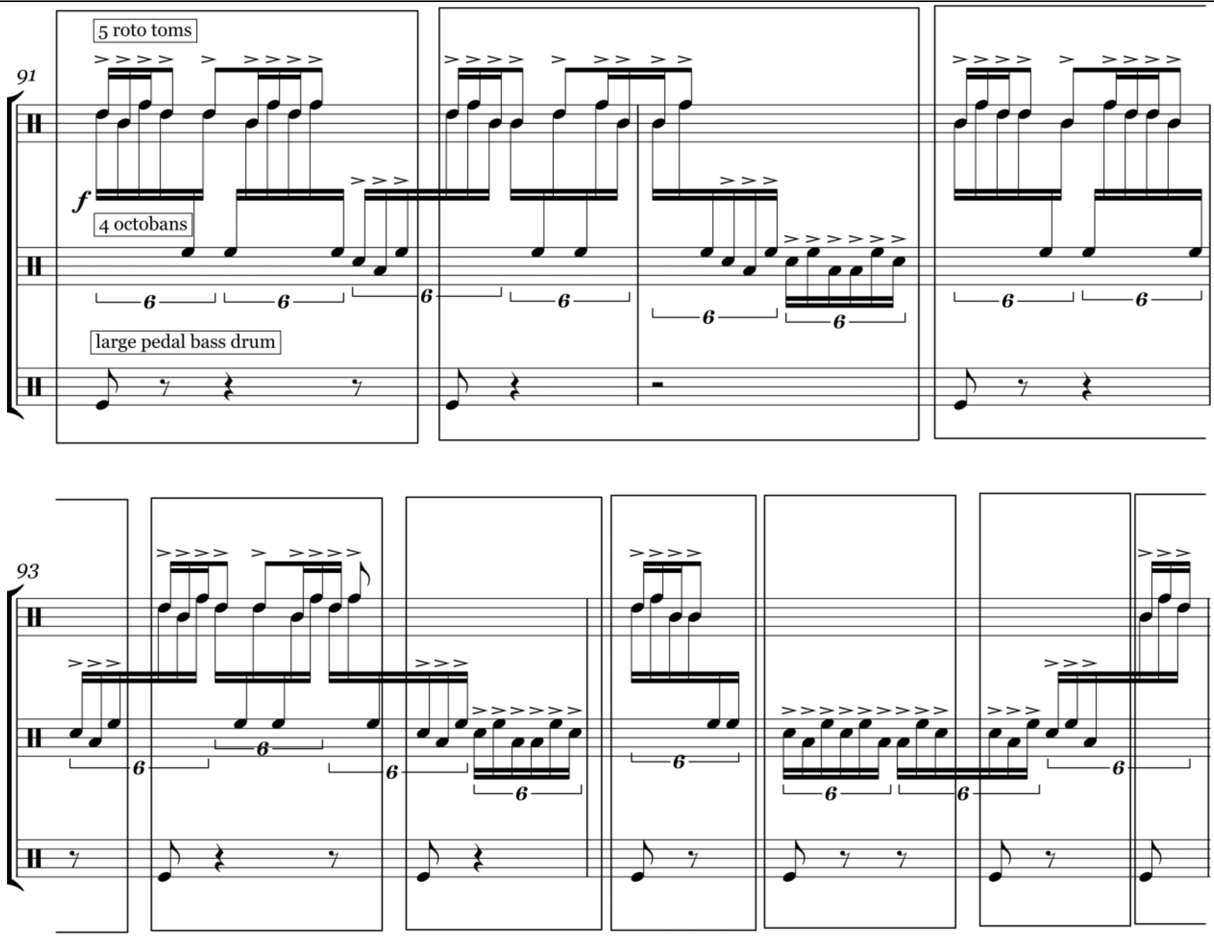


Example 6-23

Raga I *for percussion solo, part II, mm. 91-94*

When we listen to a passage of music performed on unpitched percussion instruments, such as the passage in the example above, listeners hear the point of stability in terms of the lowest instrument – in the example above, it is the bass drum.[19] Although the bass drum does not play only on metrically stable beats, but sometimes also on subdivisions of strong beats, it leads listeners to hear the bass drum as metrically more stable than the attacks in the rototoms and the octobans, and it clearly marks the start of rhythmic gestures. Listeners will thus hear the rhythmic gestures in the passage as shown by the blocks in Example 6-24.

[19] The opposite is, of course, also true: a composition can be composed in such a way that a high-sounding unpitched percussion instrument becomes aurally associated with stability, but I consider it unconventional and therefore listeners will relate better to conventional practice where low-sounding unpitched percussion instruments are aurally associated with stability.



Example 6-24

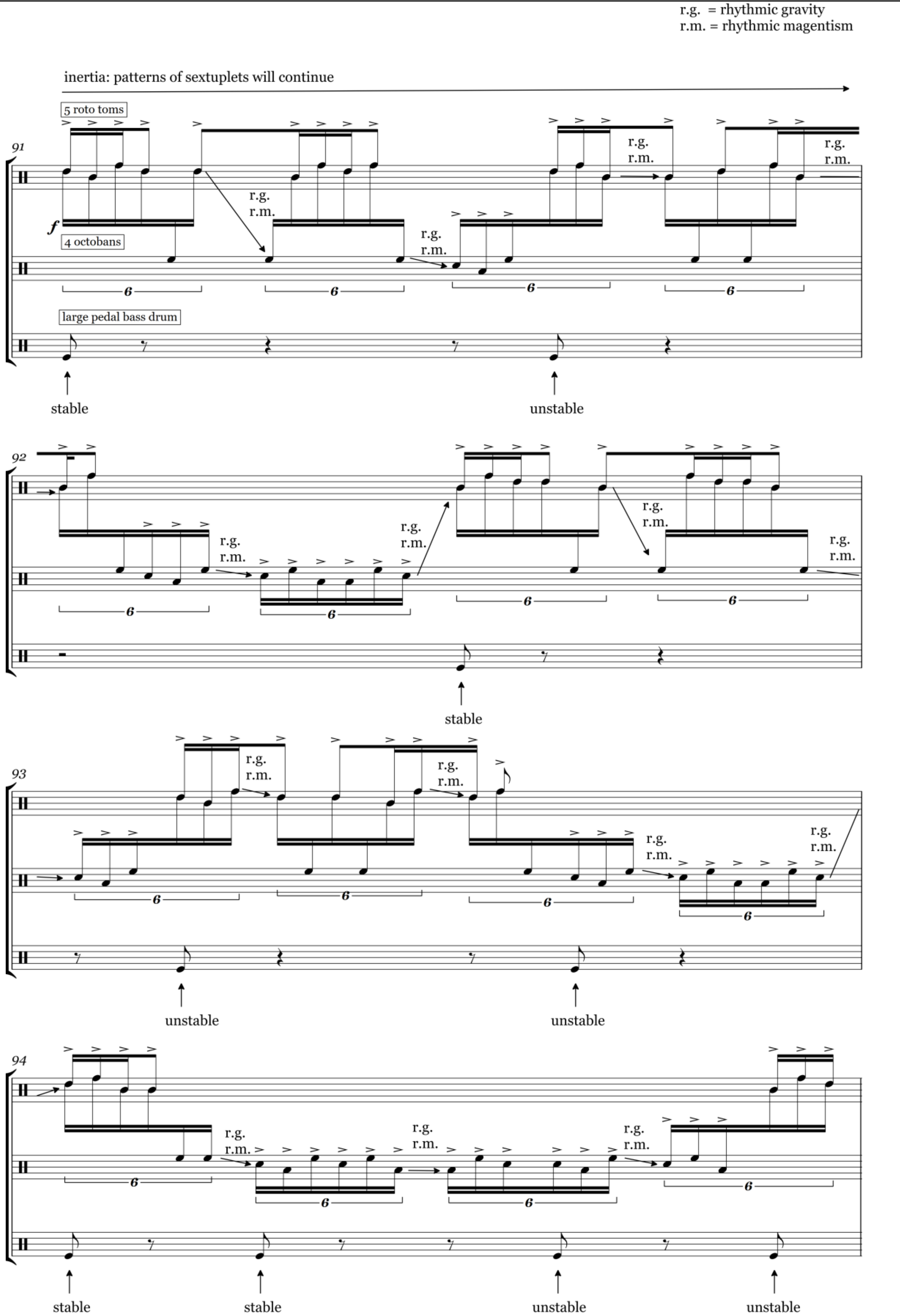
Musical gestures in Raga I *for percussion solo, part II, mm. 91-94*

If my argument above – that low instruments can indicate stability and that metric stability is not necessarily steady – is accepted, it can be argued further that, in music for multiple unpitched percussion instruments, the operation of rhythmic gravity and rhythmic magnetism will not necessarily be heard when a strong metrical beat is reached, but when the stable point is reached. This stable point is heard not in relation to pitch (which includes pitch height and chroma) but only in relation to pitch height.

Other examples to support my argument are Example 6-25 and Example 6-26. The first example is Example 6-25 where I indicate how rhythmic forces operate in part II, mm. 91-94 of *Raga I* for percussion solo according to Larson's theory of rhythmic forces. The movement of the last tones of the subdivisions of crotchet beats (metrically unstable) to the first beat that follows (metrically stable) is indicated in the example. The operation of rhythmic forces as defined by Larson does not make sense when applied to this example – specifically in terms of the operation of rhythmic gravity (r.g.) and rhythmic magnetism (r.m.) in the rototoms to the octobans, and the arbitrary placement of beats for the bass drum.

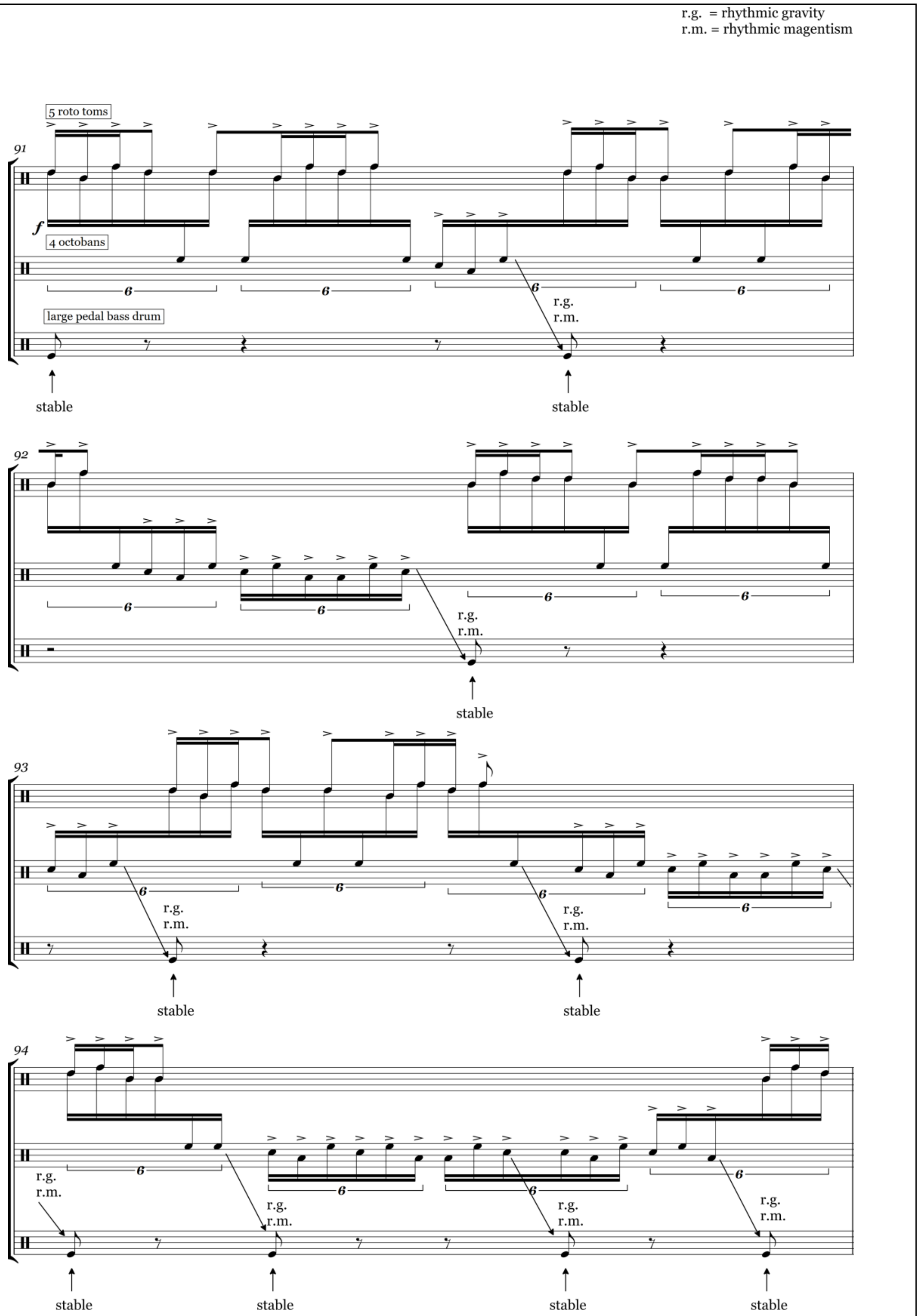
In contrast to how rhythmic forces operate in this example according to Larson's theory, I present Example 6-26, where I indicate how rhythmic forces operate in part II, mm. 91-94 of *Raga I* for percussion solo according to my suggestions. The operation of rhythmic forces is not heard from beat to beat or from bar to bar, but from the one rhythmic gesture to the next. Each rhythmic gesture is started by a bass drum beat. The role of musical inertia is not clear in either of the examples. In Example 6-25 the irregular material of the rototoms causes difficulties in terms of musical inertia, and in Example 6-26 the irregular temporal durations of rhythmic gestures cause difficulties in terms of musical inertia.

My argument above could be presented in a simpler manner, but with more challenges to Larson's rhythmic forces: a notation of the same passage but with changing time signatures, such as the version shown in Example 6-27. In the case of Example 6-27, listeners will hear the semiquaver beats as continuous subdivisions of dotted quavers (inertia). These dotted quavers are, however, not grouped regularly. Listeners will hear the beginning of each bar as a rhythmic gesture and as the result of the operation of musical forces. In all three of the abovementioned examples – of which each example is a different approach to stability and the operation of musical forces in that passage – stability is aurally amplified by the bass drum. This means that the expectations of listeners, governed by the operation of rhythmic gravity and rhythmic magnetism, are stretched to the point where the bass drum sounds.



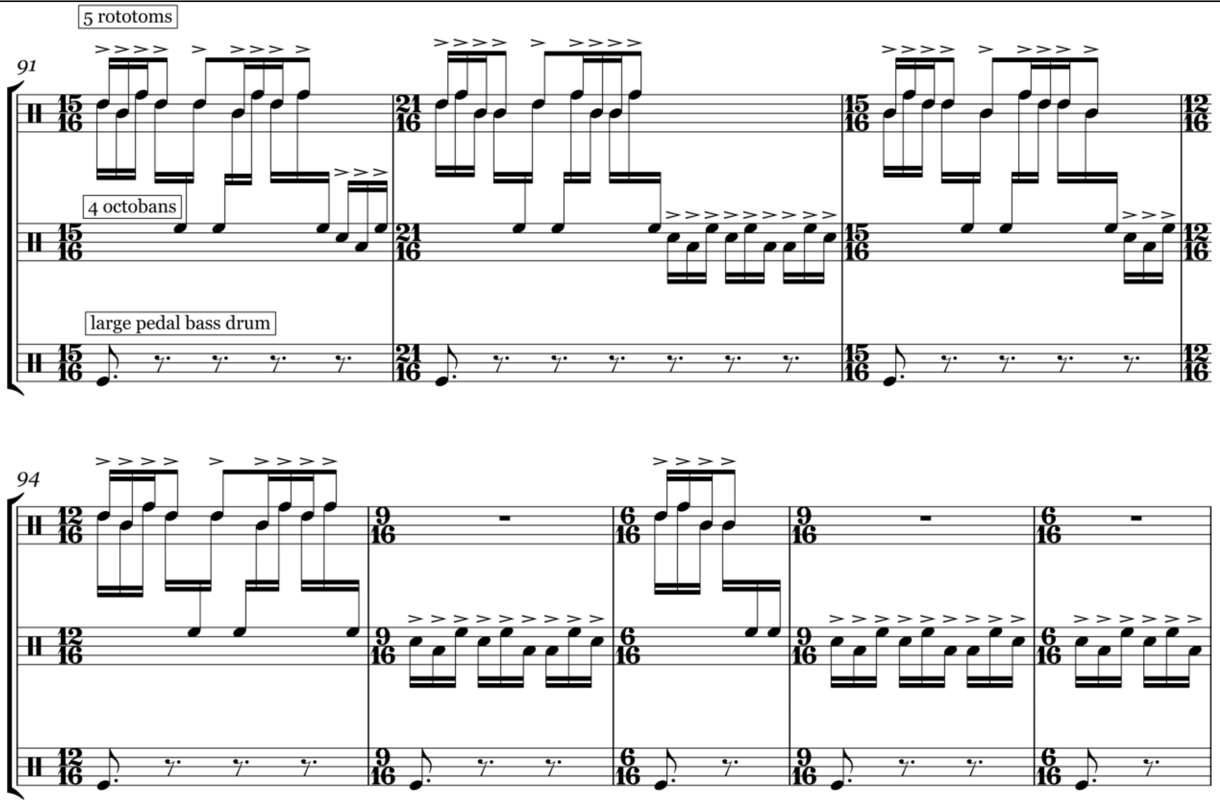
Example 6-25

The operation of Larson's rhythmic forces in Raga I *for percussion solo, part II, mm. 91-94*



Example 6-26

Another view on the operation of rhythmic forces in Raga I *for percussion solo, part II, mm. 91-94*



Example 6-27

Raga I *for percussion solo, part II, mm. 91-94 with changing time signatures*

Conclusion

The examples and discussions above enable me to suggest that different unpitched percussion instruments can influence what listeners hear as stable and unstable. Unless it is deliberately composed to contradict listeners' conventional relation, most listeners will interpret the lowest-sounding percussion instrument as a reference of metric stability. Situating unpitched percussion instruments in Larson's theory of rhythmic forces is a contribution that can be applied to a broader repertoire of music than when only working with Larson's theory of musical forces. My arguments and discussions also enable me to further discuss how stability is described in music when rhythmic and pitch material is combined. I discuss this topic in the section below.

2.5.2 Describing Stability in Music: the Interaction of Rhythmic and Melodic Forces

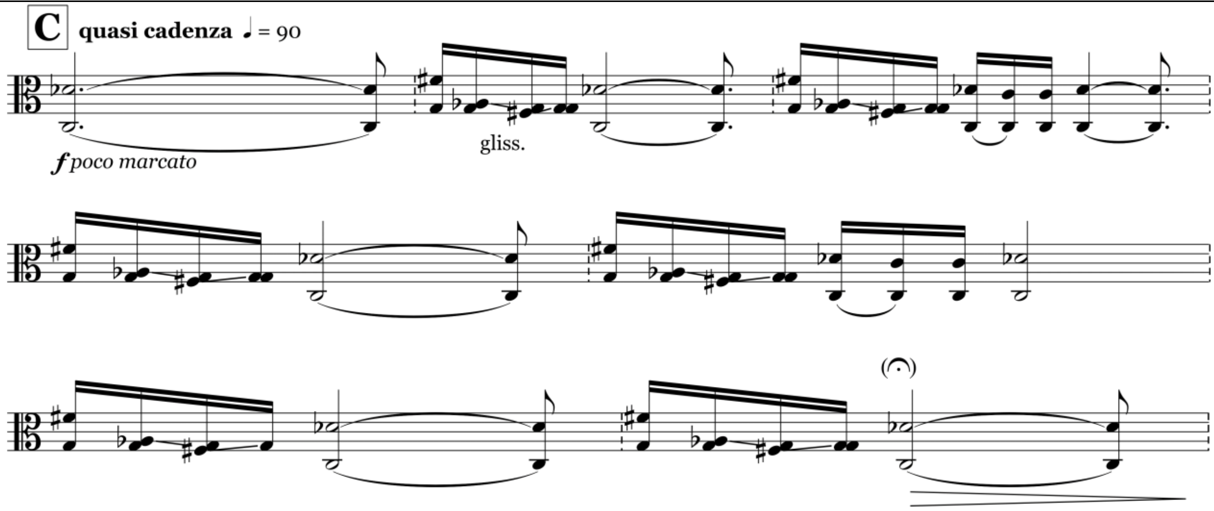
The pitch of an unpitched drum is described as indefinite due to the complex inharmonicity of the overtones produced on that instrument. In the same way in which listeners hear the complex inharmonicity of the overtones of the beat that is produced on a bass drum, for example, they hear the complex fundamentals and overtone partials of a cluster chord. Also, in a similar way in which the bass drum beat provides metrical stability – as discussed in the examples above – a cluster chord can provide metric stability. In sound events like these, aspects of melodic forces are combined with aspects of rhythmic forces. For a clear example of this, I return here to *Raga I* for percussion and two pianos. Example 6-28 shows four bars (mm. 49-52) of the second part of *Raga I* for percussion and two pianos: the cluster chords in the second piano that consist of stable and unstable tones C♯, D, and E♭.

From a tonal point of view, the cluster chords consist of more unstable tones (C♯ and E♭) than stable tones (D), but from a metrical point of view they are stable and evenly spaced.

The beginning of segment C in part II of *Raga III* for viola solo and electronics, shown in Example 6-29, is an instance where dyads of stable and unstable tones (C and D♭) can be heard as placed on metrically stable or metrically unstable beats.

Example 6-28

Raga I *for percussion and two pianos, part II, mm. 49-52*



Example 6-29

Raga III *for viola solo and electronics, part II, beginning of segment C*

This example poses two difficulties in terms of tonality and metre:

- Although the D♭ is an unstable tone with the tendency to resolve to C, it is presented to listeners as an ambiguous unstable tone that can also be heard as a stable tone.
- The rhythmic complexity of the material makes the metre unclear.

Despite these difficulties in tonality and metre, listeners will still describe the dyad of C-D♭ in *Raga III* for viola and electronics as 'stable'. This instance poses a challenge for the theory of musical forces in terms of its terminology. The terms 'stable tone' and 'unstable tone' refer to the tonal quality of a single tone. The terms 'stable beat' and 'unstable beat' refer to the metric stability of a single beat. In the previous section I used 'stable' and 'unstable'. But, what more general term can be used to describe tones, chords, and clusters? For such instances I suggest a third set of terms namely 'point of stability' and 'point of instability'. These terms do not refer to a single tone or beat, and do not only describe the tonality, metre, or rhythm of tones, but refers to a specific point in the music and whether listeners hear that point as predominantly stable or unstable.

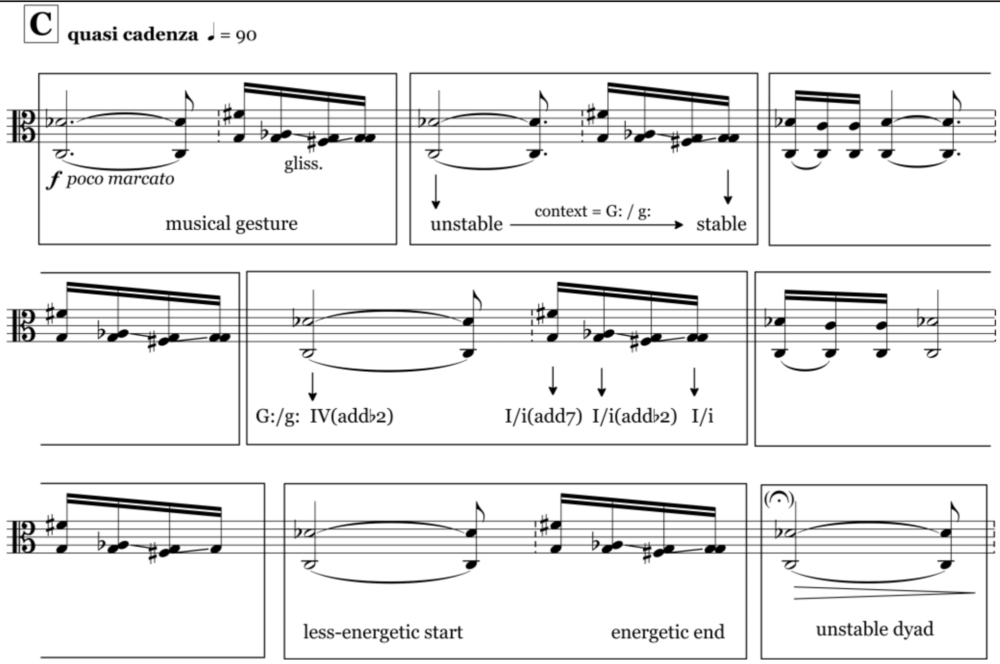
2.6 Structure and Segmentation

In this section, I discuss aspects of the structure of compositions, and how listeners will aurally divide musical segments when a drone is present and when it is not. Larson (2006) worked with aspects of structure and segmentation in terms of musical gestures, and he suggested that musical gestures are shaped by the operation of musical forces. I include musical gestures and larger musical segments in my discussion below, and I specifically work in terms of a drone, an aspect that was not considered in Larson's discussions.

Raga III for Viola Solo and Electronics

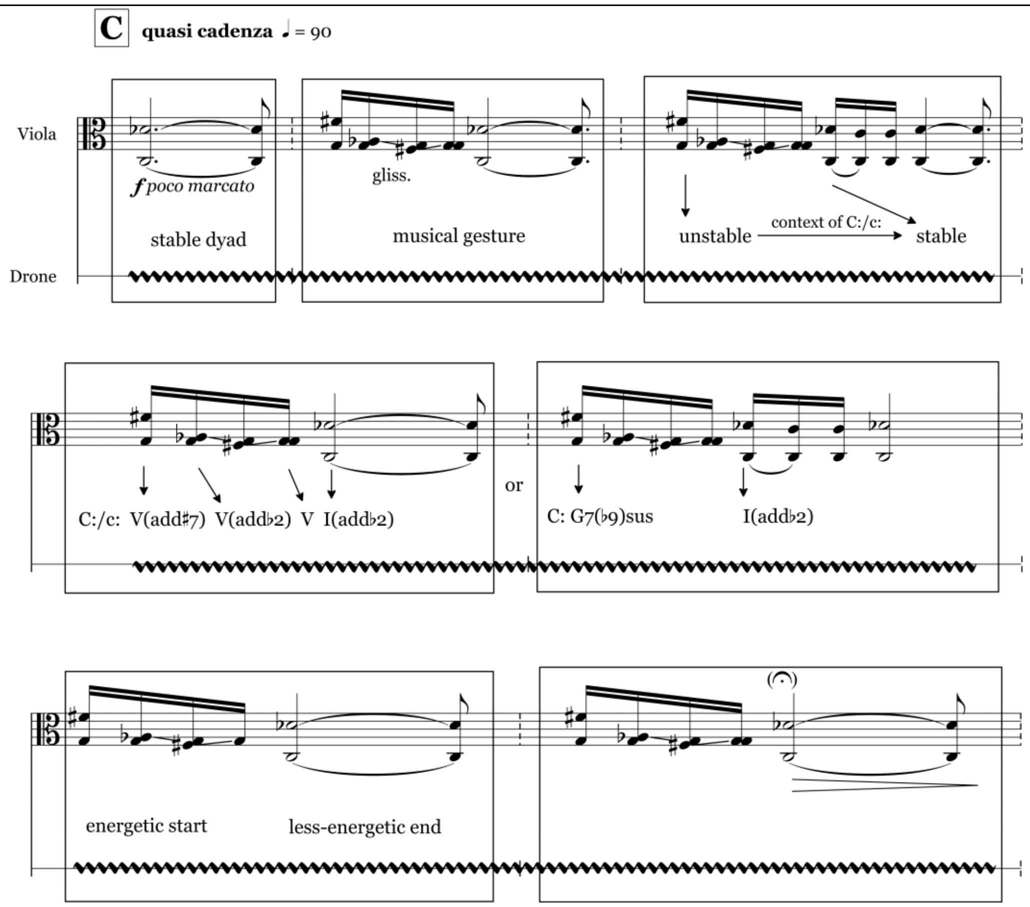
In order to critically inquire on how the addition of a drone influences the way in which listeners hear structures of compositions, I asked 'how will listeners hear musical gestures and/or segments differently when the version for viola solo is compared with the version for viola solo and electronics?' Of the many instances I found, I chose the beginning of segment C in part II of *Raga III* to illustrate the differences of my aural experiences of the two versions.[20] The blocks in Example 6-30 show how I heard the musical gestures in that passage in *Raga III* for viola solo. The blocks in Example 6-31 show how I heard the musical gestures of that passage in *Raga III* for viola solo and electronics.

[20] This passage is a solo cadenza in *Raga III* for viola and orchestra, and my segmentation for viola solo (without electronics) is thus also applicable to the versions for viola and orchestra.



Example 6-30

Raga III *for viola solo (without electronics), part II, beginning of segment C*



Example 6-31

Raga III *for viola solo and electronics, part II, beginning of segment C*

My segmentation of the two versions, shown in the examples above, is significantly different. These differences are summarised in Table 6-1 below.

Table 6-1

A comparison of musical gestures: Raga III *for viola solo and* Raga III *for viola solo and electronics*

***Raga III* for viola solo**	***Raga III* for viola solo and electronics**
Musical gestures are divided as 	Musical gestures are divided as 
Musical gestures are heard in a context with G as the most stable tone	Musical gestures are heard in a context with C as the most stable tone
Musical gestures start unstable and end stable	Musical gestures start stable and end unstable
Harmonic movement suggests plagal cadence	Harmonic movement suggests perfect cadence
Musical gestures start with less-energetic material and end with energetic material	Musical gestures start with energetic material and end with less-energetic material
There are 6 musical gestures and an unstable dyad at the end	There are 6 musical gestures and a stable dyad at the beginning

I would like to reiterate that different listeners will divide the musical gestures differently – or not hear any differences between the two versions. The table above shows how I heard the musical gestures in the two versions. Instead of discussing how different listeners might hear the musical gestures in this passage, I would rather like to focus on the fact that different listeners will hear the musical gestures differently. Because the two examples can be divided into different musical gestures when a drone is present or absent, the drone proves to be an important factor that determines how listeners will divide the composition in musical gestures and segments – thus an important aspect of structure.

The Larger Structure of Compositions

In my discussion above I discussed musical structures on a meso-level (musical gestures and segments). The addition of a drone also has a significant influence on how listeners hear the macro-level structure of the composition. In §2.2 I discuss how the extended G at the end of part I is heard as unstable, specifically when the drone is added, and the tendency of the unstable G in *Raga III* for viola solo and electronics to resolve to stable C – governed by musical gravity – implies the resolution of one movement (part I) to the next movement (part II). It is clear that the drone, due to its temporal duration, also influences various structural levels. Although Larson did not include drones in his theory of musical forces, he also did not discuss how musical forces operate on different structural levels in music without a drone.

The way in which listeners hear structures in music is a relatively recent field of interest to music psychologists. Music theorists, Fred Lerdahl and Ray Jackendoff, are the authors of *A Generative Theory of Tonal Music* (1983) and their writings about structure and segmentation were quasi-experimentally tested by the cognitive scientist, Irène Deliège (1987). Cook (1994:71) considers Deliège's work as a major contribution in the field and her work motivated Cook (1994:73-75) to research listeners' responses to large-scale tonal closure. In this research, Cook used two versions of music: the one version starts and ends in the same key, and the other version was recomposed to end in a different key than the key it started in. He found a slight, but not statistically significant, preference among the music students for the original version over the recomposed one. As mentioned earlier in this chapter, Cook (1994:75) later found that listeners' perspective of tonal closure is more accurate when the duration of the music is shorter than a minute. Thus, listeners do not accurately hear the tonal closures of large-scale structures such as sonata movements or different movements of a composition as proved by Cook (1994). The close relation of tonal closure to the notion of stability and the operation of musical forces implies that listeners also do not hear the operation of musical forces on large-scale structures because they can lose their sense of stability in a passage of music. However, the addition of a drone enables listeners to have a better sense of stability throughout compositions and hear the structure of compositions better on different levels.

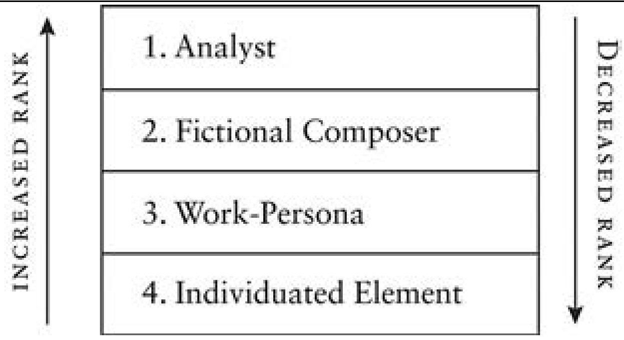
3. Conclusion

3.1 What is moving? – Motion

3.1.1 Musical Movement

The four agent classes described by Monahan (2013) are hierarchically related (Monahan, 2013:333). The individuated elements, discussed in the previous two chapters, are closely related to the work-persona, discussed in the previous chapter, on different levels. When Monahan (2013:328) describes the work-persona, he mentions that the work-persona dwells in an intramusical world, like the individuated element. He also distinguishes between the two classes of agents, writing that the work-persona is unitary and continuous, unlike the individuated element. Although the individuated elements and the work-persona are in different classes, with some similarities and differences between the classes, there is a reciprocal relation between the two classes. Some analyses that feature a central work-persona include some individuated elements, either protagonists or antagonists, and some individuated elements define the work-persona. Although I will first focus on individuated elements and work-persona, they are not the only two classes with relational logic. Monahan (2013:334) presents a hierarchical ordering of agent classes to indicate the relational logic[21] between classes – see Example 6-32.

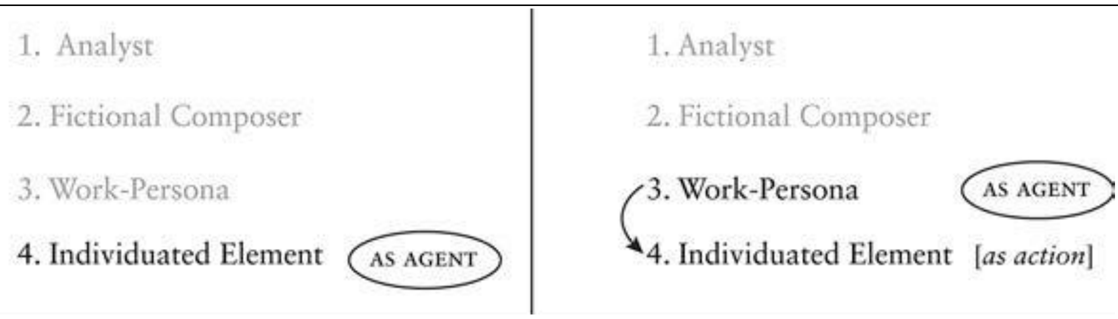
[21] Monahan (2013:337) defines 'relational logic' as follows: "Any fictional agency called forth in an analysis may also be understood by the reader as an action of any or all of the higher-raking (but not lower-ranking) agent classes, whether or not they have been made explicit by the analyst."



Example 6-32

A hierarchical ordering of the agent classes (Monahan, 2013:334)

This hierarchical ordering of agent classes is important when multiple classes of agents are involved, because "any musical event that can be regarded as agential can also be constructed as the intentional action of any higher- (but not lower-) raking agent class" (Monahan, 2013:333). For example, if there is only one class – say individuated elements – the individuated element is considered as the agent. But if there is an individuated element and work-persona, the work-persona becomes the agent and the individuated element the action of that agent because work-personae are ranked higher than individuated elements – see Example 6-33 below.



Example 6-33

Agential understandings of individuated elements and work-persona (Monahan, 2013:335)

In the sections below, I discuss how individuated elements are actions of the work-personae as agents in *Raga III* for viola solo, and *Raga III* for viola solo and electronics. My discussions are in terms of two central topics of Case 3, namely the drone and the operation of rhythmic forces.

The drone in *Raga III* for viola solo and electronics is the most prominent individuated element that acts on the work-persona of *Raga III* for viola solo and electronics. Henderickx (2015b) and De Neve (2015) both mention that *Raga III* for viola solo and electronics best represents the sound world of the Indian rāga, which is a prominent aspect of the work-persona of the composition. The work-persona of the version for viola and electronics is significantly different from the work-persona of the version for viola and orchestra and the work-persona of the version for viola solo. The problematic aspects identified in *Raga I* for viola solo without electronics affected the work-persona of the composition, and the addition of the drone as an individuated element was a solution to improve the work-persona of *Raga III* for viola solo. Like *Raga III* for viola and large orchestra, the work-persona of *Raga III* for viola solo without electronics does not exist anymore because it was replaced by the version for viola solo and electronics.

The rhythmic patterns in *Raga I* for percussion solo are also prominent individuated elements that act on the work-persona of the composition. In *Raga I* for percussion solo, the work-persona of the composition mainly comprises these individuated elements. The work-persona of the other versions of *Raga I* comprises these individuated elements and other individuated elements in the two pianos, orchestra, or concert band. Henderickx (2015b) mentions the importance of the tāla (rhythmic structures) and it is evident that we cannot understand *Raga I* without understanding the rhythmic forces.

The drone is an important individuated element that determines the work-persona of *Raga III* when the different versions of the composition are compared. The rhythmic patterns are prominent individuated elements that determine the work-persona of *Raga I* because they are in the foreground in the different versions of the composition. The rhythmic patterns are less prominent in *Raga III*, and *Raga I* does not have a version with a drone. My discussions of the drone are thus only in terms of *Raga III*, and my discussions of the rhythmic patterns are done only in terms of *Raga I*.

3.1.2 Physical Movement

In this section I focus on the performer and the composer as agents in Case 3. The addition of performers as historical agents, rather than avatars of individuated elements, was discussed in Case 1. I also mention in Case 1 that one of Monahan's (2013) classes of agents is 'fictional composer', and that I – in contrast – work mainly with a historical composer. I briefly return here to Monahan's ideas about the composer as agent. The 'fictional composer' is categorised into Monahan's third class of agents and described as "the person postulated by the analyst as the controlling, intending author of the musical text" (Monahan, 2013:329). Monahan specifically refers to a 'fictional 'composer as an agent and an eponymous 'historical composer' that is described as "the living individual who actually brought the work into the world" (Monahan, 2013:329). I work with both a fictional and a historical composer in this research project. My discussions in this case regarding aspects of the music and how the composer stands in relation to those aspects, based on my observations and interpretations, refer to a fictional composer as described by Monahan. My discussions in this case regarding other aspects of the music and how the composer stands in relation to those aspects, are based on my interviews with Henderickx, and refer to Henderickx as the living historical composer.

Although Monahan (2013:329) writes that the composer – both the fictional composer and the historical composer – has control over the music, the composer does not have full control over the music because the performers are also left with some choices. This means that performers also have control, to some extent, over the unfolding of the composition when they perform it. I already hinted at this with my remarks in this chapter that refer to 'thoughtful soloist'. I will therefore discuss the choices of the composer and the choices of the performer below, relating to the work-persona and not enter into detail about individuated elements.

Choices of the Composer: Raga III

The composer as creator of the compositions is the most important agent in creating the individuated elements and work-persona of *Raga I* and *Raga III*. When I asked Wim Henderickx (2015b) about his choice of specifically the viola as solo instrument, he replied: "I am a big fan of the viola. It is my only concerto for solo strings at the moment. But it was always an instrument that I like very much and I feel that it connects well with the Indian music, like the sārangī. The sārangī is an Indian type of string instrument, and that was my inspiration. Also, on the level of mood and expression, the viola is the most melancholic instrument of the string section. That is why I was keen to write something for that instrument. Another reason is because the deFilharmonie commissioned me to write a piece for viola and orchestra. Leo De Neve was the soloist, and we were always good friends. He played my music with the Spiegel String Quartet, he knew my music, and we had good contact. So there were many things that guided me to the idea of a concerto for viola." A large part of Henderickx's motivation for choosing the viola as solo instrument relates to aspects of work-persona.

Henderickx's choice to use the viola as a solo instrument is also an example of how a composer can enable a performer to act better in an agential manner. When I asked Henderickx (2015d) about the scale of *Raga III*, he mentioned that he "was led by the open strings of the viola: [he] had an open C and an open G, thus an open fifth that was the starting point of the composition". This is a conventional approach followed by many composers: to take into account the qualities of the open strings of the instrument(s) they compose for. In *Raga III* the scale of the composition and the open strings of the instrument complement each other: the pitch classes C and G are the most important tones of the composition, with the C as the most stable tone and the G as the second most stable tone. These tones correspond with the lowest two open strings of the viola and these open strings have the following qualities:

- They are longer and freer than fingered strings, and therefore they ring better than fingered strings.
- They can be left to ring while fingered tones are produced on other strings.
- They can be played easily and quickly without stopping the string.

Leo De Neve (2015) mentioned that he and Henderickx spent much time on details with regard to choices of strings in the musical gestures. Open strings were employed on structurally important points, as reiterated tones of pedal points, and as sustained stable tones that are combined with ornamented unstable tones.

Another aspect of the choices of the composer is that Jorrit Tamminga can be considered as a co-composer of *Raga III* for viola solo and electronics. This is due to his collaboration with Wim Henderickx in creating the drone. Although in a different way, Tamminga also acted as an agent in creating an individuated element (the drone) that is included in the actions of the work-persona of the composition.

Choices of the Performer: Raga III

Leo De Neve (2015) said that "[w]hen Wim [Henderickx] composes he does not only compose for the sake of music but he also composes for the people". De Neve refers here to the specific performers who *Raga I* and *Raga III* are composed for and dedicated to. The fact that Henderickx also collaborated closely with the performers when he composed, shows that there was interaction between the composer and performers, and that the performers could also give some input.

As mentioned in other parts of this research project, the performers who present *Raga III* for viola solo and electronics as soloists have autonomy and freedom with regard to several aspects of performance – i.e. that they do not collaborate with other performers, there are no bar lines in the score, and the soloist can start to perform at any point after the drone has been faded in. The performers also control the amount of freedom they wish to exercise and how they perform the individuated elements. For example, the performer determines the scope of dynamic changes indicated in the score, or how many reiterations there are in a tremolo – this cannot be controlled by the composer. De Neve (2015) mentioned an aspect of performance that relates to his autonomy in performing individuated elements: "If you perform solo you do not have the possibility of polyphony, so you have to make your performance attractive to listeners with those things [performing stable tones leggiero, with more vibrato, different tone colours, at different dynamic levels, and different durations] just mentioned. You can also use the bow to make a slight accent or crescendo." A further example shows how deep the choices of a performer can sometimes influence the work-persona, and also shows something of the complex musical contexts that are present in the collaborative actions of the various agents: Henderickx even allowed De Neve to put certain parts of *Raga III* together to create a fragment he performed when Henderickx was invited for a television interview (De Neve, 2015).

Choices of the Composer: Raga I

Henderickx's choice of a solo percussion player is a notable choice, because he is a skilled percussionist himself who has an embodied understanding of the instruments for which he composed. The implication of this is that Henderickx wrote the percussion part in such a way that the performer can act in an agential manner, even when performing the solo version.

Choices of the Performer: Raga I

François (2015) explained his experience in performing the different versions of *Raga I*: "When you listen to the solo version of *Raga I* (1996) you are very exposed to the percussion instruments because there are no other instruments involved. When you listen to the version for percussion and two pianos (1994), you have this boiling pot of three players producing sound. Every time you perform a different version of *Raga I* you collaborate with other instruments. So there are points where you are the soloist, but there are points where you collaborate more with the other instruments." He also mentioned aspects about his autonomy as performer: "I always try to tune my unpitched percussion instruments according to the rāga scale, although it is not in the score. I came up with this idea when I was tuning the octobans and I tuned them to the notes of the rāga scale." (François, 2015.) This is another example of the performer as an autonomous agent, and these choices of François relate to aspects of stability in unpitched percussion instruments discussed above.

Visuals: Raga III *and* Raga I

Seeing a performance of the solo version of *Raga III* (see Image 6-1) is significantly different from seeing a performance of the solo version of *Raga I* (see Image 6-2). This is because only the viola player and his/her viola is on stage when performing *Raga III*, but when *Raga I* is performed the percussionist is on stage with a vast array – nearly thirty – of large percussion instruments.

Image 6-1

Marc Tooten performing Raga III *for viola solo – Photo: Frederik Bevens*

Image 6-2

Gert François setting up the solo percussion instruments of Raga I *– Photo: Gert François*

Wim Henderickx (2015c) answered one of my interview questions to him in terms of the visual aspects of *Raga I* for solo percussion: "The energy and the virtuosity are the aspects that excite people. If you look at the performance of the Raga, the focus is on this one person and the island of percussion instruments around him. And one of the strong points in *Raga I* is the island of percussion instruments. I am aware of the fact that I need to create something that makes sense to a percussion player, and I found that in the combination of instruments, that setup as well as the instruments creates an enormous energy. Then you listen to it in a different way, maybe not concerned about pitch." This answer of Henderickx refers to the physicality of the solo percussionist who needs to make large movements in order to move from one instrument to another. In contrast, the movements of viola player are not as salient, distinct, and articulated. Similar to the movements of the soloists in the accompanied versions, the percussionist is able to move in a more agential manner to visually support what listeners hear than the viola player is.

3.2 How do we listen? – Meaning

The ways in which we create meaning from listening to the solo versions of *Raga I* and *Raga III* can be ascribed in each composition to individuated elements. In *Raga I* the individuated element is the rhythmic patterns and how rhythmic forces operate, and in *Raga III* the individuated element is the drone. Because the temporal duration of these individuated elements is prolonged from the beginning of the compositions to the end, they are actions of the work-persona.

Listeners can create meaning from the operation of rhythmic forces, even in the simplest contexts, like when they hear a series of undefined clicks (Larson, 2012:138) and start to group those clicks into patterns. When we work with metre and beats that are more defined (such as playing on a djembe drum and stressing the strong beats), the way in which we create meaning is even deeper and will be more coherent among listeners. This is because we hear the shaping of rhythmic patterns as they unfold in metre. It is up to this point to which Larson's (2012) ideas regarding rhythmic forces extend. However, I suggested in this case that we can create even more and deeper meaning when we hear the beats as even more defined. This is the operation of rhythmic forces in unpitched percussion instruments. A selection of unpitched percussion instruments provides us with a variety of tone colours and we can hierarchically categorise the instruments according to high and low sounding instruments, even though we cannot ascribe definite pitches to them. The combination of tone colour and high-low enables us to ascribe a sense of stability to certain instruments. For example, when we listen to a bass drum, djembe, and cymbal, we hear the bass drum as the lowest unpitched percussion instrument and the cymbal as the highest unpitched percussion instrument. We are most likely to ascribe a sense of stability to the bass drum, and hear the other instruments as unstable with the expectation that the bass drum will sound again at a stable point. However, it is possible that the beats of these unpitched percussion instruments can also be internally represented differently by listeners. Thus, although it enables us to create a deeper meaning of the rhythmic forces, it will not necessarily be heard similarly among listeners in certain instances. Therefore, the interaction of rhythmic forces with melodic forces can enable us best to create meaning from the music we listen to. This is because we can hear how rhythmic and melodic forces agree or disagree in music. This allows for listeners to be more likely to create meaning in the same way, because there is a reciprocal relation between rhythmic and melodic forces that allows us to create meaning by means of two sources: pitch content and rhythmic content.

Returning to *Raga I* for percussion solo, described in this case, we create meaning by hearing tones that are produced by certain low-sounding instruments as stable and starting rhythmic gestures. Because the points of stability provided by these low-sounding instruments are not equally spaced, creating meaning is not an easy task for listeners. I believe that this is what the composer wanted, else he would lose the interest of listeners when they are able to create meaning early in the composition and hear these meaningful patterns as continuously repeating. Furthermore, we hear unstable beats with the tendency to resolve to stable beats as beats that are governed by the operation of rhythmic magnetism, and we hear the material of high-sounding unpitched percussion instruments as beats that are pulled down to resolve in a low-sounding percussion instrument. It is due to this clear, but complex, operation of rhythmic forces that listeners do not miss the experience of the tonal tendencies that were created by the pitched percussion instruments in the first part of the composition.

As I highlighted in this case, the drone in *Raga III* clarifies various aspects of the composition. These aspects are fundamental in creating meaning in music, and therefore the drone plays a significant role in how we create meaning in *Raga III*. The drone enhances our creation of meaning by helping listeners to clearly hear stability and instability when tones are heard together with the drone. This clarity in stability/instability leads to a clearer understanding of how melodic forces operate in the composition, and because the operation of melodic forces is clear, the operation of rhythmic forces becomes clearer. This collaboration of melodic and rhythmic forces elucidates the structure of the composition in several ways and listeners can create meaning as the music unfolds.

The presence of the drone in *Raga III* for viola solo and electronics is important when we compare this version with the version of *Raga III* for viola solo without electronics, especially in terms of individuated elements. When we compare the two versions, we compare them in terms of the individuated elements we can remember, because we cannot hear them at the same time. The drone also acts as a protagonistic agent that supports and enhances our creation of meaning, like other agents do in the other cases.

3.3 How do we understand? – Metaphor

Collaboration of Melodic and Rhythmic Forces

The collaboration of melodic forces and rhythmic forces can be understood according to several metaphors. This is because the interactions when there are only two forces interacting (which is seldom the case) have ten possible relations when they agree, and ten possible relations when they disagree – see Diagram 6-4 below.

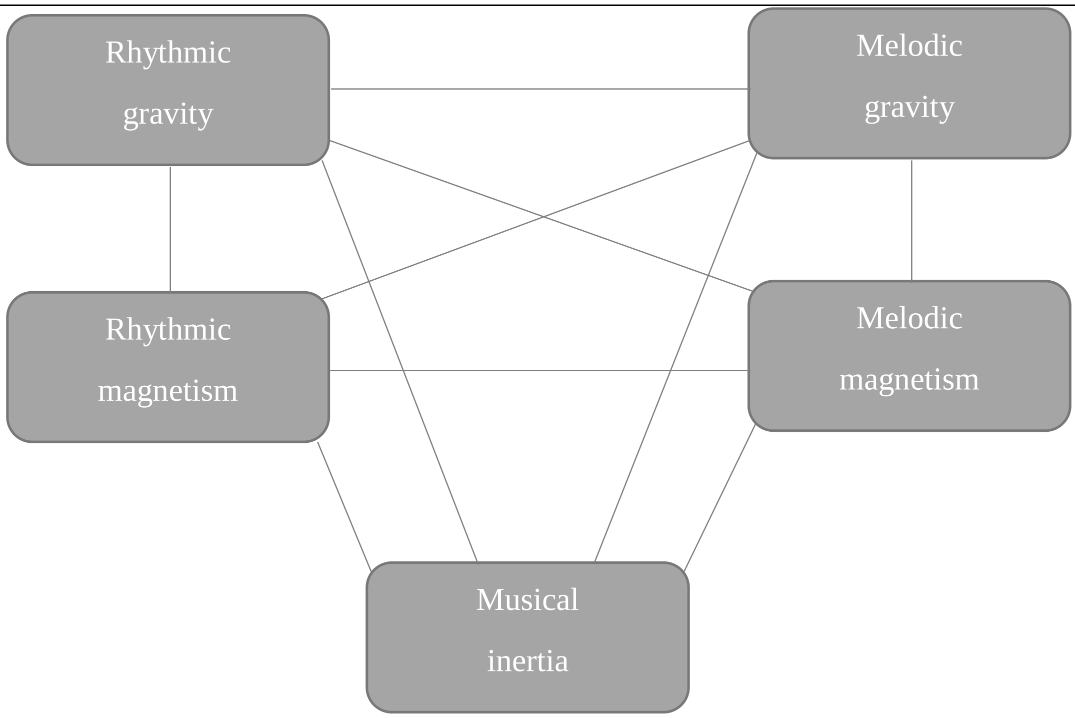


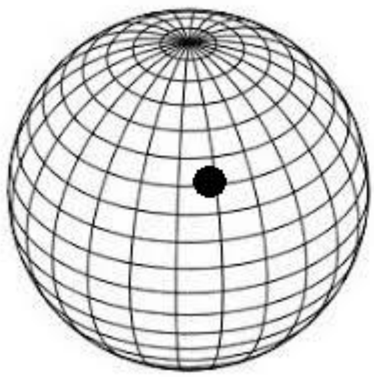
Diagram 6-4

Relations of melodic and rhythmic forces when they agree or disagree

Metaphors of melodic and rhythmic forces can be understood separately in similar ways. For example, if the tendency of an unstable tone to resolve to a stable tone is understood as an object that is pulled downwards by gravity, the tendency of a metrically unstable beat to resolve to a stable beat can be understood and explained in the same way. However, these two metaphors cannot be merged, because that would equate the operation of forces, as well as the objects. Because it is not my aim to present an exhaustive discussion on metaphors and cross-domain mappings in this research project, I am not taking this section of metaphors on the collaboration of melodic and rhythmic forces further here. See Chapter 8 §2.6 for further suggestions on this topic.

The Drone

The drone is a versatile individuated element that has an influence on the operation of gravity, magnetism, and inertia. Because the drone creates multiple platforms, I understand the working of a drone in physical terms as the working of multiple forces on an object floating in a hollow sphere made up of intersecting circles representing the forces (see Example 6-34 below).



Example 6-34

An unstable object that is influenced by a stable environment

The work presented in this case, and the other two cases, is brought into closer relation with each other by means of a cross-case analysis in order to arrive at conclusions. The cross-case analysis is presented in the next chapter.

Chapter 7

Musical Forces: Motion, Meaning, and Metaphor

1. <u>Introduction</u>

Which changes and additions to Larson's theory of musical forces are suggested when the results from the cross-case analyses and insights from comparable studies that rely on Larson's theory are fused with Larson's theory? In order to answer this secondary research question, as well as the primary research question, I firstly performed a cross-case analysis of the three cases, which I present in this thesis as part I of this chapter. Comparable literature that relates to my research project is then discussed as part II of this chapter, and the changes and additions to Larson's theory of musical forces – based on the cross-case analyses and insights from comparable literature – are suggested in part III. This leads to answering the primary research question: Which expansions of the theory of musical forces can be proposed on the basis of analyses and comparisons of the different versions of Wim Henderickx's *Raga I* and *Raga III* in terms of Steve Larson's theory of musical forces? As has become clear from Chapter 4 onwards, the concept of agency is the nexus around which all of my interpretations are built, and this concept is thus the most important centre point from which the main research question will be answered.

Agency

Although Larson did not include agency in his analyses, he mentions that "analysis has the potential to tell us important things [about] the attribution of intention, inevitability, and agency" (Larson, 2012:313). The suggestions of BaileyShea (2012) and Graybill (2012:116) to incorporate agency into the work on the theory of musical forces were valuable for interpreting observations in this research project. Monahan's (2013) clear work on agency and classes of agents allowed me to incorporate agency in my analyses without entering the discourse in literature about this topic. Monahan's four classes of agents also clearly support the process of music analysis because music analysis entails sound patterns and their performers (agents class 1: individuated elements), the character of compositions (agents class 2: work-persona), composers (agents class 3: fictional composer), and analysts (agents class 4: the analyst).

Monahan's first class of agents, the individuated elements, is employed in Case 1 to interpret my observations of phenomena in *Raga I* for percussion and orchestra as amplifications of musical forces. The second class of agents, the work-persona, is employed in Case 2 to interpret my observations of phenomena in *Raga I* for percussion and concert band and *Raga III* for viola and smaller orchestra. In Case 3, I focus on how individuated elements are actions of the work-persona and the third class of agents, the fictional composer, to interpret observations in *Raga I* for percussion solo, *Raga III* for viola solo, and *Raga III* for viola solo and electronics. Although I discuss all the versions of *Raga I* and *Raga III* in the three cases, I do not explicitly discuss all four of Monahan's classes of agents in the three cases. The fourth class of agents, the analyst, has not yet been discussed but was implicitly present in all three cases. This fourth class now comes more to the foreground in this chapter.

Monahan's classification of agents is the only classification I am aware of that includes the analyst as an agent, because other classifications are based on fictional agencies that are depicted by analysts. I agree with Monahan that analysts should be considered as agents in their own class, because they stand in similar relations to their written texts as the fictional composer to the composition. Monahan (2013:332) writes that the task of analysts in reading "is to interpret that text as an intelligible action of some analyzing agent, some plausible intending subject". He considers the analyst the most ubiquitous of the four classes of agents because any critical interpretation of a text can be called 'agential'.

As analyst, my incorporation of agency at the end of each chapter enabled me to interpret the phenomena I observed in each case, to draw conclusions, and to suggest changes and additions to Larson's theory of musical forces. I suggest that specific changes and additions are to be incorporated into Larson's theory of musical forces. They are the following:

- Amplification of musical forces;
- Collaboration of melodic and rhythmic forces;
- Agency;
- Historical agency;
- Presence and absence of individuated elements; and
- Protagonism and antagonism.

The concepts that I suggest in this list are given here to provide clarity for the cross-case analyses and the short discussion on similar projects described in literature that follows. The concepts will be defined in the third part of this chapter when the relationships between the concepts will also be discussed.

2. Part I: Cross-Case Analysis

Each of the previous three chapters had conclusions in three parts. The cross-case analysis in part I below is presented in terms of the three sections of the conclusions of each case: motion, meaning, and metaphor – see Diagram 7-1 below. The headings "motion", "meaning", and "metaphor" were derived from Larson in order to make a close connection to the terms that form the central part of his theory.

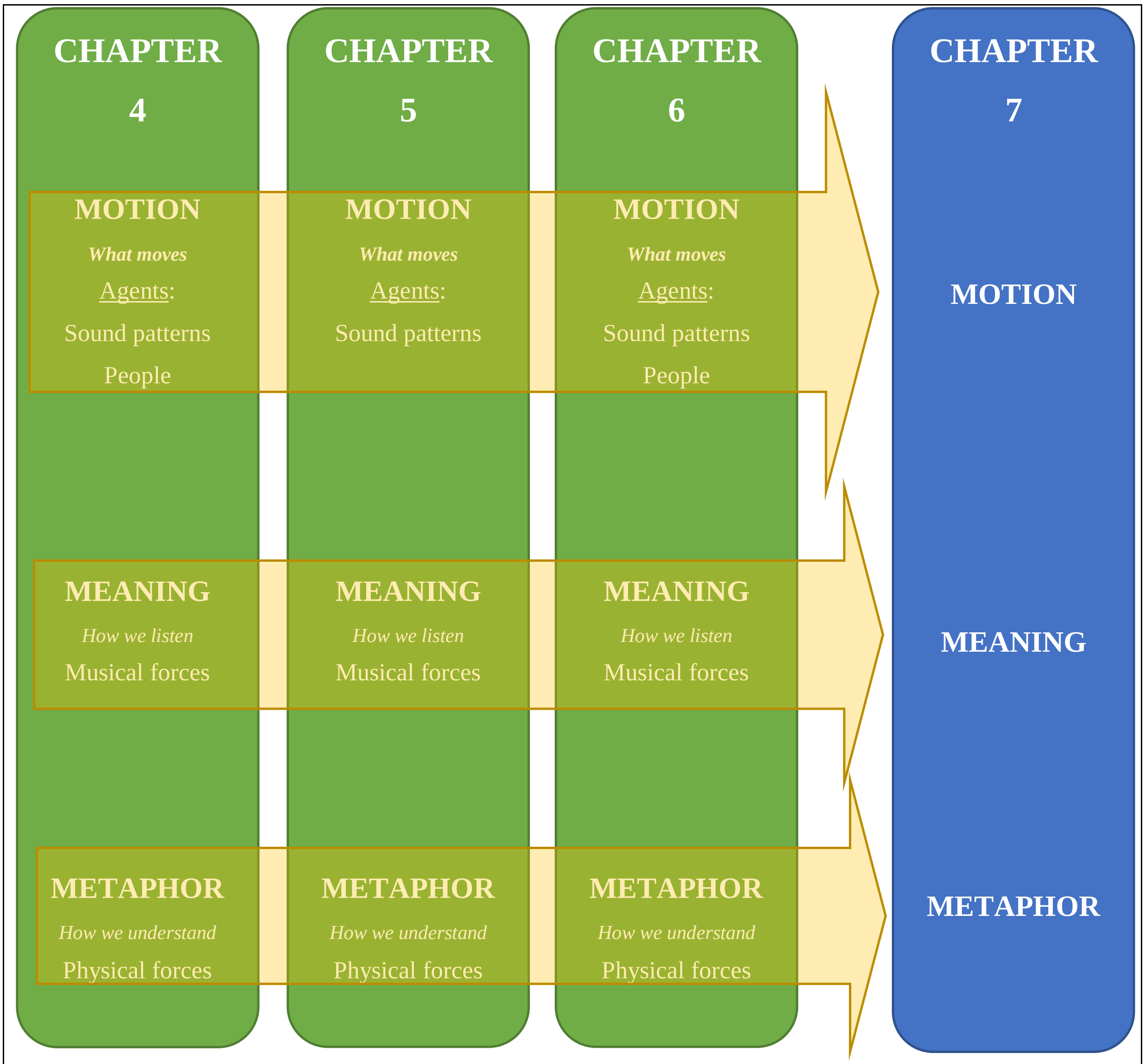


Diagram 7-1

Cross-case analysis

2.1 Motion

As mentioned above, the concept of agency became the nexus around which my interpretations of observations were built. It is also the central concept in the first part of this cross-case analysis. It is discussed below in terms of the four classes of agents identified by Monahan: individuated elements, work-persona, fictional composer, and analyst. Because agents are 'that which moves' it is discussed here under 'motion'.

The role of individuated elements can clearly be described in terms of their influence on the operation of musical forces in all three cases. In Case 1, I present the individuated elements as agents that amplify the operation of musical forces. In Case 2 the individuated elements are presented as agents that influence and contribute to the work-persona of the compositions, and in Case 3 the individuated elements are presented as actions of the work-persona as agent. In whichever way they are presented in the cases, all the individuated elements influence the operation of musical forces in a significant way. Although the individuated elements as discussed in all three the cases influence the operation of musical forces, the subclasses of individuated elements in each case are different. These subclasses of individuated elements can be divided further according to their widely different temporal durations, because they influence the temporal unfolding of segments differently. Another way to divide the subclasses of individuated elements is in terms of protagonists and antagonists. I will not show how they can be divided in different ways here, but rather use those ways to structure my discussions. Not all the individuated elements in the cases are protagonists that support the operation of musical forces, such as those presented in Case 1, which clearly act in protagonistic ways. Some of the individuated elements are also antagonists that counteract the operation of musical forces, such as those presented in Case 2, which clearly act in antagonistic ways. Still, they influence the operation of musical forces in significant ways.

The ways in which these individuated elements were employed by the composer to create motion in the compositions is studied in all three cases. The motion created by the individuated elements can be ascribed to the operation of musical forces, and described fruitfully in terms of musical forces. My analyses, categorisations, and interpretations of the ways in which the composer employed the individuated elements enable me to draw conclusions on how the protagonistic individuated elements amplify the operation of musical forces and the antagonistic individuated elements reduce the operation of musical forces. The composer who created these individuated elements (Wim Henderickx) and the analyst who observes and interprets these individuated elements (myself) are thus present as agents alongside the individuated elements as agents in the three cases.

Although I only introduce and discuss aspects of the work-persona in Case 2 and Case 3, it is evident that the compositions in Case 1 also have a work-persona. The work-personae of the compositions in Case 1 and Case 2 are very similar, but the work-personae of the compositions in Case 3 are significantly different. This is because the compositional process followed in Case 1 and Case 2 are conventional processes, but the compositional process followed in Case 3 is less conventional. This less-conventional approach causes the different versions to be significantly different in their work-personae. It is also true that the work-personae of the versions of *Raga I* are more similar to each other than the work-personae of the different version of *Raga 3 III*. Because of the differences between the work-personae of the specific compositions studied in this project, I suggest an addition to the literature on agency, namely a distinction **actualised agents versus remembered agents**. Furthermore, my work is the first study of the differences between the work-personae of different versions of the same composition.

These different work-personae were also observed by Leo De Neve (2015): "If you listen to *Raga III* with the orchestra (1995 or 2012), and right after that you listen to a version without orchestra (2003 or 2010), you will note a significant difference. I wish I could do a concert like that. But if you perform the version for solo viola (2003) or the version for viola and electronics (2010), the listeners do not have the reference to the version for viola and orchestra (1995 or 2012), so they cannot compare the versions." De Neve compares this observation with the Viola Concerto (1983) of Krzystof Penderecki, which also followed a similar compositional approach as *Raga III* because it was also transcribed for viola solo from the original version for viola and orchestra. He hints here at the distinction of 'actualised agents versus remembered agents', and I interpret his ideas specifically in terms of individuated elements: the actualised agents in *Raga III* for viola and electronics, for example, are not the same as the actualised agents in *Raga III* for viola and orchestra. Listeners would thus have to depend on their memory of the agents in one version in order to compare it with the agents in another version. Comparing individuated elements among two or more versions is thus a conceptual process for listeners. This conceptual interaction of individuated elements is discussed further in §2.2 in terms of work-persona.

The physical movements of performers play an important role in how listeners – those who are, of course, able to see the performer – hear the operation of musical forces. This notion is clear in all the cases. But the performers of the compositions in the different cases do not move in the same way. For example, the physical movements of the solo percussion player are larger than the physical movements of the solo viola player. Because the movements of the percussion player are larger movements, the visual information provided by the performer during the performance supports what we hear more than in the case of the viola player, whose movements are small. It is thus easier for listeners to observe motion and relate it to what they hear when the percussion player plays on two different instruments that are far apart, than to observe motion visually when the viola player's fingers move on the fingerboard and the bow changes between the strings. The contributions of the actual percussion player in how we hear motion and the operation of musical forces is thus more than the contributions of the actual viola player. Wim Henderickx (2015c) also made similar observations: "[I]t is something completely different when you hear this [*Raga I*] as a solo version. It is like seeing an object from different perspectives: the object did not change, but the environment or viewpoint has changed. And that changes the experience of the listener." For clarification, it is valuable to note that Henderickx's reference to an 'object' in this quotation refers to the material of the music that did not change in significant ways. Later, I also use the metaphor of an object that changes in terms of musical forces.

Despite their different movements, the soloists of *Raga I* and *Raga III* have more autonomy over the music when they perform as soloist than the orchestra members have, or than they have when they perform as a soloist with accompaniment. This autonomy of the soloist was also observed by Gert François (2015): "It is as if you are a soloist in a chamber music situation when you perform the version for percussion and two pianos. I see it as performing as part of a trio. Knowing the chamber music situation gives you a fantastic starting point to go into the orchestra because you know the score and how it develops. So it is easy to say that I have to be precisely together with the double basses or whatever." He also said that performing the work with an orchestra changed his approach to the music: "[T]his orchestration made me, as a soloist, rethink my engagement with the composition because I could not perform it in the same way with pianists as with an orchestra" (François, 2015). The improvisation sections in the solo version of *Raga I* (described by François, 2015) and the dashed bar lines in the solo version of *Raga III* also point toward more freedom of the soloist in these versions because they do not collaborate with other performers.

Taking the observation of movement on visual levels further, both the solo performers in Case 1 and Case 2 are less in the foreground when they are compared to the solo performers in Case 3. The solo performers in Case 1 and Case 2, i.e. the percussion player and the viola player, become part of a large group of performers – the orchestra – in a large environment. The solo performers in Case 3, on the other hand, are the focus points of performances because they are the only performers on the stage and it is more probable that they will perform this chamber music in smaller environments rather than the large environments in which orchestral music is normally performed. This clearly influences the ways in which they exercise their agency, and the influences their physical presence has on our understanding of the meaning of the compositions – the way in which we hear the compositions.

This discussion points toward an important aspect demonstrated in this research project, namely that motion is an integral part of the operation of musical forces.

2.2 Meaning

The three cases presented in this study show that it is possible to listen to complex compositions that are embedded in complex musical contexts in terms of musical forces. This allows us to create meaning in both the compositions and the complex contexts that we would not have been able to create if we did not listen to the compositions in terms of musical forces. Although the operation of musical forces is different among the different cases, it remains an important aspect that enables listeners to create meaning. Certainly, musical forces are not the only aspects in creating meaning in music. Yet, we are only able to understand the amplification –

and the reduction – of musical forces, for example, when listening to the music in terms of musical forces.

The amplifications and reductions of musical forces, presented in the different cases, enable us to create meaning from the compositions included in these cases. This is due in great parts to the individuated elements in the compositions: listeners create meaning by means of the presence and interaction of individuated elements or the absence of individuated elements. Leo De Neve also observed this notion that the operation of musical forces, and by implication the way in which listeners create meaning, changes in the presence and absence of individuated elements such as accompaniment: "Sometimes I work for a long time on a composition with a student that I have never played myself, or never heard before, and then comes the first lesson with the accompaniment on the piano. That is when you feel how these three aspects (musical gravity, musical magnetism, and musical inertia) change." (De Neve, 2015.)

Hearing the actions of individuated elements with more refinement can be aided by the distinctions I make above among individuated elements in terms of temporal duration, protagonism versus antagonism, and actual versus remembered individuated elements. Linked to this last distinction is the one between perceptual versus conceptual hearing of agents, which I discuss later.

The influences of these individuated elements in creating meaning are also heard differently in terms of the temporal duration of agents. For example, glissandi have short temporal durations because they were mostly added at the end of segments, and the drone has a long temporal duration because it was added to the entire composition.

We can create meaning through individuated elements without employing the concept of the work-persona – this was done in Case 1. However, we can progress in listening towards an understanding of individuated elements as actions of work-persona – this was done through Case 2 into Case 3. To do this, we need to differentiate between perceptual and conceptual interactions of agents, as mentioned above. This distinction 'perceptual versus conceptual interactions of agents' is another one that I add to the literature on agency and to the theory of musical forces. I discuss this in the next paragraph in terms of individuated elements and in terms of work-persona.

Individuated elements can interact on perceptual and conceptual levels – this can be illustrated by taking the individuated elements in Case 1 as examples. We can hear their interaction while the music unfolds and we can think about the interactions after we've heard the music. However, the interaction of the work-personae is on a conceptual level only, such as the interactions of the work-personae discussed in Case 2 and Case 3. Although we hear the work-persona on a perceptual level (and then conceptually create it further from our perceptions), we cannot hear the work-personae of two different compositions at the same time and that is why we are only able to think about them in retrospect. This notion relates to Larson's principle of thinking in music, rather than thinking about music. When we listen to the interaction of individuated elements, we think in music because it relates to what we hear. But when we listen to the interaction of work-personae, we think about music. Larson (2012:29) writes that "[t]hinking in music is quintessential to musical experience", which is an encouragement to think in music (perceptually), rather than to think about music (conceptually). This explains why we can create more meaning when we work in terms of individuated elements as actions of work-personae, rather than merely work-personae.

The three cases show instances of how the point of stability is amplified, which influences the way in which we hear the operation of musical forces in music. The amplification of tonal stability is clearly observed in Case 1 and Case 3, and the amplification of metric stability is clearly observed in Case 2 and Case 3. It is in in Case 3 where I argue explicitly that melodic forces collaborate with rhythmic forces, but this point is implicit in all the other cases. This collaboration of melodic forces and rhythmic forces can lead us to create more meaning than when only one of the forces is considered.

2.3 Metaphor

Theorising about cross-domain mapping is an aspect of music theory, rather than an aspect of music analysis, and it can be employed as tool in both. In this research project I combined music theory and music analysis, but my project is rooted in music analysis. Therefore, cross-domain mappings were presented in this thesis in a way that does not resemble the exhaustive cross-domain mappings that one would associate with music theory. Exhaustive cross-domain mappings cannot be done adequately from my analytical work on *Raga I* and *Raga* III – there are simply not enough observations on which one can base general discussions of cross-domain mappings. Cross-domain mappings are presented as a way to support an understanding of the work presented in the thesis, rather than to interrogate the interaction between musical forces and physical forces. This topic is argued further in Chapter 8 §2.6. My cross-domain mappings in this section of the cross-case analysis will necessarily be incomplete because of the more limited scope of the research question of this research project: Which expansions of the theory of musical forces can be proposed on the basis of analyses and comparisons of the different versions of Wim Henderickx's *Raga I* and *Raga III* in terms of Steve Larson's theory of musical forces?

The question that guides the section titled 'How do we Understand? – Metaphor' is taken in a limited sense to refer to the cross-domain mappings that are made in this thesis between physical forces and musical patterns. Metaphor is also taken in a limited sense to refer to the cognitive processes that allow us to create meaning in the sense that Larson describes the creation of meaning as hearing sound patterns in terms of musical forces. The most prominent metaphors that are applicable to the three cases are marked as subsections below and each applicable case is discussed individually.

2.3.1 Musical Succession Is Physical Motion

In all three cases the metaphor 'Musical Succession Is Physical Motion', a metaphor provided by Larson (2012:21), guided our understanding of how we create the manifold meanings of the different versions of the compositions. This metaphor provides for successive musical events, which relates to the salient horizontal operation of musical forces, and includes gravity and magnetism.

Case 1

The individuated elements described in this case are mostly musical successions that follow each other. These individuated elements, such as glissandi and trills-tremolos on stable tones, create a sense of motion through succession in musical gestures and towards the end of segments. The metaphor suggests that the successions created by the individuated elements are understood in terms of physical motion.

Case 2

The successive addition of material for percussion in *Raga III* causes the composition to maintain its movement, on a meso-level in terms of segments and on a macro-level in terms of the entire composition, in spite of the losses incurred through the attenuations of timbre. These additions were thus applied throughout the entire composition. Because the addition of this material is heard as successive, it is understood as physical motion on larger structural levels.

Case 3

The percussion part of *Raga I* displays a large density of successive attacks that create motion, especially in the second part of the composition. These dense successions are hardly interrupted in the accompanied versions of the composition, and not interrupted at all in the solo version. It is because of these continuous successions of attacks that the version for solo percussion is also understood as physical movement when it is compared with the other versions of the composition. The two cases above refer to the succession of pitch material, and this case refers to the succession of unpitched material. Both the pitched and unpitched material is shaped in rhythmic patterns. This indicates that successions in terms of both melodic and rhythmic forces are understood as physical motion.

2.3.2 Larger Volume of Sound increases Gravity

This metaphor guided our understanding of how we create meaning in these compositions in terms of the volume of sounds. This 'larger volume' is similar to a larger physical object that will be pulled with more force by gravity because of its size and, by implication, mass. The focus of this metaphor is on the force of gravity, and because it is not to be interpreted in terms of musical succession, like in the previous metaphor, the larger volume of sound can occur at any point in the unfolding of the music. It can be applied to single tones, musical gestures, and segments.

Case 1

Crescendos on unstable tones gradually increase the volume of those tones, causing them to be heavier and be pulled with a stronger force of gravity. Additions of instruments on unstable tones function similarly because they also create a larger volume of sound due to added individuated elements. This increases the operation of gravity, pulling the unstable material to descend to a stable platform.

Case 2

In this case we find the inverse of this metaphor, because the volume of sounds is reduced through various reduction methods of material. This is understood in terms of the metaphor as a decrease in gravity, because the gravitational pull on reduced volumes of sound is smaller.

Case 3

The micro-variations in the drone of *Raga III* help to maintain the perceived volume of sound of the drone, which enables listeners to remain constantly aware of the drone. The drone is thus not a simple sound event that can be omitted from listeners' perception, and because it is maintained in our perception it maintains a stable platform that exerts a constant pull of gravity. In this case it is not the material that is governed by the operation of gravity that has a greater tendency to give in to gravity, but the stable platform that has a large volume of sound and that increases that gravitational pull of the unstable material with which it is combined.

2.3.3 Operations of added Musical Agents amplify the Operation of Musical Forces

The metaphor that states that the operation of an added musical agent is the amplification of the operation of musical forces clearly shows the close relationship of agency with the operation of musical forces. An added musical agent can amplify the operation of musical forces by exerting the same force that it amplifies, or by exerting a new force to amplify another existing force.

Case 1

The addition of new musical material, such as an ascending pattern, adds magnetic forces because the unstable tones are attracted upwards to the closest stable tone and may continue to ascend, due to the operation of musical inertia, to the most stable tone. When the existing material descends due to the operation of gravity, and the stable goal tone of the existing descending pattern is the same as the stable goal tone of the added ascending pattern, the magnetism exerted by the added material amplifies the operation of gravity in the existing material.

Case 2

The added material for percussion in *Raga I* are agents in the 'individuated elements' class. If we expect the successive addition of material to continue to occur in other parts of the composition, it can be understood as the amplification of inertia. This is because we expect the pattern of addition to continue in the same way it started, albeit in a more abstract sense than the one in which Larson would discuss inertia. The operation of the added musical agent (material for percussion) thus amplifies a musical force (inertia).

Case 3

The addition of the drone as individuated element to *Raga III* amplifies the operation of musical forces. I do not mention a specific musical force here, because the added drone plays a significant role in the operation of melodic gravity, magnetism, inertia, and the operation of rhythmic forces. Although agents in the solo viola part, in the absence of the drone, indeed act in accordance with musical forces, the drone is an agent that amplifies their actions because the operation of the musical forces becomes stronger. This is a concept that might be difficult to grasp, because the drone is a simpler agent and a much simpler aspect of musical texture than the many agents of the orchestral part of *Raga III*, but its clear alignment with the operation of musical forces on a perceptual level allows it to act in ways that amplify the operation of musical forces more than the orchestral parts can.

2.3.4 Added Mass to Salient Musical Events increases Stability of Physical Objects

Although this metaphor specifically refers to stability and not forces, stability plays a key role in the operation of forces. In the physical world, a stable object is less likely to give in to the operation of forces than an unstable object. Although forces still operate on both the stable and unstable objects, the unstable objects are more likely to give in to the operation of those forces to become stable. When those objects are in stable positions and mass is added to them, their stability is increased further because they become less volatile to the operation of similar subsequent forces. This metaphor helps us to understand certain aspects of how musical forces operate.

Case 1

The addition of instruments to stable tones, to the resolution of unstable tones to stable tones, and to ends of segments that end on climaxes amplifies the stability we perceive in them. This is because the addition of instruments to stable tones adds tonal mass to those stable points and they become more salient. They are thus perceived as stable tones of which the stability is increased. Stability can be suddenly or gradually increased by adding tonal mass to stable tones. Although not in the same way or to the same extent, the addition of crescendos to stable tones also gradually increases the tonal mass of those tones. When the stability is increased or amplified, the subsequent operation of musical forces also becomes clearer.

Case 3

Certain lower percussive sounds, such as the bass drum and timpani, in the solo part of *Raga I* and some of the sounds with more piercing timbres, such as the tuned Thai gongs, function as stable objects in the music. When they start segments, they are heard as adding mass that provides stability for the operation of musical forces in subsequent material. When they are at other points in the segment and not starting the segment, the sound patterns that lead into these stable objects are characterised by the addition of rhythmic mass on various time scales. In other words, the operation of rhythmic forces acts on a micro- and meso-level to create the impression of added mass that increases the stability of certain reference points. The concept of mass is thus not only applicable to tonality where tonal stability is amplified, but also to rhythm where metric instability is amplified.

2.3.5 Change in Musical Events Is Change in Physical Objects

When musical events are changed, the changes are understood as a change of physical objects, but the forces that operate on those objects mostly remain the same forces although they might operate differently.

Case 1

Changes in register do not change stable tones, unstable tones, or the forces that operate on them, but they do change the way in which we perceive the stability or instability of tones, and the way in which forces operate on tones in different registers is different when those tones are compared in terms of musical forces. This is because the distance of the tones is different in relation to the stable platform, which allows us to see these tones as different objects.

Case 2

The change of instruments is understood as a change in physical objects. This is because the same musical patterns are performed on different musical instruments, which are different musical and physical objects. The forces that operate on those objects do not change, but the way in which we experience the operation of those forces is different.

Case 3

As already mentioned several times, the addition of the drone is a significant change in the musical event of *Raga III*. In this case the changed object is the orchestra part that was changed to the drone. This is again both a change in musical and physical objects. This significant change of the object enabled the forces that operate on the objects to change. Thus, both the forces themselves and the way in which they operate are changed.

3. <u>Part II: Comparable Literature</u>

The theory of musical forces was a topic that was worth further investigation and research for the scholars cited in this thesis and myself, and it is also an appealing theory to the research participants of this study and other scholars whose work is not discussed in detail in the thesis. I provide brief overviews of the research participants' comments that relate to the theory of musical forces and the recent work of scholars in the field of musical forces.

Research Participants

Wim Henderickx (2015c) said about musical forces: "[it] is an integral part of my own work. That is my universe, I only call it differently." Henderickx uses the terms 'tension' and 'relaxation' to refer to stable/unstable tones and the tendencies of unstable tones to resolve to stable tones. He also found the theory a structured way to understand motion in music. Gert François (2015) said that that musical forces are "part of the package when you are involved in music." He found my suggestions on further research on the operation of musical forces in unpitched percussion instruments a topic of interest, and many of his responses related to aspects of metric stability. Leo De Neve was particularly interested in how the operation of musical forces can be amplified, and how stable tones can be amplified in performances. He sees it as an integral part of performing that performers use "intuitively when you perform" (De Neve, 2015), but also as part of the technical preparation of compositions for performance.

Other Scholars

Heather Holmquest (2014) conducted research for her PhD at the University of Oregon for her thesis *Structure, musical forces, and musica ficta in fourteenth-century monophonic songs*. This research project expands on Larson's work and on the criticism by Cox, by applying the theory of musical forces to early Renaissance music. Because her focus is on monophonic music, she was able to illustrate clear applications of melodic forces on the music she analysed. Rhythmic forces and other expansions of theorists are not prominent in her thesis.

Adam Roy's (2015) MA-research dissertation *Music in motion: a metaphoric mapping of forces in Piano Concertos by Mozart and Schumann*, submitted to the University of Ottawa, illustrates an analytical process that was followed in terms of musical forces. Roy developed a tool for presenting analyses of melodic and rhythmic forces, and demonstrates how he employed this tool in the music of Mozart and Schumann to highlight aspects of the operation of musical forces. Similar to my research project, he expanded Larson's concepts by adding aspects of the theory as presented by Robert Hatten (2012b). He also added aspects of metre and rhythm to Larson's theory, adapted from the work of Christopher Hasty (1997). Although he devotes a part of his literature overview to the operation of rhythmic forces, it is not clear how they collaborate.

Jamie Keesecker is a young composer who conducted PhD research at Duke University. His thesis *Into the bends of time and music forces in jazz: group interaction and double-time in "My Foolish Heart" as performed by the Bill Evans Trio with Scott LaFaro and Paul Motian* focused on this specific jazz composition which he analysed in terms of how musical forces operate. He too expanded Larson's theory of musical forces by adding concepts of Hatten to perform his analyses of the composition. His work includes aural analyses, and discussions in terms of a close relation between performance and the operation of musical forces. He includes rhythmic forces in his work, but does not explain how rhythmic forces collaborate with melodic forces. However, he presents his analyses as integrated discussions of how both the rhythmic and melodic forces operate.

The work presented in the PhD thesis *Musical forces in Claude Vivier's* Wo bist du Licht! *and* Trois airs pour un opéra imaginaire, a thesis by Emilie Marshall (2016) from The University of Western Ontario adds ideas of spectral music analysis to the theory of musical forces. She also expanded Larson's theory by adding concepts of Hatten (2012b) and BaileyShea (2012) in order to work with Larson's theory on deeper integrated levels. Metaphors of motion are thoroughly discussed, as well as metaphors of timbre, which are important additions of Marshall's research project to the theory of musical forces.

4. Part III: Musical Forces – Concepts and Relationships between Concepts

In this section I conclude by defining the concepts and relationships between those concepts in order to expand the theory of musical forces on the basis of my analyses and comparisons of the different versions of Wim Henderickx's *Raga I* and *Raga III* in terms of Steve Larson's theory of musical forces. In this section I present expansions to Larson's theory of musical forces in terms of three groups of concepts:

- Amplification of musical forces,
- Collaboration of melodic forces and rhythmic forces, and
- Agency.

4.1 Amplification of Musical Forces

My first expansion to the theory of musical forces is that the operation of musical forces can be amplified. This amplification occurs in different ways that relate to how listeners perceive motion, how they create meaning, and how they understand what they hear in terms of metaphor. I specifically refer to 'musical forces' here, because the operation of both melodic and rhythmic forces can be amplified. In the paragraphs below I discuss the ways in which the operation of musical forces can be amplified.

The operation of musical forces can be amplified by changing the succession of musical events. Successive musical events that work in/by the operation of musical forces in similar ways allow for a sense of motion to arise. This is because the operation of musical forces governs musical patterns to move in a certain direction towards stability. This successive continuation of musical events allows for the sense of motion to be preserved when changes are made in terms of orchestration or instrumentation. This sense of motion is not necessarily preserved, but can also be amplified when the succession of musical events is made denser. For the amplification of melodic forces, individuated elements, such as glissandi or trills-tremolos, can be employed to change the succession of melodic events. For the amplification of rhythmic forces individuated elements, such as changes in duration and rhythm, can be employed to change the succession of rhythmic events.

The operation of musical forces can be amplified by changes in musical events. Our understanding of the operation of musical forces is determined by musical events. These musical events, such as changes of registers, changes in instrumentation, and adding a drone allow the interaction of stable and unstable tones to change and can be employed to amplify the operation of musical forces. Such musical events have a large scope of temporal duration within which they can be employed: they can be applied to a single tone only, or an entire composition.

The operation of musical forces can be amplified by changes in the volume of sound. The volume of sound plays an important role in how listeners perceive the stability/instability and tendencies of tones. When the volume of sound in stable tones is increased, the stability of those tones is amplified. When the volume of sound in unstable tones is increased, the tendencies of those tones to resolve to stable tones are amplified. These tendencies of unstable tones to resolve to stable tones are governed by the operation of musical forces, and the amplification of the tendencies is by implication an amplification of the forces that act on them. I specifically refer to 'changes' in the volume of sound and not 'increasing' the volume of sound, because in some instances the operation of musical forces can also be amplified when the volume of sound is reduced. The deliberate decrease of volume in sound to reduce the operation of musical forces is thus also possible, and considered an amplification of the vagueness or ambiguity of the ways in which forces can operate. Changes in the volume of sounds can be achieved by changes in dynamics, the addition and reduction of musical instruments, and drones.

The operation of musical forces can be amplified by changes in mass of salient musical events. Changes in mass can amplify stable tones and the tendencies of unstable tones to resolve to stable tones, governed by the operation of musical forces. When the tendencies of unstable tones to resolve to stable tones are amplified by changes in mass, the musical forces that cause those tendencies are also amplified. When the mass of salient musical events is increased, the operation of musical forces is amplified. When the mass of events is decreased, the operation of musical forces is reduced. These changes in mass can be either sudden or gradual changes, and can be applied to musical events of any temporal duration. Adding mass to salient music events can be done by adding new material, adding instruments to existing material, trills-tremolos, and changes in register.

In this section I only discussed the amplification of the operation of musical forces, which is an important musical event, but the operation of musical forces can also be over-amplified and reduced. I consider them as subcategories to the amplification of musical forces, because they are important aspects of the amplification of the operation of musical forces but not significant expansions of the theory of musical forces.

The ways in which the operation of musical forces can be amplified are ascribed to the actions of agents. These actions of agents are important in how the musical forces operate, but we can understand the operation of musical forces without involving agency. When we want to gain an understanding of how the operation of musical forces is amplified, we cannot gain a deep understanding of this notion without considering the actions of agents. Because Larson does not discuss the amplification of musical forces in his theory of musical forces, he did not encounter a point in his work– such as the point in the conclusion of Case 1 – where the addition of agency was vitally necessary. The amplification of musical forces is thus not my only expansion of Larson's theory. I also add agency in a specific way to the theory of musical forces. Agency is discussed further in §4.3 below.

4.2 Collaboration of Melodic Forces and Rhythmic Forces

Larson presents melodic forces and rhythmic forces separately in his theory, and he does not explicitly indicate how they collaborate. My expansion of the theory of musical forces in terms of rhythmic forces is twofold: 1) understanding rhythmic forces, and 2) understanding the collaboration between duration, rhythmic forces, and melodic forces.

Larson neglected several aspects when he wrote about the operation of rhythmic forces, most notably the operation of rhythmic forces in unpitched percussion instruments. I argue that sounds of unpitched percussion instruments can also create a sense of stability, instability, and motion. The operation of rhythmic forces in unpitched percussion instruments shows that the operation of rhythmic forces is not limited to how rhythmic patterns are shaped in metre, but to how we hear certain unpitched sounds as more stable than other unpitched sounds.

The way in which rhythmic and melodic forces collaborate is, to some extent, dependent on the duration of tones. Rhythmic and melodic forces do not always agree. The two extremes of duration, i.e. very short and very long durations, are an example of the disagreement of these forces. Very short durations can cause the operation of rhythmic forces to be clear and melodic forces to be unclear to listeners. Very long durations can also cause the operation of rhythmic forces to be clear and melodic forces to be hampered, but it is also possible that the operation of rhythmic and melodic forces is hampered. The operation of rhythmic forces can also be stronger than the operation of melodic forces and vice versa. The stronger and more prominent force will thus enable listeners to create more meaning in what they hear than the less prominent force will. When rhythmic and melodic forces coincide in their operation of fulfilment, we can refer to the culmination of their operations as a 'point of stability', which is stable in terms of metre and tonality.

4.3 Agency

The incorporation of agency in the theory of musical forces, as suggested by BaileyShea (2012), Graybill (2012:116), and Larson (2012:313), was already done in some work on musical forces – most notably the work of BaileyShea (2012), Hatten (2004, 2012b, 2015), and Peterson (2014). Although incorporating agency in musical forces is not a revolutionary approach in this research project, the way in which I incorporated agency in musical forces is different from the existing work in terms of the following:

- *Raga I* and *Raga III* are complex compositions that exist in different versions. Some of the versions are so diverse that they can be considered to be different compositions, instead of different versions of the same composition. These compositions also have extramusical dimensions, such as Wim Henderickx's collaboration with Gert François to compose *Raga I* (François, 2015), Leo De Neve to compose *Raga III* (De Neve, 2015), Martyn Brabbins to reduce *Raga III* (Henderickx, 2015b), and Jorrit Tamminga to create the drone for *Raga III* (Tamminga, 2016).
- My analyses are mainly intramusical, which involves individuated elements and work-persona that are intramusical agents, because I focus on sound patterns that can be heard in *Raga I* and *Raga III*.
- The abductive and inductive inference employed in the cases enabled me to categorise phenomena, interpret my observations, and draw conclusions by using analysis as a method. The work presented here is thus findings of my analyses and not examples of theoretical work.

- By using a case study approach, the cases are delimited in a way conducive to systematic work and they are analysed as exhaustively as necessary.
- I work with the fictional composer and performers, as well as the historical composer and performers. The interviews conducted as part of the data collection for this research project enabled me to gain insights from the composer and performers on my work.
- In both *Raga I* and *Raga III*, the work-persona of the composition changes in the different versions. This is an aspect that is not discussed by Monahan (2013).

Historical Agents: Performers, Conductors, and Composers

I work with fictional and historical agents in this research project, and the majority of my work about performers and the composer is presented in terms of historical agents. This is because I involved the performers and composer of *Raga I* and *Raga III* as research participants of this study, and conducted interviews with them. This is an important aspect of my study because the existing work on musical forces which involves people as agents is presented in terms of fictional agents, imagined agents, or performers as avatars of individuated elements. This work with historical agents enabled me to gain deeper understandings in the compositions I analysed and to understand the sound patterns I heard, as well as the complex musical contexts in which these compositions were created and are heard.

The physical movements of historical agents were observed in this study. Of the many empirical research projects in which scholars study the physical movements of performers, this part of my study relates to the work of scholars who work from music analysis to physical movements. This work on the physical movement of historical performers enabled me to theorise about the operation of musical forces in terms of existing compositions that are part of a historical context of events and people.

The amplification of musical forces influences the physical movements of historical agents such as soloists, ensemble members, and conductors.[1] These movements (motion) of historical agents are influenced by the acting of musical agents. The different compositions in Case 1 are clear instances of how physical movement is influenced by agents: there are more historical agents (performers and conductor) in the orchestral version than in the two piano version, and the way in which the orchestral members move is different from the way in which the two pianists move. The physical movements of the soloist in relation to the accompanying instruments are also different. These physical movements are aspects of the visual information conveyed by performers during performances.

Historical Agents: Other Analysts

I discuss the analyst as agent in the introduction of this chapter. Although that discussion refers to myself as agent in the analyses of *Raga I* and *Raga III*, I also included the work of other historical analysts. The work on musical forces by Robert Hatten (2012b) and Matthew BaileyShea (2012) was important contributions to the theory of musical forces that enabled me to expand aspects of Larson's theory in order to perform my analyses in terms of musical forces in the different cases. The work of these analysts, and correspondence with them, enabled me to gain deeper understandings of *Raga I* and *Raga III*. The analytical work of Holmquest, Roy,

[1] The interaction of these agents is discussed by François (2015): "Being a timpani player in an orchestra gives you all the friction you can get. What you need is metrical stability. Metric stability is when you aim to achieve perfection in a concert. Sometimes you achieve this perfection, and other times it is completely lost. I believe that we can sense metric stability to each other: what a pulse is and how we think about this pulsation with a hundred other people. The smallest deviation, however, can cause a disaster – then the music becomes very disorganised and does not flow. When you are with a hundred people and everyone plays at exactly the same time, you get an enormous force. You do not have to play fortississimo to reach this intensity, the 'bang' is perfectly on time and it is like the explosion of an atomic bomb. We had this experience two weeks ago in a concert when all of us suddenly had a loud 'bang' together in *The Firebird* of Igor Stravinsky. We did not play loudly, we just played at the impeccably right time."

Keesecker, and Marshall can also be employed in future research projects in musical forces and agency.

Presence and Absence of Individuated Elements

As discussed above, Larson does not include the amplification of musical forces in his theory. Because he does not compare the individuated elements between compositions, we can understand why he did not include amplification in his theory: he did not observe how the individuated elements influence the operation of musical forces. Larson's work in terms of individuated elements is thus limited to the individuated elements that are present in isolated compositions he discusses. If this was not the case, as in my study, Larson would have been able to also discuss the absence/omission of individuated elements and their influence on the operation of musical forces – this relates to the work presented in Case 2 and Case 3 of this study. In some of Larson's work he deliberately omitted some individuated elements, such as the accompaniment of *Twinkle, Twinkle, Little Star*, to discuss the operation of melodic forces in the melody. Although these individuated elements are deliberately omitted, Larson does not discuss the implications of this omission on the operation of musical forces. My study includes individuated elements that are present, added, and omitted, and how they influence the operation of musical forces.

Protagonism and Antagonism

Meaning is an important part of Larson's theory of musical forces, but his theoretical and interpretative work in terms of meaning is limited. I employed these limited definitions and descriptions of meaning, presented by Larson, as starting points to add new concepts, such as agency, to the theory of musical forces. The addition of individuated elements as agents that influence the operation of musical forces further enabled me to identify individuated elements that act in protagonistic and antagonistic ways.

5. Conclusion

The analyses and comparisons of the different versions of Wim Henderickx's *Raga I* and *Raga III* that were discussed in the three cases of this case study, as well as the coding, abductive inference, and inductive inference methods that were employed, enabled me to draw conclusions through which I can expand the theory of musical forces. The addition of the notion of agency in the cases enabled me to work with intramusical and extramusical aspects of musical forces, which contributed to deeper understandings of motion, meaning, and metaphor in terms of musical forces.

My expansions of Larson's theory of musical forces are not the only contributions to the theory. As I showed, other scholars are also working in this direction. In my thesis, various aspects of the theory of musical forces are clarified and brought in relation with other fields of study; I provide partial syntheses of different scholars' ideas on the theory, and identify aspects that can be researched in more depth. These aspects and their relationships are summarised in Diagram 7-2.

To clarify these aspects and their relationships, I colour-coded the diagram as follows:

- Aspects of Larson's theory and their relationships with other aspects or fields of research are marked in black.
- The work of other scholars and their relationships with the theory of musical forces are marked in green.
- The additions presented in this thesis and their relationships with the theory of musical forces are marked in red.

This diagram is not a theory, because I do not define concepts and relationships in the diagram, but rather present issues and topics that relate to the theory of musical forces.

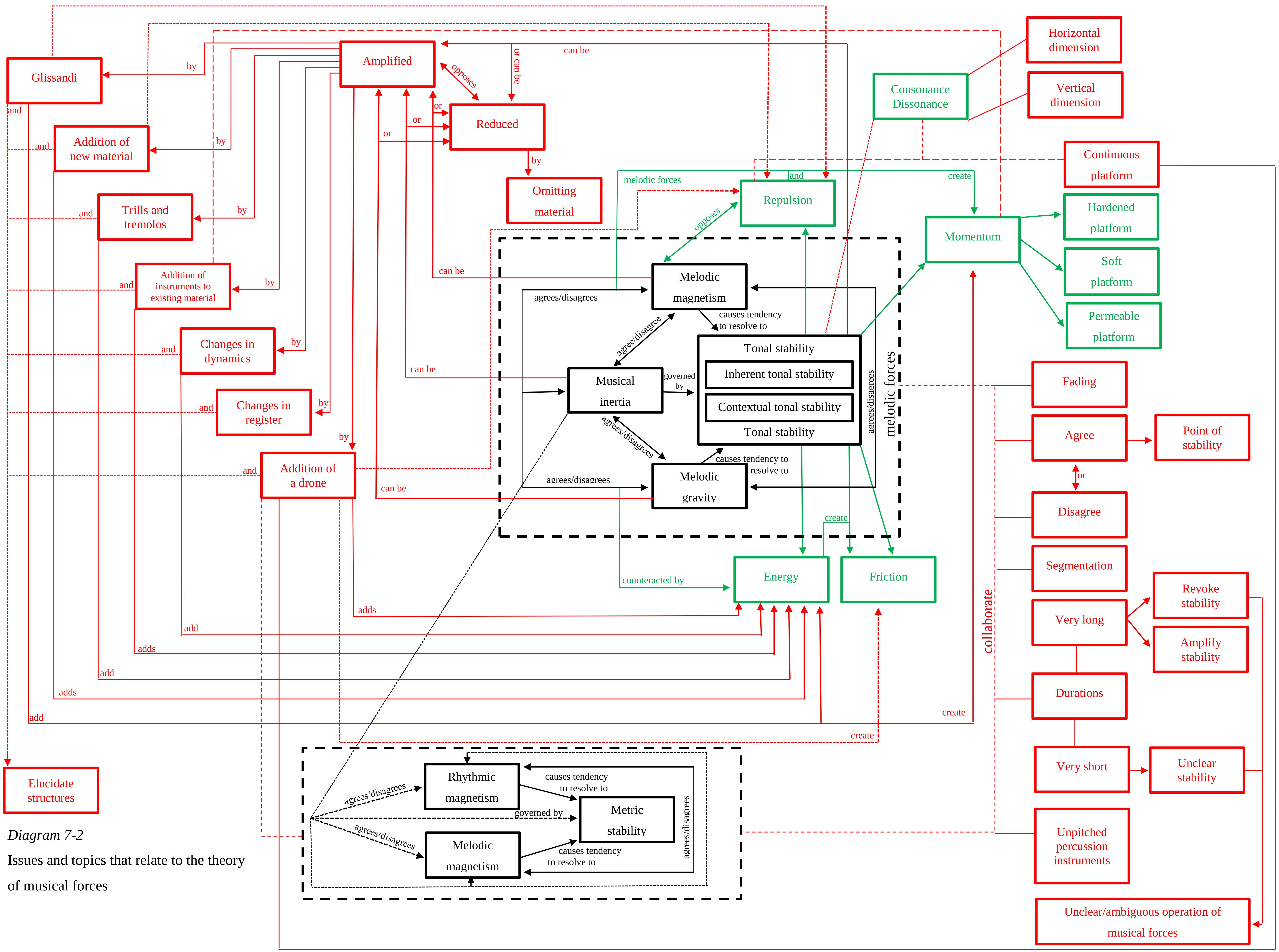


Diagram 7-2

Issues and topics that relate to the theory of musical forces

CHAPTER 8

Conclusions and Suggestions for further Study

I start this chapter with a brief critical reflection on this research project, discussing the value of this study and how it contributes to various fields of research in music. This forms the first part of the chapter. The second part of the chapter contains suggestions for further study: I propose future projects related to my work on musical forces and also studies that go beyond my expansions and additions to Larson's theory of musical forces.

1. Reflecting on the Research Project

Working with the music of Wim Henderickx through the lens of musical forces and by adding agency enabled me to work differently in music analysis. It offered the possibility to depart from the conventional ways in which I worked before this research project. By analysing complex music in terms of musical forces I was able to bring music analysis and the theory of musical forces in closer relation. This influenced my work as analyst and theorist because I had to think critically about these two concepts and the integration between them. I also had to tease out and unpack many of the concepts of other scholars to find ways to reconcile some of the differences and to clarify the central concepts of my work. This integration between analysis and music theory is one of the fundamental aspects in my work as composer. Thus, the findings from this research project do not only enable me to approach analyses differently or to understand music theory differently, but also to create differently when I compose. The intramusical and embodied aspects uncovered and employed in this study are directly related to the experience of listeners, the understanding of which is an important aspect of composition.

This research project also enriched me in many other ways, e.g. working in a niche area of research, connecting with other researchers in the field, opportunities to present my research at colloquia and conferences, discovering new related and unrelated literature, and travelling to Europe to conduct interviews with the research participants of this project to name but a few. Since my participants were all active and prominent artists – composers and performers – this enriched my work as composer beyond measure, and provided valuable inspiration into a fascinating world.

Although my aim was to expand Larson's theory of musical forces, and I worked elaborately in order to achieve this aim, I came to a similar central conclusion to that of Larson (2012:312-313) when he writes that there are certain limits to his claims in *Musical Forces*. Like Larson, I do not claim that the work presented in this thesis, added to Larson's theory of musical forces, completely explains the roles of musical forces in how we hear music. Furthermore, like Larson, I do not claim that musical forces are the only factors in determining our musical experience or in creating meaning. Some of Larson's claims, such as that gravity, magnetism, and inertia are not the only determinants in our experience of music, have already been addressed in this thesis. This means that even at the end of a project such as this, one needs to entertain the possibility of further additions and expansions, and the possibility that other scholars will hopefully understand the theory in other ways than what I presented here, and that this will lead to fruitful debate that will progressively pierce the 'aura of invisibility' of how we listen and how we understand.

Although this research project already had an impact on my work as analyst, theorist, and composer, it is certainly not a culmination of my work on the theory of musical forces. Working with the theory of musical forces promises to be a lifelong research project, which I intend to pursue to a great extent. The case study method brought many benefits that are also related to my career as artist and it seems wise to plan future projects with this in mind.

The suggestions for further research, presented in the section below, are thus encouraging invitations to researchers in other fields to consider including the theory of musical forces in their work, or to collaborate. Some of the suggestions for further research are more specifically aimed at researchers in the field of musical forces. I hope to be able to soon undertake some of these suggestions in my own future research.

2. Suggestions for Further Study

The theory of musical forces is an interdisciplinary theory that Steve Larson integrated with most major fields of research in music, fields which address topics such as music perception, music expectation, aural training, music analysis, music theory, composition, movement in music, and performance. This theory offers many opportunities for further research in fields where the theory of musical forces is already established, and also in fields where it is not yet established. In my suggestions for further research, I propose possibilities for further research that relates to some of the work presented in this thesis. I also suggest research possibilities related to work that was not presented in this thesis. These suggestions are centred on the following topics:

- music analysis (§2.1);
- composition, composition teaching and orchestration (§2.2);
- topics of research highlighted in the thesis (§2.3);
- quantitative and quasi-experimental research on the theoretical work presented in this thesis (§2.4);
- music education (§2.5);
- cross-domain mapping of physical forces and musical forces (§2.6);
- music and altered states of consciousness (§2.7); and
- ethnomusicology (§2.8).

2.1 Music Analysis

Larson (2012:180) states that the theory of musical forces is a powerful tool for music analysis and BaileyShea (2012) agrees with this statement. Apart from Larson's (2012:180-202) analyses, the theory of musical forces was also employed as a tool for music analysis by BaileyShea (2012), Holmquest (2014), Meyer (2014), Roy (2015), Keesecker (2016), Marshall (2016), and Meyer (2017b). Although the theory of musical forces can be employed as it currently stands as a tool to analyse music and to gain insight into the music that is analysed, the tool itself needs to be refined. This was not necessary for my research project or the analyses mentioned above, but it will be vital when the theory of musical forces becomes more prominent in the field of music analysis and coherence among approaches and findings of analysts is desired.

The following aspects of music analysis and the theory of musical forces can be researched:

- Which music can be analysed by employing the theory of musical forces as a research tool, or what adaptations to the theory of musical forces should be in place for different types of music?
- Which steps should be followed in order to analyse music in terms of musical forces?
- How can data be interpreted and presented when music is analysed in terms of musical forces?
- What challenges, constraints, exceptions, and deviations are possible when music is analysed in terms of musical forces?
- How can concepts of the theory of musical forces be brought in relation to standard music analysis?

2.2 Composition, Composition Teaching, and Orchestration

One of my findings is that the theory of musical forces, including my expansions of the theory, is a valuable tool for composers who create new compositions or orchestrate existing compositions.

When the theory of musical forces is presented to composers, including orchestrators, it will provide a new perspective on their work. The following aspects of this different angle can be studied further:

- How can the theory of musical forces be presented to composers and orchestrators?
- How can the theory of musical forces improve teaching of composition and orchestration?
- What constructive implications do the addition of the theory of musical forces have on existing principles of orchestration such as those identified by Adler (1982), Belkin (2008), Berlioz & Strauss (1948), Collinson (1941), Jacob (1962), Jacob (1977), Kennan & Grantham (1997), Koechlin (1955), McKay (1969), Parrott (1957), Piston (1980), Rauscher (1963), Read (1976), Rimsky-Korsakov (1964), Wagner (1959), and Widor (1946)?
- How does an awareness of the operation of musical forces, and its influence on listeners' expectations, influence compositions and the work of composers and orchestrators?

An aspect that needs to be clarified when the theory of musical forces is taught to students of composition and orchestration is this: composers do not necessarily need to amplify the operation of musical forces; they can also counteract the operation of musical forces – depending on what they wish to achieve. However, this can only be done when they are aware of how musical forces operate in the music they compose.

2.3 Topics of Research highlighted in the Thesis

Some discussions, arguments, and explanations of literature and other topics of research were not repeated or discussed in detail in the thesis because they are not related to the work covered in this research project. Some of my observations, interpretations, and arguments in the thesis are related to the work covered in this research project, but they are not within the scope of the project. As argued in some sections of this thesis, discussions would thus not have contributed to rigorously answering the research questions, but they would have contributed to situate the theory of musical forces in other fields of research or vice versa. I list these as possibilities for further research:

a) One can pursue deeper insights into the music of Wim Henderickx. The music of Henderickx can be studied in different ways in order to gain deeper insights into his music. How can analysis in terms of the theory of musical forces be employed to gain deeper insights into Henderickx's music?

b) I presented critical discussions of certain concepts in Chapter 2, specifically between consonance, dissonance, stability, and instability. Although I brought these terms in relation with each other and contextualised them in the theory of musical forces, they remain unclear to some extent. For example, this will be more evident when brought in relation with Straus's (1997) writings about prolongation. These terms, among others, can be clarified further and brought into relation with wider theoretical frameworks.

c) Spectral analysis, hearing range of listeners, and the role of overtones in the operation of musical forces are fundamental topics in research on acoustics and the physical science of music. Spectral analyses and filtering or changing overtones can be employed to further investigate the influence of overtones in the way listeners hear the operation of musical forces.

d) Further research on the operation of musical forces through different musical instruments could also be grounded in research conducted in the fields of acoustics and psychoacoustics. Specific aspects that can be included here are the differences between instrument groups, instruments with sympathetic strings, and alternative performance techniques on instruments. For example, how does the operation of musical forces compare when the same material is performed col legno on a violin and pizzicato on a violoncello? Or how does the operation of musical forces compare when the same material is performed on a viola and a viola d'amore?

e) The operation of musical forces in different tempering systems, such as the meantone temperament, well temperament, and equal temperament can be investigated in an acoustic or a historic study. Such a study will also shed new light on the operation of musical forces in historical performance practices and instruments. This will also show why it is important for scholars to situate themselves in studies that relate to the operation of musical forces.

f) The operation of musical forces, dynamics, and volume. I discussed the operation of musical forces when the dynamics change, such as in the case of crescendos and decrescendos, in Chapter 4. However, the operation of musical forces in/through material with different dynamic levels and concurrent material with different dynamic markings can be investigated further. For example, if the operation of musical forces changes when the music gets gradually louder, does is also change when the music is suddenly louder? And do musical forces operate in the same way when a recording is played at a higher volume than another recording?

g) The operation of musical forces in instruments with sustain pedals or instruments that can sustain tones can be investigated further with regard to these specific aspects. For example, a stable tone that is sustained in the pedal of an organ will provide more stability than a stable tone that is sustained in a piano with the use of the sustain pedal.

h) The addition of a drone proved to have a significant influence, specifically on how melodic forces operate. Would the addition of continuous undifferentiated clicks or metronome clicks influence the operation of rhythmic forces in unpitched percussion instruments in a similar way? An analysis of the rhythmic content of *Raga I* for percussion solo in terms of rhythmic forces can also contribute to new ways of understanding the composition better, especially because the rhythmic content (tāla) is the primary focus of the composition.

i) Hierarchies of stability in the sounds of unpitched percussion instruments. Metric stability in unpitched percussion instruments can be investigated and quantified, in the same way that tonal stability was studied by Krumhansl and Kessler, Lerdahl, and Margulis. Such research will enable scholars to quantify metric stability and create hierarchies for the different unpitched percussion instruments in terms of how they influence listeners' perception of stability in music.

j) The interaction of melodic forces and rhythmic forces; criteria to determine whether a discussion in terms of only melodic or only rhythmic forces is adequate, and when both should be used. The interaction of melodic forces and rhythmic forces can be quantified in order to determine how they operate and when one force is more prominent than the other. This will enable scholars who employ the theory of musical forces in their analyses to determine whether their discussions are adequate in terms of only melodic or rhythmic forces.

k) The contribution of rhythmic forces to structure. Inquiry into the interaction of melodic and rhythmic forces will elucidate aspects of structure and how rhythmic forces contribute to listeners' perception of the different levels of structure of compositions. In such an inquiry, scholars might want to return to work with unpitched percussion instruments and investigate roles of timbre in our understanding of structure in order to determine to what extent rhythmic forces shape listeners' perception of structure. Working with undifferentiated clicks might also enable scholars to determine the role of timbre in shaping structure.

2.4 Quantitative and Quasi-Experimental Research

Larson validated the theoretical aspects of his work on his theory of musical forces with empirical evidence gathered from experiments in visual perception and neuroscience (Larson, 2012:212-225), compositions and improvisations (Larson, 2012:226-250), music-theoretical misunderstandings (Larson, 2006; Larson, 2012:251-263), a listener-judgment experiment (Larson, 2012:264-272), and comparing computer models with production-experiment results (Larson, 2012:273-307). Several research projects were conducted by Larson over twenty years in order to gain evidence and support for his theoretical work. The theoretical work of his theory of musical forces preceded his empirical research and this theoretical work formed the basis of the empirical research that was conducted. Some of the empirical work also allowed Larson to expand his theoretical work.

The expansions of Larson's theory of musical forces and other theoretical work presented in this thesis can also serve as theoretical bases for quasi-experimental and empirical research, similar to those of Larson. More specifically, listeners can participate in a research project where they have to compare recordings of different versions of the same composition in which the operation of musical forces is amplified in the one version. Their feedback can be valuable for determining how different listeners hear the amplification of musical forces and how listeners describe what they hear.

Other aspects discussed in this thesis, such as the interaction of melodic and rhythmic forces or aural segmentation with the absence and presence of a drone, among other expansions, can also be researched empirically when listeners participate in the research project. Such a research project will require the observers of these experiments to determine how musical forces operate in the music they hear and to ensure that ambiguities that can influence listeners' hearing of how musical forces operate are better understood. It will be valuable to take problematic aspects of perception, music psychology, and music theory (Ariello, 1994; Cook, 1994) into consideration in order to avoid an "unstructured 'leakage' between the disciplines" as Clarke (1989:2) puts it, or the "mistranslation [...] of concepts from one discipline to the other" as Cook (1994:92) puts it.

All the expansions suggested in this thesis can be tested empirically on participants, which will not only support and serve as proof for the theoretical work of the thesis, but can also be employed to further improve theoretical work on the expansion of the theory of musical forces when findings are made.

2.5 Music Education

Larson (2012:314) writes that the value of a theory can be tested by investigating how that theory helps us to improve teaching. The theory of musical forces was applied by Larson in two fields of music education: aural skills training (Larson, 1992, 1993c; Hurwitz & Larson, 1994) and counterpoint (Larson, 1994a). I found these works by Larson valuable additions to music education, because they can be employed to improve aural skills and lead to better insight into Fux's species counterpoint and Martin's (2005) approach of species counterpoint based on Schenker's counterpoint. Larson's (1992; 1993c) work on aural training illustrates how his theory of musical forces can be employed to improve aural skills and he provides practical worksheets that can be used by teachers for these purposes. His work (Larson, 1994a) on counterpoint focuses on Johann Joseph Fux's species of counterpoint and he explains how an understanding of musical forces can lead to a better understanding of species counterpoint. However, it is unclear what the prerequisites for students would be in terms of age, experience, and prior knowledge.

In order to employ the theory of musical forces, students need to study the theory of musical forces. Teaching the theory of musical forces itself can also be researched further and the following problems can be considered in such a research project:

- When and how can the theory of musical forces be introduced?
- What prior knowledge is necessary for students in order to comprehend the theory of musical forces?
- Is an inclusion of physical forces, metaphorical interpretations, and cross-domain mapping necessary to learn about the operation of musical forces?
- How can the theory of musical forces be applied in order to support students who prepare for examinations by external examinations boards?

Case study research or action research can be conducted in order to answer these questions and conduct further research into the theory of musical forces and music education.

2.6 Cross-Domain Mapping of Physical Forces and Musical Forces

Larson's theory of musical forces has its origin in Arnheim's cross-domain mappings between visual and physical forces. In Larson's work, physical forces constitute the source domain and musical forces constitute the target domain. Larson (2012:316) writes that he "[does] not claim that musical forces have the same universality or 'natural' status that physical forces do" and that "it appears that the tendency to conceptualize music in terms of physical motion *is* a worldwide phenomenon". Cross-domain mapping is a valuable tool that enhances our understanding of abstract concepts because those abstract concepts are derived from concrete concepts that become abstract in the process of cross-domain mapping.

My expansions of Larson's theory of musical forces took place in the target domain (musical forces) only, with limited influence from the source domain (physical forces). My focus on the target domain can be ascribed to the fact that my research involves imagined listeners and how they hear the operation of musical forces. Teasing out the topic of cross-domain mapping and further unpacking the metaphors employed in this study are not deemed unimportant, but lie outside the scope of this research project. Although Larson (2012) often refers to aspects of physical forces and explains how some of his work is supported by the operation of physical forces, it might be valuable to more rigorously investigate how the target domain (the theory of musical forces) maps onto the source domain (physical forces) – to determine the accuracy of the cross-domain mapping of the source domain (physical forces) onto the target domain (the theory of musical forces) – and whether aspects of the source domain can be calculated scientifically when they are mapped onto the target domain

My expansions of the theory of musical forces were informed by aspects of my understanding of how physical forces operate, but I did not discuss the metaphorical interpretations and cross-domain mappings of my expansions. I am convinced that such cross-domain mappings will elucidate aspects of my expansions further, and situate my expansions within the cross-domain mapping of physical forces (source domain) and musical forces (target domain).

2.7 Music and Altered States of Consciousness

Music can be employed to changes states of consciousness (Fachner & Aldridge, 2005; Kreitler, 2017), and I believe that the theory of musical forces can be employed efficiently as a theoretical basis to shed new light on research of the music involved in these altered states of consciousness. The theory of musical forces, importantly both melodic forces and rhythmic forces, can be employed to investigate the operation of musical forces in music used to alter states of consciousness. An interpretative phenomenological analysis can be conducted to study the lived experiences of research participants and research further aspects of the theory of musical forces and altered states of consciousness. Such research can be conducted to expand existing research of traditional trance music (Rouget, 1985; Becker, 2004; Pilch, 2005), meditational music (Hennion, 2002; Diaz, 2011), hypnotic music (Kennaway, 2012), glossolalia (Rockower, 2011), and aspects of the music that can serve as catalysts for these altered states of consciousness.

2.8 Ethnomusicology

Larson expressed his interest in musical cultures and the operation of musical forces. One of Larson's (2012:317) prospects were to investigate "[t]o what extent are the ideas described in this book shared by different cultures, and what differences do the differences make?" He (Larson, 2012:317-320) provides several possibilities that can be researched to investigate musical universalities and cultural differences.[1] In support of Larson's search for similarities and differences in different cultures the theory of musical forces, as well as my expansions of the theory, can be employed in ethnomusicological research projects. Findings of these research projects can serve as valuable additions to the role that culture plays in how listeners hear the operation of musical forces.

The theory of musical forces can also be employed as a valuable research tool to investigate cultural understandings of music in terms of meaning, motion, physical gestures, tension, dance, and performance practices. Larson's work (Larson, 2012) included a thorough study of

[1] These possibilities include an investigation into musical cultures and sounds as meanings; the shaping of musical time map onto the shaping of non-musical time; the reflection of cultural values and ideas; embodied meanings; experience of musical motions as physical gestures; musical space and physical space; language and speech; musical states and goals; tonality and meter; and step collections (Larson, 2012:317-320).

literature of Western music theory, and he addressed music-theoretical misunderstandings from a historic point of view (Larson, 2012:251-265, 2006:61-74) to gain a deeper insight into the historical contexts of literature that relates to the theory of musical forces. A similar approach can be followed with literature of different cultures in different times. Further research can also be conducted in the form of an ethnographic study, for which music recording, music transcription, and cross-cultural analysis through fieldwork will be suitable methods.

ADDENDA

The addenda listed below are attached to this thesis.

ADDENDUM A

Biographies of Steve Larson and Rudolf Arnheim

1. Steve Larson (1955-2011)

1.1 Short Biography

Steve Larson was born on 30 December 1955 in Corvallis, Oregon, United States of America. He graduated from Corvallis High School in 1974 and completed a BA in music and an MA in music theory from the University of Oregon, as well as a PhD in music theory from the University of Michigan. His PhD thesis entitled *Schenkerian Analysis of Modern Jazz* was nominated for an Outstanding Dissertation Award after its completion in 1987. Larson was a Visiting Faculty Research Associate at Douglas Hofstadter's Center for Research on Concepts and Cognition of Indiana University in 1992-1993 and 2002-2003. He taught at Temple University from 1987 to 1992 and the University of Washington from 1994 to 1996. He later became Robert M. Trotter Professor in Music at the University of Oregon School of Music and Dance.

Larson was also a leader of a music research group called THEME and a member of the University of Oregon Institute of Cognitive and Decision Sciences. His many research outputs are mainly on musicological research, cognitive science, and jazz music and were published in leading academic journals and books which include *The New Grove Dictionary of American Music* and *The New Grove Dictionary of Jazz*.

Image A-1

Professor Steve Larson[1]

Apart from his research and teaching career, he was also an active performer. He was countertenor for *Ars Musica* and the pianist for *Jazz Piano Collective* and *The Steve Larson Trio*.

Larson was diagnosed with brain cancer in 2010 and passed away on 7 June 2011. The University of Oregon established a memorial fund for music theory, unveiled a plaque and planted a maple tree at the university in his memory.

[1] Anon. (2011b:18).

Larson was survived by his wife, Sonja Rasmussen and his two children, Eric and Hannah, among other close relatives (Anon., 2011a). *Music Theory Online: A Journal of the Society for Music Theory* published volume 18.3 of this online journal as a Festschrift in memory of Steve Larson that features nine papers from a memorial conference that took place in 2012.

1.2 List of Publications by Steve Larson

Johnson, M. & Larson, S. 2003. "Something in the Way She Moves." *Metaphor and Symbol*, 18(2):63-84.

Larson, S. 1982. 'Yellow Bell' and a Jazz Paradigm. *In Theory Only*, 6(3):31-46.

Larson, S. 1987a. A Tonal Model of an 'Atonal' Piece: Schoenberg's Opus 15, Number 2. *Perspectives of New Music*, 25:418-433.

Larson, S. 1987b. Questions about the *Ursatz*: A Response to Neumeyer. *In Theory Only*, 10(4):11-31.

Larson, S. 1992. Scale-Degree Function: Cognition Research and Its Application to Aural-Skills Pedagogy. Research paper published as Technical Report #67 of The Center for Research on Concepts and Cognition (CRCC). pp. 1-22.

Larson, S. 1993a. On Rudolf Arnheim's Contributions to Music Theory. *Journal of Aesthetic Education*, 27(4):97-104.

Larson, S. 1993b. Dave McKenna's Performance of 'Have You Met Miss Jones?' *American Music*, 11(3):283-315.

Larson, S. 1993c. Modeling Melodic Expectation: Using Three 'Musical Forces' to Predict Melodic Continuations. (*In* Proceedings of the Fifteenth Annual Conference of the Cognitive Science Society. Hillsdale: Lawrence Erlbaum Associates. pp.629-634.)

Larson, S. 1993d. Scale-Degree Function: A Theory of Expressive Meaning and Its Application to Aural-Skills Pedagogy. *Journal of Music Theory Pedagogy*, 7:69-84.

Larson, S. 1994a. Another Look at Schenker's *Counterpoint*. *Indiana Theory Review*, 15(1):35-52.

Larson, S. 1994b. Musical Forces, Step Collections, Tonal Pitch Space, and Melodic Expectation. (*In* Proceedings of the Third International Conference of Music Perception and Cognition, Belgium. pp.227-229.)

Larson, S. 1995. 'Integrated Music Learning' and Improvisation: Teaching Musicianship and Theory through 'Menus, Maps, and Models'. *College Music Symposium*, 35:76-90.

Larson, S. 1996a. The Art of Charlie Parker's Rhetoric. *Annual Review of Jazz Studies*, 8:141-166.

Larson, S. 1996b. Strict Use of Analytic Notation. *Journal of Music Theory Pedagogy*, 10:31-71.

Larson, S. 1997a. Continuations as Completions: Studying Melodic Expectation in the Creative Microdomain *Seek Well*. (*In* Leman, M., *ed.* Music, Gestalt, and Computing: Studies in Cognitive and Systematic Musicology. Berlin: Springer-Verlag. pp.321-334.)

Larson, S. 1997b. The Problem of Prolongation in *Tonal* Music: Terminology, Perception, and Expressive Meaning. *Journal of Music Theory*, 41(1):101-136.

Larson, S. 1997-98. Musical Forces and Melodic Patterns. *Theory and Practice*, 22-23:55-71.

Larson, S. 1997c. Triple Play: Bill Evans' Three-Piano Performance of Victor Young's 'Stella by Starlight'. *Annual Review of Jazz Studies*, 9:45-56. Response to Forte's Questions, pp.105-107.

Larson, S. 1998. Schenkerian Analysis of Modern Jazz: Questions about Method. *Music Theory Spectrum*, 20(2):209-241.

Larson, S. 1999a. Reviews of The American Popular Ballad of the Golden Era, 1924-1950, by Allen Forte; The Music of Gershwin, by Steve Gilbert; and Charlie Parker and Thematic Improvisation by Henry Martin. *Music Theory Spectrum*, 21(1):110-121.

Larson, S. 1999b. Swing and Motive in Three Performances by Oscar Peterson. *Journal of Music Theory*, 43(2):283-313.

Larson, S. 2001. What Makes a Good Bridge? *Tijdschrift voor Musiektheorie/Dutch Journal of Music Theory*, 8(1):1-15.

Larson, S. 2002. Musical Forces, Melodic Expectation, and Jazz Melody. *Music Perception: An Interdisciplinary Journal*, 19(3):351-385.

Larson, S. 2003. Recapitulation Recomposition in the Sonata-Form First Movements of Haydn's String Quartets: Style Change and Compositional Technique. *Musical Analysis*, 22:1-2, 139-177.

Larson, S. 2004. 'Musical Forces' and Melodic Expectations: Comparing Computer Models and Experimental Results. *Music Perception: An Interdisciplinary Journal*, 21(4):457-498.

Larson, S. 2005. Composition versus Improvisation? *Journal of Music Theory*, 49(2):241-275.

Larson, S. 2006a. Musical Gesture and Musical Forces: Evidence from Music-Theoretical Misunderstandings. (*In* Gritten, A. & King, E., *eds*. Music and Gesture. Hampshire: Ashgate. pp.61-74.)

Larson, S. 2006b. Rhythmic Displacement in the Music of Bill Evans. (*In* Gagné, D. & Burstein, P., *eds*. Structure and Meaning in Tonal Music: A Festschrift for Carl Schachter. Hillsdale: Pendragon. pp.103-122.)

Larson, S. & Johnson, M. 2002-03. Architectural Metaphors in Music Discourse and Music Experience. *Yearbook of Comparative and General Literature*, 50:141-154.

Larson, S. 2012. Expressive Meaning and Musical Structure, Chapter 1 of *Schenkerian Analysis: Pattern, Form and Expressive Meaning*. *Music Theory Online*, 18(3).

Larson, S. & VanHandel, L. 2005. Measuring Musical Forces. *Music Perception: An Interdisciplinary Journal*, 23(2):119-136.

1.3 List of Dissertations and Theses by Steve Larson

Larson, S. 1981. Some Aspects of the Album *Out of the Woods* by the Chamber Ensemble 'Oregon'. Eugene: University of Oregon. (Thesis – MMus).

Larson, S. 1987c. Schenkerian Analysis of Modern Jazz. Ann Arbor: University of Michigan. (Dissertation – PhD).

1.4 List of Books by Steve Larson

Larson, S. 2009. Analyzing Jazz – A Schenkerian Perspective. Hillsdale: Pendragon.

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

1.5 List of Conference Papers and Posters by Steve Larson

Larson, S. 1987d. Integration in Jazz Performance: Concealed Repetition in Oscar Peterson's Performance of Thelonious Monk's "'round midnight". Paper presented at the Society for Music Theory Annual Conference.

Larson, S. 1988. Analyzing Jazz 'Strategies': Two Performances by Bill Evans. Paper presented at the Sonneck Society Conference.

Larson, S. 1992. Scale-Degree Function: Cognition Research and Its Application to Aural-Skills Pedagogy. Presentation to the SMT Special Session on Cognition Research and Its Application to Aural-Skills Pedagogy, National Meeting of the Society for Music Theory, Kansas City.

Larson, S. 1993e. Computer Models of Melodic Implication and Key Determination in Tonal Music. Presentation to the Society for Music Perception and Cognition, Philadelphia.

Larson, S. 1996c. Jazz Recipes. Paper presented at the West Coast Conference of Music Theory and Analysis.

Larson, S. 1996d. Expert Expectations: Professional Theorists' Continuations Compared with a Computer Model of Musical Forces. National Meeting of the Society for Music Theory, Baton Rouge. Current Research in Music Cognition and Aural Training [poster].

Larson, S. 1997d. Great Expectations: The Interdisciplinary Promise of a Theory of Expressive Meaning in Music. In a study session titled "Implications for Mainstream Musicology of Recent Research in Music Cognition" at the meeting of the International Musicology Society, London.

Larson, S. 1999c. Musical Imagery and Melodic Expectation. Paper presented at the Conference on Musical Imagery, Oslo, Norway.

Larson, S. & Waters, K. 2004. Conversations with Monk and Evans. Paper presented at the West Coast Conference of Music Theory and Analysis.

Larson, S., Waters, K., Strunk, S. & Martin, H. 2009. Circular Thinking: A roundtable on 'Blue in Green' and "Nefertiti'. Paper presented at the Annual Meeting of the Society for Music Theory, Montreal.

2. Rudolf Arnheim (1904-2007)

2.1 Short Biography

This short biography of Rudolf Arnheim is compiled from the following sources: Arnheim (1981), Diederichs (1997), Fox (2007), Shteyrenberg (2002) and Verstegen (1996:197-213).

Rudolf Julius Arnheim was born on 15 July 1904 on Alexanderplatz, Berlin. The oldest of his three sisters, Leni, married the German artist and art historian, Kurt Badt, who influenced Rudolf Arnheim's life and career significantly. In 1923 he enrolled at the University of Berlin, studying psychology and philosophy as major subjects, and art history and the history of music as secondary subjects. He also studied Gestalt psychology with Max Wertheimer, one of the founders of the Gestalt psychology, as his mentor and advisor. In 1928 he became the junior editor of *Die Weltbühne* and four years later, in 1932, his book entitled *Film als Kunst* appeared.

Shortly after the publication of this book, sales of the book were no longer permitted because of his Jewish ancestry. *Die Weltbühne* was also discontinued and Arnheim fled to Rome to continue his writings. In 1940 he emigrated to America where he later received a fellowship from the Rockefeller Foundation and a Guggenheim Fellowship.

From 1943 to 1968 Arnheim was professor in psychology at the Sarah Lawrence College in Bronxville, New York. One of his most important books, *Art and Visual Perception: A Psychology of the Creative Eye*, appeared in 1951.

Image A-2

Rudolf Arnheim – © National Portrait Gallery, London

From 1968 to 1974 he was Professor of the Psychology of Art at Harvard University and after his retirement from Harvard he became associated with the University of Michigan where he taught as visiting professor. Arnheim passed away at his home in Ann Arbor, Michigan, on 9 June 2007 at the age of 102.

2.2 Rudolf Arnheim and Music

An important contribution by Rudolf Arnheim to music[2], and one of the articles that served as the basis of Steve Larson's analogy on Arnheim's work in order to develop his theory of musical forces, is Arnheim's article *Perceptual Dynamics in Musical Expression* (Arnheim, 1984). The most important aspects of this article that are relevant to Steve Larson's analogy, and later his theory of musical forces, are summarised here.

Arnheim (1984:295) writes that "[i]n the visual arts, consideration of the "directed tensions" that animate shapes, color relations, and motion has led to a theory of visual expression that has promising analogies in music". Arnheim (1984:296) also states that "in aesthetic theory one cannot adequately account for the nature of a visual statement without referring to it as a pattern of forces" and that "[t]his is all the more true for music because, by the very nature of the auditory medium, tones are perceived not as objects but as activities, generated by some source of energy". According to Arnheim, there are thus forces that cause tones to move to other tones in a melody. These forces exist because they have their own "inherent power" and the forces are seen as a deviation from a "norm base" at which there is minimum tension.[3]

---

[2] Like Steve Larson, Patricia Carpenter (1993) also elaborated on Arnheim's writings on music. Her article deals with Arnheim's theory and the teaching of music.

[3] Arnheim (1984:298) writes that the deviancy is either pushing toward the base or pulling away from the base.

The "norm base" is put into the perspective of Western music and interpreted as the "tonal center [sic]". Arnheim (1984:298) uses the major scale as an exemplar and writes that "the relation of the various pitches to the level of keynote is thoroughly dynamic and constitutes a principal perceptual source of musical expression. It is not merely a matter of measurable distance from the keynote but of the tension generated by the attractive power of the base. The configuration of forces that determines the dynamic action of a given tone includes the reference to the tonal base quite prominently. Above the keynote, the melody takes off by overcoming the attraction of the base through its own upward-directed impulse; below it, the melody moves downward against the resistance of the base." Arnheim (1984:299) also discusses the interaction of the "gravitational vector" and a "magnetic pull" as forces toward the tonal centre, stating that the gravitational vector causes a downward pull and the magnetic pull can be upward or downward.

The remainder of the article deals with major and minor scales and Arnheim uses two melodies (*Träumerei* by Schumann and the viola part of *String Quartet no. 6* by Bartók) as examples to illustrate his theory. Although Arnheim (1984:307) acknowledges that "a piece of music is not simply a linear event", he does not elaborate on how his theory can be applied in instances which involve more than linear events.

ADDENDUM B

List of Orchestrated Compositions

Table B-1 shows compositions I studied before or orchestrated compositions that are known to me. I did not attempt to create a comprehensive list of orchestrated compositions here.

	ORIGINAL VERSION			ORCHESTRATED VERSION		
Composition Title	**Composer**	**Instrumentation**	**Year**	**Composer**	**Instrumentation**	**Year**
Iberia suite	Isaac Albéniz	Piano	1905-1909	Enrique Fernández Arbós	Orchestra	1910-1925
Fantasie and fuge in C minor, BWV 537	Johann Sebastian Bach	Organ	1723	Edward Elgar	Orchestra	1921-1922
Schmücke dich, o liebe Seele, BWV 654	Johann Sebastian Bach	Soloists, choir, Baroque ensemble	1724	Arnold Schönberg	Orchestra	1922
Komm, Gott Schöpfer, Heiliger Geist, BWV 667	Johann Sebastian Bach	Organ	1708-1717	Arnold Schönberg	Orchestra	1922
Prelude and fugue in E♭ major, "St. Anne", BWV 552	Johann Sebastian Bach	Organ	1739	Arnold Schönberg	Orchestra	1928
Ricercar a 6, BWV 1079	Johann Sebastian Bach	Harpsichord	1747	Anton Webern	Orchestra	1935
Romanian folk dances, Sz. 56 BB 68	**Béla Bartók**	**Piano**	**1915**	**Béla Bartók**	**Orchestra**	**1917**
Transylvanian dances, Sz. 96 BB 102 (Sonatina, Sz. 55 BB 69)	**Béla Bartók**	**Piano**	**1915**	**Béla Bartók**	**Orchestra**	**1931**
The philosophy of composition	**Michael Blake**	**Violoncello, piano**	**2009**	**Michael Blake**	**Orchestra**	**2013**

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Livre pour cordes	**Pierre Boulez**	**String quartet**	**1948-2012**	**Pierre Boulez**	**String orchestra**	**1968-1989**
String Quintet No. 2 in G major, Opus 111	Johannes Brahms	String quintet	1890	Peter Klatzow	Orchestra	1991
Piano quartet no. 1 in G minor, Opus 25	Johannes Brahms	Piano quartet	1856-1861	Arnold Schönberg	Orchestra	1937
Variations and fugue on a theme by Händel, Opus 24	Johannes Brahms	Piano	1861	Edmund Rubbra	Orchestra	1938
Liebeslieder Walzer	**Johannes Brahms**	**Voices, piano duet**	**1870-1875**	**Johannes Brahms**	**Voices, orchestra**	**1870**
Joyeuse marche	**Emmanuel Chabrier**	**Piano (four hands)**	**1885**	**Emmanuel Chabrier**	**Orchestra**	**1889**
Suite Pastorale	**Emmanuel Chabrier**	**Piano**	**1880**	**Emmanuel Chabrier**	**Orchestra**	**1888**
Funeral march	Frédéric Chopin	Piano	1839	Edward Elgar	Orchestra	1933
Proclamation	Aaron Copland	Piano	1973-1982	Phillip Ramey	Orchestra	1985
Préludes	Claude Debussy	Piano	1909-1913	Colin Matthews	Orchestra	2007
Legends, Opus 59	**Antonín Dvořák**	**Piano duet**	**1881**	**Antonín Dvořák**	**Orchestra**	**1881**
Biblical songs	**Antonín Dvořák**	**Voice, piano**	**1894**	**Antonín Dvořák**	**Voice, orchestra**	**1895**

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
American suite	**Antonín Dvořák**	**Piano**	**1894**	**Antonín Dvořák**	**Orchestra**	**1894-1895**
Ballade in F♯ major, Opus 19	**Gabriel Fauré**	**Piano**	**1877**	**Gabriel Fauré**	**Piano, orchestra**	**1881**
Rhapsody in Blue	George Gershwin	Solo piano, jazz band	1924	Ferde Grofé	Orchestra	1926 1942
In autumn, Opus 11	**Edvard Grieg**	**Piano (four hands)**	**1866**	**Edvard Grieg**	**Orchestra**	**1887**
Funeral march in memory of Rikard Nordraak, EG 107	**Edvard Grieg**	**Piano**	**1866**	**Edvard Grieg**	**Orchestra**	**1892**
Two elegiac melodies, Opus 34	**Edvard Grieg**	**Piano**	**1880**	**Edvard Grieg**	**String orchestra**	**1880**
Norwegian dances, Opus 35	**Edvard Grieg**	**Piano (four hands)**	**1881**	**Edvard Grieg**	**Orchestra**	**1881**
Lyric suite, Opus 54	**Edvard Grieg**	**Piano**	**1891**	**Edvard Grieg**	**Orchestra**	**1904**
Two lyric pieces, Opus 68	**Edvard Grieg**	**Piano**	**1898-1899**	**Edvard Grieg**	**Orchestra**	**1898**
Ariodante overture in D minor, HWV 33	Georg Friedrich Händel	Violin I, violin II, oboe, basso continuo	1717-1718	Edward Elgar	Orchestra	1923

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Raga I	**Wim Henderickx**	**Percussion, two pianos**	**1994**	**Wim Henderickx**	**Percussion, orchestra**	**1996**
General William Booth enters into heaven	**Charles Ives**	**Voice, piano**	**1914**	**Charles Ives**	**Voice, orchestra**	**1914**
Dances of Marosszék	**Zoltán Kodály**	**Piano**	**1924**	**Zoltán Kodály**	**Orchestra**	**1930**
Arbeiterchor	Franz Liszt	Choir	1843-1848	Anton Webern	Bass solo, chorus, orchestra	1924
Deux Légendes	**Franz Liszt**	**Piano**	**1863**	**Franz Liszt**	**Orchestra**	**1863**
Vexilla regis prodeunt	**Franz Liszt**	**Piano**	**1864**	**Franz Liszt**	**Orchestra**	**1864**
Festvorspiel	**Franz Liszt**	**Piano**	**1856**	**Franz Liszt**	**Orchestra**	**1857**
Huldigungsmarch	**Franz Liszt**	**Piano**	**1857**	**Franz Liszt**	**Orchestra**	**1857**
Vom Fels zum Meer!	**Franz Liszt**	**Piano (4 hands)**	**1853-1856**	**Franz Liszt**	**Orchestra**	**1853-1856**
Hungarian Rhapsodies (no. 1-6)	Franz Liszt	Piano	1846-1853	Franz Doppler, revisions by Franz Liszt	Orchestra	1860
Boris Godunov	Modest Mussorgsky	Opera	1868-1873	Dmitri Shostakovich	Opera	1940
Songs and dances of death	Modest Mussorgsky	Voice, piano	1875	Dmitri Shostakovich	Voice, orchestra	1962
Pictures at an exhibition	Modest Mussorgsky	Piano	1874	Maurice Ravel	Orchestra	1922

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Pictures at an exhibition	Modest Mussorgsky	Piano	1874	Mikhael Tushmalov	Orchestra	1886
Pictures at an exhibition	Modest Mussorgsky	Piano	1874	Henry Wood	Orchestra	1915
Pictures at an exhibition	Modest Mussorgsky	Piano	1874	Leopold Stokowski	Orchestra	1929/ 1971
Pictures at an exhibition	Modest Mussorgsky	Piano	1874	Vladimir Ashkenazy	Orchestra	1982
Andante from Piano sonata 4 in C Minor, Opus 29	**Sergei Prokofiev**	**Piano**	**1917**	**Sergei Prokofiev**	**Orchestra**	**1934**
Menuet antique	**Maurice Ravel**	**Piano**	**1895**	**Maurice Ravel**	**Orchestra**	**1929**
Pavane pour une infante défunte	**Maurice Ravel**	**Piano**	**1899**	**Maurice Ravel**	**Orchestra**	**1910**
Miroirs (Une barque sur l'océan and Alborada del gracioso)	**Maurice Ravel**	**Piano**	**1904-1905**	**Maurice Ravel**	**Orchestra**	**1906 1918**
Ma mère l'Oye	**Maurice Ravel**	**Piano (four hands)**	**1908-1910**	**Maurice Ravel**	**Orchestra**	**1911**
Valses nobles et sentimentales	**Maurice Ravel**	**Piano**	**1911**	**Maurice Ravel**	**Orchestra**	**1912**
Le tombeau de Couperin	**Maurice Ravel**	**Piano**	**1914-1917**	**Maurice Ravel**	**Orchestra**	**1919**

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Wiegenlied	**Max Reger**	**Voice, piano**	**1900**	**Max Reger**	**Voice, orchestra**	**1900**
Marcia Funèbre	Max Reger	Piano	1894	Lothar Windsperger	Orchestra	1916
I waited in the Grotto	Nikolai Rimsky-Korsakov	Soprano, piano	1897	Dmitri Shostakovich	Soprano, orchestra	1921
Rhapsodie bretonne	**Camille Saint-Saëns**	**Organ**	**1866**	**Camille Saint-Saëns**	**Orchestra**	**1891**
Gymnopédie 1 and 3	Erik Satie	Piano	1888	Claude Debussy	Orchestra	1897
Gnossienne 3	**Erik Satie**	**Piano**	**1890**	**Erik Satie**	**Orchestra**	**1890**
Memnon	Franz Schubert	Voice, piano	1817	Johannes Brahms	Voice, orchestra	1862
Tränenregen	Franz Schubert	Voice, piano	1823	Anton Webern	Voice, orchestra	1903
Ihr Bild	Franz Schubert	Voice, piano	1928	Anton Webern	Voice, orchestra	1903
Der Wegweiser	Franz Schubert	Voice, piano	1827	Anton Webern	Voice, orchestra	1903
Du bist die Ruh	Franz Schubert	Voice, piano	1823	Anton Webern	Voice, orchestra	1903
Death and the maiden, String quartet no. 14 in D minor, D 810	Franz Schubert	String quartet	1824	Gustav Mahler	String orchestra	1896

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Märsche von Franz Schubert (Vivace, Trauermarsch, Reitermarsch, Ungarischer Marsch)	Franz Schubert	Piano (four hands)	1818/ 1824, unkn., 1824	Franz Liszt	Orchestra	1859-1870
Der Erlkönig	Franz Schubert	Voice, piano	1815	Hector Berlioz	Voice, orchestra	1860
Carnaval, Opus 9	Robert Schumann	Piano	1834-1835	Maurice Ravel	Orchestra	1914
Carnaval, Opus 9	Robert Schumann	Piano	1834-1835	Alexander Glazunov Nikolai Rimsky-Korsakov Anatoly Lyadov Alexander Tcherepnin	Orchestra	1910
Quatre études pour orchestre (Three pieces for string quartet and Étude pour pianola)	**Igor Stravinsky**	**String quartet Pianola**	**1914 1921**	**Igor Stravinsky**	**Orchestra**	**1928**
Tango	**Igor Stravinsky**	**Piano**	**1940**	**Igor Stravinsky**	**Orchestra**	**1941**
Suite no. 2 (Trois pièces faciles and Cinq pièces faciles)	**Igor Stravinsky**	**Piano (four hands)**	**1915 1917**	**Igor Stravinsky**	**Orchestra**	**1921**
Mozartiana	Wolfgang Amadeus Mozart	Piano	various	Pyotr Ilyich Tchaikovsky	Orchestra	1887

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Mazurka-Fantaisie	Hans von Bülow	Piano	1860	Franz Liszt	Orchestra	1865
Polacca brilliant, Opus 72	Carl Maria von Weber	Piano	1819	Franz Liszt	Piano, orchestra	1848
Invitation to the dance, Opus 65	Carl Maria von Weber	Piano	1819	Hector Berlioz	Orchestra	1841
Er ist's. Frühling läßt sein blaues Band	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Seufzer. Dein Liebesfeuer	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1889**
Auf ein altes Bild. In grüner Landschaft Sommerflor	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1889**
In der Frühe. Kein Schlaf noch kühlt	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Schlafendes Jesuskind. Sohn der Jungfrau	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1889**
Karwoche. O Woche, Zeugin heiliger Beschwerde!	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1889**
Gebet. Herr! schicke was du willst	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1890**
An den Schlaf. Schlaf! süßer Schlaf!	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1890**

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Neue Liebe. Kann auch ein Mensch	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Wo find' ich Trost. Eine Liebe kenn' ich	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Denk' es, o Seele! Ein Tännlein grünet wo	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1891**
Gesang Weyla's. Du bist Orplid, mein Land!	**Hugo Wolf**	**Voice, piano**	**1888**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Harfenspieler I. Wer sich der Einsamkeit ergibt	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Harfenspieler II. An die Türen will ich schleichen	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Harfenspieler III. Wer nie sein Brot mit Tränen aß	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Mignon. Kennst du das Land	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1890 1893**
Der Rattenfänger. Ich bin der wohlbekannte Sänger	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1890**
Anakreons Grab. Wo die Rose hier blüht	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1893**

Composition Title	Composer	Instrumentation	Year	Composer	Instrumentation	Year
Prometheus. Bedecke deinen Himmel, Zeus	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1890**
In dem Schatten meiner Locken	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1895**
Wenn du zu den Blumen gehst	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1897**
Wer sein holdes Lieb verloren	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1897**
Herz, verzage nicht geschwind	**Hugo Wolf**	**Voice, piano**	**1888/ 1889**	**Hugo Wolf**	**Voice, orchestra**	**1895**
Tahiti-Trot, Opus 16	Vincent Youmans	Voice, piano	1925	Dmitri Shostakovich	Orchestra	1927

ADDENDUM C

Biographies of Research Participants

1. Wim Henderickx (b. 1962) – Short Biography

Wim Henderickx was born on 17 March 1962 in Lier and is a prominent living Belgian composer and percussionist, residing in Antwerp, Belgium. He studied composition with Willem Kersters (1929-1998) and percussion with Louis Cauberghs at the Royal Conservatoire of Music in Antwerp (Henderickx, 2014; Henderickx, 2015a). His music studies also include participation in the Internationale Ferienkurse für Neue Musik[1] in Darmstadt[2], as well as classes in sonology at the Institute for Music/Acoustic Research and Coordination (IRCAM) in Paris[3] and the Royal Conservatory of Music in The Hague (Henderickx, 2014).

Henderickx has been the composer in residence of Muziektheater Transparant since 1996 and artist/composer in residence of the Royal Flemish Philharmonic since August 2013. He currently teaches composition and music analysis at the Royal Conservatoire of Music in Antwerp[4] and the Conservatoire of Music in Amsterdam. He is also the main composition and orchestration teacher for the annual International Summer Composition Workshop in Neerpelt, Belgium (Henderickx, 2014).[5]

[1] International summer courses for new music.
[2] Composers who were of interest to Henderickx were Wolfgang Rihm (b. 1952), Helmut Lachenmann (b. 1935) and Brian Ferneyhough (b. 1943).
[3] Henderickx was inspired by composers Pierre Boulez (1925-2016) and Jonathan Harvey (1939-2012) when he met them at IRCAM.
[4] Koninklijk Vlaams Conservatorium.
[5] This course was later renamed to 'SoundMine'.

Image C-1

Wim Henderickx in Lier, Belgium – Photograph by Benjamin Martijn (2013)

On an international level he is a much respected composer and has been awarded numerous awards. His list of compositions includes operas, theatre music, compositions for orchestra (and soloists), chamber music, compositions for solo instruments, vocal music and electronic music. Amongst his many commissioned compositions is *Canzone* for voice and piano for the 2008 *Queen Elisabeth International Music Competition* in Belgium (Henderickx, 2014).

1.1 Wim Henderickx's Major Prizes and Accolades

Wim Henderickx won numeral prestigious awards and prizes, and he was honoured with lifelong accolades. These awards, prizes and accolades include the following:

- Prize A. De Vleeshouwer of the Royal Conservatoire Antwerp (1988)
- Jeugd-en Muziekprijs Vlaanderen - Prize Youth and Music Flanders (1989)
- International Composition Prize Flanders - Quebec (1993)
- Triennial prize Eugène Baie I from the province of Antwerp for a talented Flemish artist (1999)
- Laureate of the Royal Flemish Academy of Belgium for the Arts - KVAB (2002)
- Nomination for the Flanders Culture Prizes by the Minister of Culture (2006)
- Lifetime Achievement Award in Lier (2011)
- Appointment as a member of the Royal Flemish Academy of Belgium for Science and the Arts - KVAB (2015)
- Golden Label Career Award from Klassiek Centraal (2016)

1.2 Wim Henderickx's Music

Wim Henderickx's music is characterised by "solid structure, changing colourful sonorities and an intensely expressive power" (Henderickx, 2014). The Belgian musicologist, Yves Knockaert (1998), writes that Henderickx's compositions have a "psychological, compositional and perceptual approach". Another musicologist and music critic, Jan Vandenhouwe (2001), describes Henderickx as a "virtuoso orchestrator, with a strong feel for the most subtle combinations of timbre". Vandenhouwe (2001) also comments on *Een Totale Entführung*[6] by

[6] Henderickx's re-composition of Mozart's *Die Entführung aus dem Serail* combines Western and Eastern ideas on music. The original cast included Jan Decleir and Els Dottermans with Ramsey Nasr as producer (Goris, s.a., Van der Speeten, 2006).

Henderickx: his "rattling, rousing percussion parts betray the composer's background as a percussionist."

Many of Wim Henderickx's compositions contain virtuosic percussion parts because Henderickx is an experienced percussionist and timpanist who used to be percussionist of the Nieuw Belgian Chamber Orchestra, the Beethoven Academie Orchestra, and the Eugène Ysaÿe Ensemble (Henderickx, 2014).

Vandenhouwe (2001) writes that "[t]he music of Wim Henderickx finds its inspiration mainly in non-European cultures. His predilection for Eastern thought led early on to a great interest in Indian music". Many of Henderickx's compositions were influenced by Eastern music, philosophies, and visits to Eastern countries[7] (Esser, 2009; Henderickx, 2014). The first appearances of Eastern influences are found in Henderickx's music in 1989-1990 (Knockaert, 1998). Although Henderickx's music is inspired and influenced by Eastern music, he is not trying to imitate Eastern sources or melodic and rhythmic patterns[8] (Culot, 1999; Knockaert, 2005).

[7] Knockaert (1995) writes that Willem Kersters gave Wim Henderickx the freedom to compose in his own style but he had to be able to explain what he was doing. Kersters also did not allow students to imitate his personal style and encouraged students to find their own styles. This is a possible explanation for Henderickx's interest in and broad knowledge of Eastern music.

[8] Wim Henderickx elaborated in an interview with Yves Knockaert (2005) his view of the Eastern influences: "Mijn muziek is zeker geen imitatie of een herschrijven van niet-westerse muziek" and "[m]ijn respect voor niet-westerse culturen is te groot om daar enkel als "voyeur" naartoe te trekken en ze daarna in mijn werk te gaan imiteren." [Free translation: "My music is definitely not an imitation or a rewrite of non-Western music" and "I have too much respect for non-Western cultures to be a voyeur and imitate it in my own work."]

Henderickx clarifies that his interest in Eastern religions led to the Eastern influences in his music, but he prefers to think about this music from a Western point of view[9] (Snyers, 2001). In 1996, after his three Ragas, Henderickx decided to explore other, non-Easten influenced compositional worlds, through his opera of 2000, *Triumph of Spirit over Matter* (Knockaert, 2005).

Wim Henderickx (s.a.) writes about his own music: "Social engagement is an actuating motive while composing. I always try to combine a strong musical structure with an extra-musical meaning. For me music has to touch people. Music has a metaphysical power; I want to use this to realise a communication between myself as a composer and the listener. To be guided by non-Western cultures is more than only a source of inspiration. In a period where people talk about integration, multicultural society, community artists, crossover etcetera I try to think intensively about integrating other cultures in a pure and true way in my work as an artist."

Hubert Culot (1999) finds Henderickx's music extraordinary and believes that his music is also valuable for analysis: "[r]eally well worth investigating for Henderickx is undoubtedly one of the most endearing composers of his generation."

[9] "Ik ben vertrokken vanuit de oosterse religie (Boeddhisme, Zen, Hindoeïsme), maar niet vanuit een zoektocht naar een eigen religie. Het was meer een interesse. Vanuit deze religie ben ik uiteindelijk in de muziek beland. Het is gestart vanuit een voelen van oosterse dingen, soms zelfs een evocatie van het oosterse denken. Maar ik besef het gevaar dat de compositie kitscherig en exotisch getint kan worden. Daarom blijf ik westers denken." (Snyers, 2001.) [Free translation: "My point of departure is the Eastern religions (Buddhism, Zen, Hinduism), but not from a quest for their own religion. It was more an interest. From the religion I eventually ended up in music. It started as a sense of Eastern things, sometimes even an evocation of Eastern thought. But I realize the danger that the composition can become kitschy and exotic. That is why I keep on thinking from a Western point of view."]

1.3 Wim Henderickx's List of Compositions

A complete list[10] of works by Wim Henderickx is presented in this section, stating the title, year of composition, duration, instrumentation, and text credits. The works in this list are ordered alphabetically by genre.

1.3.1 Stage Works (opera, music theatre)

ACHILLEUS (2001-2002)

opera for young people, based on a libretto by Imme Dros

Duration: ca. 75'

Singers: soprano, mezzo-soprano, tenor, baritone, bass baritone, bass, and countertenor, children's choir

Instrumentation: fl (+picc, alto fl), alto sax (+bar. sax) / tp, tbn / perc (1 player) / pno (+synth)/ vln, vla, vc, db / electronics

ANTIFOON (2014)

for orchestra, wind band, choir, percussion ensembles ad lib, soprano and bass

Duration: ca. 35'

ANTIFOON (2017)

for symphony orchestra, wind band, mixed choirs, soprano, and bass-baritone

Duration: ca. 20'

[10] This list reflects all works that formed part of Wim Henderickx's work list at the time of publication of this thesis.

ATLANTIC WALL (2012)

for mezzo-soprano, instrumental ensemble (6 musicians), video, and electronics

Duration: ca. 30'

Text: Inspired by *Chanson d'automne'* – Paul Verlaine

Instrumentation: mezzo-soprano, fl (+picc, alto fl, bass fl), cl (+bass cl) / vla, vc / keyboards / perc / electronics

BEHOUDEN STEM: CONVERSATIONS WITH M (1998)

for baritone or mezzo-soprano and 2 percussion players

Duration: ca. 30'

Text: Inspired by *Con che soavità* – Claudio Monteverdi

CONFRONTATIONS (2003)

for African and Western percussion (10 musicians)

Duration: ca. 75'

Instrumentation: 2 master percussionists with each a choir of 4 percussion players

DE KONINGIN ZONDER LAND (THE QUEEN WITH NO LAND) (2014)

for 4 singers, 2 percussion players and electronics

Duration: ca. 75'

Duration: ext: Paul Verrept

Singers: soprano (2), mezzo-soprano, bass

EEN TOTALE ENTFÜHRUNG (A TOTAL ABDUCTION) (2006)

for 4 singers, 6 actors and small orchestra (15 musicians)

Duration: ca. 150'

Text: Ramsey Nasr

Singers: soprano (2), tenor (2)

Instrumentation: fl (+picc), ob (+engl hn), cl, bsn / 2 hns, tp / perc (3 players) / vln 1, vln 2, vla, vc, db

LAMENTO DI MEDEA (2011)

for soprano, instrumental ensemble (7 musicians) and live electronics

Duration: ca. 70'

Text: Wim Henderickx

Instrumentation: soprano / duduk, electric guitar / fl (+picc, alto fl, bass fl),vla, cl (+bcl), perc (2 players) / electronics

MEDEA (2011)

for soprano, 4 actors, instrumental ensemble (7 musicians) and live electronics

Duration: ca. 120'

Text: Peter Verhelst

Instrumentation: soprano / duduk, electric guitar / fl (+picc, alto fl, bass fl), vla, cl (+bass cl) / perc (2 players) / electronics

OLEK SCHOOT EEN BEER (OLEK SHOT A BEAR) (2006)

for narrator and instrumental ensemble (in Dutch, French, English, and German) (7 musicians)

Duration: ca. 35'

Text: Bart Moeyaert

Instrumentation: narrator / cl, bsn / tp, tbn / perc (1 player) / vln, db

REQUIEM (2016)

for 2 singers, 9 musicians, choir and children's choir, dancers – based on Gabriel Fauré's *Requiem*

Duration: ca. 45'

Singers: soprano, bass-baritone, mixed choir, children's choir

Instrumentation: fl (+picc, alto fl, bass fl), cl / hn / vln, vla, vc, db / harmonium / qanun

REVELATIONS (2016)

for music theatre (for soprano, choir, instrumental ensemble, video, and electronics)

Duration: ca. 70')

Text: Wim Henderickx and fragments from Latin Christian prayers

Singers: soprano, choir (5 female singers)

Instrumentation: fl (+picc, alto fl, bass fl) / vla / perc / electronics

TERRITORIA (2012)

based on 3 string quartets by Wim Henderickx

Duration: ca. 50'

TRIUMPH OF SPIRIT OVER MATTER (1996-1999)

opera in 16 scenes, based on a libretto by Johan Thielemans

Duration: ca. 90'

Singers: soprano, tenor, baritone (2), bass

Instrumentation: fl 9+picc), cl (+sopr sax ad lib) / tp, hn, tbn / perc (1 player) / pno (+ synth) / vln 1, vln 2, vla, vc, db

VOID (SUNYATA) (2007) – Part IV of the *Tantric Cycle*

for 5 singers, instrumental ensemble (5 musicians) and electronics

Duration: ca. 75'

Text: Wim Henderickx

Singers: soprano, mezzo-soprano, baritone (2), and voice artist

Instrumentation: fl, cl / tbn / vln, vc / electronics

1.3.2 Orchestra

AN EVENING PRAYER (2000)

for orchestra

Duration: ca. 17'

Instrumentation: picc, 2 (+picc 2), 2, engl hn (+ob 3), 2, bass cl (+cl 3), 2, cbsn / 4, 3, 3, 1 / timp, perc (4 players) / hp / cel (+pno) / strings

ANTIFOON (2014)

for orchestra

Duration: ca. 20

From *Antifoon* for orchestra, wind band, choir, percussion ensembles ad lib, soprano, and bass

CIRCUS SUITE (2014)

for string orchestra

Duration: ca. 8'

IN DEEP SILENCE III (2016)

for string orchestra

Duration: ca. 10'

LE VISIONI DI PAURA (1990)

for orchestra

Duration: ca. 12'

Instrumentation: 2, 2, 2, 2 / 2, 2, 0, 0 / perc (2 players) / strings

NOSTALGIA (2016)

for string orchestra

Duration: ca. 7'

From *Symphony no. 2 (Aquarius' Dream)* for orchestra, soprano and electronics

PULSES OF THE EARTH (2017)

for orchestra

Duration: ca. 10'

RAGA II (TOMBEAU) (1995)

for orchestra

Duration: ca. 21'

Instrumentation: 2 (+2 picc), 2, 2 (+bass cl), 1, cbsn / 2, 2, 1, 0 / hp / perc (2 players) / strings

SKRIET (1993)

for orchestra

Duration: ca. 7'

Instrumentation: 2 (+picc), 2, 2, 2 / 2, 2, 1, 0 / perc (2 players) / strings

SYMPHONY NO. 1 (AT THE EDGE OF THE WORLD) (2011)

for orchestra

Duration: ca. 25'

Instrumentation: picc (+fl 3), 2 (+2 picc), 2, eng hn (+ob 3), 2, bass cl (+cl 3), 2, cbsn (+bsn 3) / 4, 3, 3, 1 / perc (5 players) / hp / strings

SYMPHONY NO. 2 (AQUARIUS' DREAM) (2016)

for orchestra, soprano, electronics and (optional) lighting design

Duration: 45'

Text: Wim Henderickx and Rabindranath Tagore

Instrumentation: picc (+fl 3), 2, 2, eng hn, (+ob 3), 2, bcl (+cl 3), 2, cbsn (+bsn 3) / 4, 4, 3, 1 / perc (5 players) / hp / pno (+cel) / soprano / strings / electronics

TEJAS (WHAT DOES THE SOUND OFTHE UNIVERSE LOOK LIKE?) (2009) – Part IV of the *Tantric Cycle*

for orchestra

Duration: ca. 33'

Instrumentation: picc, 3 (+2 picc), 3, engl hn, cl in E-flat, 3, bass cl, 3, cbsn / 6, 4 (+picc tp in E-flat), 3, 1 / hp / pno (+cel) / strings

VARIATIONS (1988)

for orchestra

Duration: ca. 17'

Instrumentation: picc, 2, 2, engl hn, 2, bass cl, 2, cbsn / 4, 4, 3, 1 / timp, perc (3 players) / hp / pno (+cel) / strings

1.3.3 Solo and Orchestra

BALLAD: THE WITCH DOCTOR AND THE TWO GIANTS (1996)

for narrator and orchestra (in Dutch, French, and English)

Duration: ca. 8'

Text: Aboriginal myth

Instrumentation: narrator / picc, 1, 1, engl hn, 1, bass cl, 1, cbsn / 2, 2, 1, 1 / perc (4 players) / hp / strings

FOUR PIECES (2007)

for clarinet and string orchestra

Duration: ca. 14'

GROOVE! (2012)

for percussion and orchestra

Duration: ca. 27'

Instrumentation: perc solo / 2 (+2 picc), 2, 2, bar sax, 2, cbsn / 2, 2, 1, 0 / perc (2 players) / synth / electric bass guitar / strings

MAKYO (1990)

for marimba and string orchestra

Duration: ca. 12'

2 NOCTURNES (1999)

for flute and string orchestra

Duration: ca. 10'

Instrumentation: fl solo / 6 vln, 4 vla, 2 vc, 1 db

OBOE CONCERTO (EMPTY MIND I) (2014)

for oboe, orchestra, and electronics

Duration: ca. 27'

Instrumentation: oboe solo / 3, 0, 3, 0 / 2, 1, 1, 1 / hp / cel / vibra / perc (2 players) / string quartet / strings (6, 6, 6, 4, 3) / electronics

ONLY DARKNESS AND SHADOWS (2004)

for soprano and orchestra

Duration: ca. 15'

Text: Triin Soomets

Instrumentation: soprano / 1, 1, 1, 1 / 1, 1, 1, 0 / perc (1 player) / pno / strings

RAGA I (1996)

for percussion and orchestra

Duration: ca. 18'

Instrumentation: perc solo / picc, 2, 2, engl hn, 2, bass cl, 2, cbsn / 4, 3, 3, 1 / hp / strings

RAGA III (2012)

for viola and orchestra

Duration: ca. 27'

Instrumentation: viola solo / 2 (2 picc), 2 (+engl hn), 2 (bass cl), 2 (+cbsn) / 2, 2, 2, 0 / hp / timp, perc (2 players) / strings

1.3.4 Wind Band / Concert Band

ANTIFOON (2014)

for wind band

Duration: ca. 20'

from *Antifoon* for orchestra, wind band, choir, percussion ensembles ad lib, soprano and bass

RAGA I (2016)

for percussion and concert band

Duration: ca. 18'

SKRIET (2010)

for wind band

Duration: ca. 7'

VARIATIONS (2013)

for concert band

Duration: ca. 17'

1.3.5 Chamber Music / Ensemble

ADANA (2016)

for flute, viola, percussion and optional electronics

Duration: ca. 12'

AFRICAN SUITE (1992)

for violin and percussion

Duration: ca. 9

AFRICAN SUITE (2007)

for soprano saxophone and percussion

Duration: ca. 9'

AFRICAN SUITE (2010)

for cello and percussion

Duration: ca. 7'

ALLA TURCA (2006)

for percussion trio

Duration: ca. 15'

ATLANTIC WALL (2012)

for mezzo-soprano, instrumental ensemble (6 musicians), video and electronics

Duration: ca. 30'

Text: inspired by *Chanson d'automne* – Paul Verlaine

Instrumentation: mezzo-soprano, fl (+picc, alto fl, bass fl), cl (+bass cl) / vla, vc / keyboards / perc / electronics

BARBARIAN DANCE (1985)

for percussion and piano

Duration: ca. 7'

BOLOMAKOTE (2004)

for percussion solo and 4 percussion players

Duration: ca. 25'

CIRCUS SUITE (1992-2014)

for flute (or bassoon or alto saxophone) and piano

Duration: ca. 8'

CIRCUS SUITE (2004)

for woodwind quartet

Duration: ca. 8'

CIRCUS SUITE (2014)

for oboe and piano

Duration: ca. 8'

CIRCUS SUITE (2014)

for clarinet in B-flat (or bass clarinet in B-flat) and piano

Duration: ca. 8'

CIRCUS SUITE (2014)

for 4 clarinets and bass clarinet

Duration: ca. 8'

CONFRONTATIONS (2003)

for African and Western percussion (10 musicians)

Duration: ca. 30'

Instrumentation: 2 master percussionists with each a choir of 4 percussion players

DAWN (1992)

for mezzo-soprano, female choir and instrumental ensemble (8 musicians)

Duration: ca. 20'

Text: Kahlil Gibran

Instrumentation: mezzo-soprano / female choir / fl / hp / perc / vln 1, vln 2, vla, vc, db

DECORS (1992)

for oboe and bassoon

Duration: ca. 5'

DISAPPEARING IN LIGHT (2008) – Part V of the *Tantric Cycle*

for mezzo-soprano, alto flute, viola and percussion

Duration: ca. 32'

Text: Wim Henderickx

DISAPPEARING IN LIGHT (2010)

for trumpet, alto flute, viola and percussion

Duration: ca. 32'

DROOMBEELDEN (DREAMSCAPES) (1988)

for oboe, bassoon, and piano

Duration: ca. 17'

FANFARE (2014)

for variable ensemble

Duration: ca. 3'

FIREWORKS (2012)

for saxophone quartet, percussion quartet and electronics (9 musicians)

Duration: ca. 11'

FOUR BAGATELLES (1996)

for percussion and piano

Duration: ca. 7'

FOUR PIECES (1990)

for clarinet and string quartet

Duration: ca. 14'

FOUR PIECES (2014)

for alto saxophone and string quartet

Duration: ca. 14'

GISHORA (2009)

for trumpet and 7 African drums (1 player)

Duration: ca. 8'

GISHORA (2012)

for soprano saxophone and 7 African drums (1 player)

Duration: ca. 8'

GROOVE! (2012)

for percussion and 2 pianos

Duration: ca. 27'

IMPRESSION NO. 1 (1993)

for flute and piano

Duration: ca. 5'

IO (1991)

for brass quintet

Duration: ca. 12'

IO (2004)

for woodwind quartet

Duration: ca. 12'

IO (2004)

for brass and percussion (12 musicians)

Duration: ca. 12'

Instrumentation: 4 tps, 3 hns, 2 tbns, 1 bass tbn, perc (2 players)

6 IMPRESSIONS (1987)

for trombone and 2 percussion players

Duration: ca. 10'

IN DEEP SILENCE II (2002)

for recorder quartet

Duration: ca. 19'

IN DEEP SILENCE II (2010)

for flute, accordion, violin, viola and double bass

Duration: ca. 19'

IN DEEP SILENCE II (2011-2014)

for flute (or piccolo or alto flute), clarinet (or bass clarinet), violin, and cello

Duration: ca. 19'

IN DEEP SILENCE II (2013-2014)

for flute (or piccolo or alto flute), clarinet (or bass clarinet), violin, and cello

Duration: ca. 19'

IN DEEP SILENCE III (IMPRESSION ON A THEME OF HAYDN) (2003)

String quartet no. 2

Duration: ca. 10'

INFINIZIO (2014)

for variable ensemble

Duration: ca. 30"-15'

3 INTERLUDES (1989)

for horn, oboe and piano

Duration: ca. 7'

LAGRIMAS (TEARS OF HOPE) (2015)

for flute, clarinet, harp and string quartet

Duration: ca. 15'

Instrumentation: fl (+alto fl), cl / hp / vln 1, vln 2, vla, vc

LAMENTO (1994)

for 4 bassoons

Duration: ca. 6'

LAMENTO (2010-2014)

for 4 baritone (or alto) saxophones

Duration: ca. 6'

LAMENTO (2010)

for 4 bass clarinets

Duration: ca. 6'

LAMENTO (2011)

for 4 cellos

Duration: ca. 6'

LAMENTO DI MEDEA (2011)

for soprano, instrumental ensemble (7 musicians) and live electronics

Duration: ca. 70'

Text: Wim Henderickx

Instrumentation: soprano / duduk, electric guitar / fl (+picc, alto fl, bass fl), vla, cl (+bass cl) / perc (2 players) / electronics

MAKYO (2015)

for marimba and piano

Duration: ca. 12'

MAYA'S DREAM (2005) – Part II of the *Tantric Cycle*

for oboe and instrumental ensemble (7 musicians)

Duration: ca. 10'

Instrumentation: oboe solo / alto fl, cl, bsn (or bass cl) / tbn / 2 vlns, db

MAYA'S DREAM (2014) – Part II of the *Tantric Cycle*

for bassoon and instrumental ensemble (7 musicians)

Duration: ca. 10'

Instrumentation: bassoon solo / alto fl, cl, bsn (or bass cl) / tbn / 2 vlns, db

MOZART'S ENTFÜHRUNG (MOZART'S ABDUCTION) (2008)

for instrumental ensemble (15 musicians)

Duration: ca. 8'

Instrumentation: picc, fl, 2 obs, 2 cls, 2 bsns / 2 hns, tp / perc (3 players) / db

MUDRA (2010) – Part IV of the *Tantric Cycle*

for instrumental ensemble (12 musicians)

Duration: ca. 27'

Instrumentation: fl (+picc, alto fl), ob (+engl hn, musette), cl (+bass cl) / mand, guitar, hp / pno / perc (1 player) / vln, vla, vc, db

MYSTERIUM (1989)

for 10 woodwinds

Duration: ca. 15'

Instrumentation: 2 fls (+2 piccs), 2 obs (+engl hn), 2 cls (+bass cl), 2 hns, 2 bsns (+cbsn)

NADA BRAHMA (2005) – Part III of the *Tantric Cycle*

for soprano, instrumental ensemble (11 musicians) and live electronics

Duration: ca. 25'

Text: Wim Henderickx

Instrumentation: soprano / fl (+alto fl), ob, bcl (+cl), bsn / tp, tbn / perc (2 players) / vla, vc, db / electronics

2 NOCTURNES (1993)

for flute (or oboe, clarinet, bassoon, English horn, alto saxophone) and piano

Duration: ca. 10'

2 NOCTURNES (1994)

for flute, violin, viola, cello and double bass

Duration: ca. 10'

2 NOCTURNES (2014)

for alto saxophone, violin, viola, cello, and double bass

Duration: ca. 10'

NOSTALGIA (2010)

for 7 Middle East instruments

Duration: ca. 7'

Instrumentation: ney, duduk, setar, santur, tar, kemençe, and kamancha

NOSTALGIA (2011)

for 7 musicians

Duration: ca. 7'

Instrumentation: flute, oboe, clarinet, violin, viola, cello, and piano

OLEK-SUITE (2006)

for instrumental ensemble (7 musicians)

Duration: ca. 25'

Instrumentation: cl, bsn / tp, tbn / perc / vln, db

OM (1992)

String quartet no. 1

Duration: ca. 15'

ONLY DARKNESS AND SHADOWS (2003)

for soprano and instrumental ensemble (10 musicians)

Duration: ca. 15'

Text: Triin Soomets

Instrumentation: soprano / fl, ob, cl, bsn / hn / pno / vln, vla, vc, db

ONLY DARKNESS AND SHADOWS (2010)

for soprano and piano

Duration: ca. 15'

Text: Triin Soomets

PIANO TRIO (IN DER SEIDENEN STILLE...) (2012)

for violin, cello, and piano

Duration: ca. 15

RAGA I (1994)

for percussion and 2 pianos

Duration: ca. 18'

RESONATING LIGHT (2013)

for instrumental ensemble (9 musicians)

Duration: ca. 15'

Instrumentation: fl (+alto fl), ob (+engl hn), cl (+bass cl), bsn / tp, hn, tbn / perc (1 player) / db

SEARCHING (1986)

for viola and marimba

Duration: ca. 10'

SEARCHING (2003)

for violin and marimba

Duration: ca. 10'

SEARCHING (2005)

for bass clarinet and marimba

Duration: ca. 10'

SEARCHING (2010)

for cello and marimba

Duration: ca. 10'

SEARCHING (2014)

for alto saxophone and marimba

Duration: ca. 10'

SONATINE (1986)

for percussion and piano

Duration: ca. 7'

SUITE (1988)

for violin and piano

Duration: ca. 14'

THE FOUR ELEMENTS (2011)

for mezzo-soprano, flute, violin, clarinet, violoncello, and electronics (optional)

Duration: ca. 27'

Text: Wim Henderickx

THE SEVEN CHAKRAS (2004) – Part I of the *Tantric Cycle*

for string quartet and live electronics

String quartet no. 3

Duration: ca. 27'

THE SEVEN CHAKRAS (2009)

for saxophone quartet and live electronics

Duration: ca. 27'

TORSO (1989)

for trumpet and piano

Duration: ca. 10'

TRIO (1986)

for oboe, clarinet, and bassoon

Duration: ca. 10'

1.3.6 Solo Works

ELEGIE (1989)

for piano

Duration: ca. 4'

MEMENTO MORI (2005)

for piano

Duration: ca. 25'

6 MINIATUREN (1988)

for piano

Duration: ca. 5'

SPIELEREI (1987)

for piano

Duration: ca. 3'

TOCCATA (1988)

for piano

Duration: ca. 3'

UNTITLED (1989)

for piano

Duration: ca. 4'

1.3.7 Strings

IL PENDOLO (1989)

for double bass

Duration: ca. 10'

RAGA III (2010)

for viola and electronics

Duration: ca. 15'

1.3.8 Woodwinds

EMPTY MIND I (2013)

for oboe and electronics

Duration: ca. 25' (full version), 15' (short version)

EMPTY MIND I (2015)

for recorder and electronics

Duration: ca. 25' (full version), 15' (short version)

HOMMAGE (1994)

for clarinet

Duration: ca. 4'

MAYA (1990)

for clarinet

Duration: ca. 10'

ON HAIKU (THE FOUR SEASONS) (2015)

for sho

Duration: ca. 7'

ON THE ROAD (2012)

for saxophone and electroncis

Duration: ca. 9'

ON THE ROAD (2013)

for bass flute and electronics

Duration: ca. 9'

ON THE ROAD (2013)

for tenor recorder and electronics

Duration: ca. 9'

RONDDOLEN (1987)

for bassoon

Duration: ca. 8'

RONDDOLEN (2007)

for bass clarinet

ca. 7'

1.3.9 Brass

ON THE ROAD (2011)

for trumpet and electronics

Duration: ca. 9'

THE CALL (1992)

for horn

Duration: ca. 10'

1.3.10 Guitar

IN DEEP SILENCE I (1998)

for guitar

Duration: ca. 10'

SAETA (2004)

for guitar

Duration: ca. 24'

1.3.11 Percussion

1001 NIGHTS (2014)

for percussion

Duration: ca. 6'

Based on G*roove!* for percussion and orchestra

RAGA I (1996)

for percussion solo

Duration: ca. 18'

SACRED PLACES (2017) – work in progress

for percussion and electronics

1.3.12 Vocal Music

BLOSSOMINGS (3 PRAYERS FOR A BETTER WORLD) (2016)

for mixed choir, trumpet and electronics

Duration: ca. 17'

COLORS (2014)

for mixed choirs, equal voices ad lib and electronics

Duration: ca. 20'

Text: Wim Henderickx

Fragment of *Antifoon* for orchestra, wind band, choir, percussion ensembles ad lib, soprano and bass

CRUCIFIXUS (2003)

for mixed choir (8 voices)

Duration: ca. 5'

Text: Claudio Monteverdi

DE PROFUNDIS (1992)

for mixed choir

Duration: ca. 4'

Text: Biblical Psalm

ESTASI (2016)

for double choir, soprano solo, bass solo and electronics ad lib.

Duration: ca. 20'

LIBERA ME (1992)

for mixed choir

Duration: ca. 4'

Text: Biblical Psalm

THE NEW RING (2013)

for mixed choir

Duration: ca. 15

Text: Wim Henderickx

TOMORROW SHALL BE ME DANCING DAY (2016)

for mixed choir and organ

Duration: ca. 4'

Text: English carol

Based on the version for mixed choir and chamber orchestra

VISIONI ED ESTASI (2015)

for mixed choirs and electronics

Duration: ca. 45'

Text: Wim Henderickx

ORPHEUS: TOVERZANGER IN DE ONDERWERELD (WITCH-SINGER IN THE UNDERWORLD) (2002)

for children's choir and piano

Duration: ca. 5'

Text: Wim Henderickx

COLORS (2014)

for mixed choirs, equal voices ad lib and electronics

Duration: ca. 20'

Text: Wim Henderickx

Fragment of *Antifoon* for orchestra, wind band, choir, percussion ensembles ad lib, soprano and bass

ELUSIVE TIME (2012)

for mezzo-soprano and electronics

Duration: ca. 7'

Text: Wim Henderickx

ELUSIVE TIME (2013)

for soprano and electronics

Duration: ca. 7'

Text: Wim Henderickx

2 MANTRAS (2012)

for mezzo-soprano

Duration: ca. 10'

Text: Wim Henderickx

2 MANTRAS (2013)

for soprano

Duration: ca. 10'

Text: Wim Henderickx

AVE MARIA (2011)

for baritone (or mezzo-soprano) and organ

Duration: ca. 6'

Text: Holy Mary prayer

AVE MARIA (2011)

for soprano (or tenor) and organ

Duration: ca. 6'

Text: Holy Mary prayer

CANZONE (2007)

for voice (versions for: soprano, mezzo-soprano, alto, tenor, baritone, bass) and piano

Duration: ca. 5'

Text: Francesco Petrarca

LIED VAN DE MEISJES (SONG OF THE GIRLS) (2006)

for voice and piano

Duration: ca. 5'

Text: Bart Moeyaert

LIED VOOR OLEK (SONG FOR OLEK) (2009)

for voice and piano

Duration: ca. 3'

Text: Bart Moeyaert

ONLY DARKNESS AND SHADOWS (2010)

for soprano and piano

Duration: ca. 15'

Text: Triin Soomets

ZOON VAN EROS (SON OF EROS) (1987)

for soprano and piano (in Dutch and English)

Duration: ca. 8'

Text: Hans Andreus

LIED VAN DE MEISJES (SONG OF THE GIRLS) (2006)

for voice and accordion

Duration: ca. 5'

Text: Bart Moeyaert

AIR (2008)

for soprano, flute and electronics (optional)

Duration: ca. 6'

Text: Wim Henderickx

ATLANTIC WALL (2012)

for mezzo-soprano, instrumental ensemble (6 musicians), video and electronics

Duration: ca. 30'

Text: Inspired by *Chanson d'automne* – Paul Verlaine

Instrumentation: mezzo-soprano, fl (+picc, alto fl, bass fl), cl (+bass cl) / vla, vc / keyboards / perc / electronics

DAWN (1992)

for mezzo-soprano, female choir and instrumental ensemble (8 musicians)

Duration: ca. 20'

Text: Kahlil Gibran

Instrumentation: mezzo-soprano / female choir / fl / hp / perc / vln 1, vln 2, vla, vc, db

DISAPPEARING IN LIGHT (2008) – Part V of the *Tantric Cycle*

for mezzo-soprano, alto flute, viola and percussion

Duration: ca. 32'

Text: Wim Henderickx

EARTH (2008)

for mezzo-soprano, violin and electronics (optional)

Duration: ca. 6'

Text: Wim Henderickx

FIRE (2008)

for baritone, cello and electronics (optional)

Duration: ca. 6'

Text: Wim Henderickx

LAMENTO DI MEDEA (2011)

for soprano, instrumental ensemble (7 musicians) and live electronics

Duration: ca. 70'

Instrumentation: soprano / duduk, electric guitar / fl (+picc, alto fl, bass fl), vla, cl (+bass cl) / perc (2 players) / electronics

LIED VAN DE MEISJES (SONG OF THE GIRLS) (2006)

for voice and instrumental ensemble (7 musicians)

Duration: ca. 5'

Text: Bart Moeyaert

Instrumentation: voice / cl, bsn / tp, tbn / perc (1 player) / vln, db

LIED VOOR OLEK (SONG FOR OLEK) (2009)

for voice and instrumental ensemble (7 musicians)

Duration: ca. 3'

Text: Bart Moeyaert

Instrumentation: voice / cl, bsn / tp, tbn / perc (1 player) / vln, db

NADA BRAHMA (2005) – Part III of the *Tantric Cycle*

for soprano, instrumental ensemble (11 musicians) and live electronics

Duration: ca. 25'

Text: Wim Henderickx

Instrumentation: soprano / fl (+alto fl), ob, bcl (+cl), bsn / tp, tbn / perc (2 players) / vla, vc, db / electronics

ONLY DARKNESS AND SHADOWS (2003)

for soprano and instrumental ensemble (10 musicians)

Duration: ca. 15'

Text: Triin Soomets

Instrumentation: soprano / fl, ob, cl, bsn / hn / pno / vln, vla, vc, db

THE FOUR ELEMENTS (2011)

for mezzo-soprano, flute, violin, clarinet, violoncello and electronics (optional)

Duration: ca. 27'

Text: Wim Henderickx

WATER (2008)

for baritone, clarinet and electronics (optional)

Duration: ca. 6'

ANTIFOON (2014)

for choir and orchestra

Duration: ca. 35'

From *Antifoon* for orchestra, wind band, choir, percussion ensembles ad lib, soprano and bass

ONLY DARKNESS AND SHADOWS (2004)

for soprano and orchestra

Duration: ca. 15'

Text: Triin Soomets

Instrumentation: soprano / 1, 1, 1, 1 / 1, 1, 1, 0 / perc (1 player) / pno / strings

TOMORROW SHALL BE MY DANCING DAY (1991)

for mixed choir and chamber orchestra

Duration: ca. 4'

Text: English carol

Instrumentation: mixed choir / fl, ob, cl, bsn / 2 hns / organ (ad lib) / strings

ACHILLEUS (2001-2002)

opera for young people, based on a libretto by Imme Dros

Duration: ca. 75'

Singers: soprano, mezzo-soprano, tenor, baritone, bass baritone, bass and countertenor

Instrumentation: fl (+picc, alto fl), alto sax (+bar sax) / tp, tbn / perc (1 player) / pno (+synth) / vln, vla, vc, db / electronics

BALLAD: THE WITCH DOCTOR AND THE TWO GIANTS (1996)

for narrator and orchestra (in Dutch, French and English)

Duration: ca. 8'

Text: Aboriginal myth

Instrumentation: narrator / picc, 1, 1, engl hn, 1, bass cl, 1, cbsn / 2, 2, 1, 1 / perc (4 players) / hp / strings

CIRCUS SUITE (1992-2014)

for flute (or bassoon or alto saxophone) and piano

Duration: ca. 8'

CIRCUS SUITE (2014)

for oboe and piano

Duration: ca. 8'

CIRCUS SUITE (2014)

for clarinet in B-flat (or bass clarinet in B-flat) and piano

Duration: ca. 8'

CIRCUS SUITE (2004)

for woodwind quintet

Duration: ca. 7'

DE KONIGIN ZONDER LAND (THE QUEEN WITH NO LAND) (2014)

for 4 singers, 2 percussion players and electronics

Duration: ca. 75'

Text: Paul Verrept

Singers: soprano (2), mezzo-soprano, bass

LIED VAN DE MEISJES (SONG OF THE GIRLS) (2006)

for voice and accordion

Duration: ca. 5

Text: Bart Moeyaert

LIED VAN DE MEISJES (SONG OF THE GIRLS) (2006)

for voice and piano

Duration: ca. 5

Text: Bart Moeyaert

LIED VAN DE MEISJES (SONG OF THE GIRLS) (2006)

for voice and instrumental ensemble (7 musicians)

Duration: ca. 5

Text: Bart Moeyaert

Instrumentation: voice / cl, bsn / tp, tbn / perc (1 player) / vln, db

LIED VOOR OLEK (SONG FOR OLEK) (2009)

for voice and instrumental ensemble (7 musicians)

Duration: ca. 3'

Text: Bart Moeyaert

Instrumentation: voice / cl, bsn / tp, tbn / perc (1 player) / vln, db

LIED VOOR OLEK (SONG FOR OLEK) (2009)

for voice and piano

Duration: ca. 3'

Text: Bart Moeyaert

OLEK SCHOOT EEN BEER (OLEK SHOT A BEAR) (2006)

for narrator and instrumental ensemble (in Dutch, French, English and German) (7 musicians)

Duration: ca. 35'

Text: Bart Moeyaert

Instrumentation: narrator / cl, bsn / tp, tbn / perc (1 player) / vln, db

OLEK-SUITE (2006)

for instrumental ensemble (7 musicians)

Duration: ca. 25'

Instrumentation: cl, bsn / tp, tbn / perc / vln, db

ORPHEUS: TOVERDOKTER IN DE ONDERWERELD (WITCH-SINGER IN THE UNDERWORLD) (2002)

Duration: ca. 5'

for children's choir and piano

Text: Wim Henderickx

1.3.13 Electronic Music

ONGRIJPBARE TIJD (ELUSIVE TIME) (2012)

open air installation at the Market Square in Lier

In collaboration with Jorrit Tamminga

SHRI YANTRA (2009)

for 8 channel soundtracks

Duration: ca. 15.41"

In collaboration with Jorrit Tamminga

1.3.14 Arrangements

SIX EPIGRAPHES (2016)

for flute, viola and harp

Duration: ca. 15'

Original version: Claude Debussy

TROIS CHANSONS DE BILITIS (2016)

for soprano, flute, viola and harp

Duration: ca. 10'

Original version: Claude Debussy

2. Gert François (b. 1960) – Short Biography

Gert François was born on 7 September 1960 in Antwerp, Belgium. He started learning percussion at the Hogeschool Gent Conservatorium at the age of 16 years, where he later obtained his Master's Degree in percussion and chamber music. He also received master classes from Ruud Wiener[11] in vibraphone and Adama Dramé[12] (b. 1954) in African percussion. He expanded his knowledge of percussion instruments and became a specialist on percussion instruments from around the world.

Image C-2

Gert François[13]

[11] Ruud Wiener is a percussionist who specialises in the vibraphone and he taught at the Rotterdam Conservatory and the Maastricht Conservatory.
[12] Adama Dramé is a master African percussionist and since 1979 he has been giving master classes in djembe in Europe and America.
[13] Photo supplied by Gert François.

Since 1987 Gert François has been the lecturer in percussion at the Koninklijk Conservatorium in Brussels, and in 2006 he organised, together with percussionist Bart Quartier[14] (b. 1961), the Brussels Percussion Festival. François was also the percussionist in various Flemish and international orchestras, most notably recording film music with the Brussels Philharmonic Orchestra for *The Aviator* (2004) and *The Artist* (2011), for which the orchestra received two Golden Globes, a Bafta, a César, a European Film Award, and an Oscar. He performed and presented master classes in different parts of Europe and the United States of America. In October 2000 he toured the United States of America with Lieve Schuermans, performing works for flute and percussion, and with Yuki Hori, performing works for violin and percussion.

In 2005 he toured with the Shanghai Philharmonic Orchestra in China and Japan, performing *Waterconcerto* by the Chinese composer Tan Dun (b. 1957), and in 2006 he gave the world premiere of *Watermusic solo* by Tan Dun. François' son, Sep François, is also a percussionist and plays for ensembles such as Ifa Y Xango and Okon & The Movement.

[14] Bart Quartier is a Belgian percussionist and composer.

3. Leo De Neve (b. 1960) – Short Biography

Leo De Neve was born on 11 January 1960 in Hasselt, Belgium and began his studies in music at a very young age with Kati Sebestyén[15] in Brussels at the Royal Conservatory of Brussels, and later with Bruno Giuranna[16] (b. 1933) in Berlin and Ervin Schiffer[17] (1932-2014) in Tilburg.

Image C-3

Leo De Neve playing on his Italian viola built by David Tecchler[18]

[15] Kati Sebestyén is Professor of violin and head of the strings department at the Royal Conservatory of Brussels. She also leads the Sebestyén String Ensemble and is a member of the Haydn Quartet. She was the wife of the late Ervin Schiffer.

[16] Bruno Giuranna was Professor at the Hochschule für Musik, International Chair at the Royal Academy of Music in London, and Prince Consort Professor of viola at the Royal College of Music in London.

[17] Ervin Schiffer was a member of the Haydn Quartet, Tahor Quartet, and the Dekany Quartet. He also taught at the Conservatory of Amsterdam, Prince Claus Conservatory in Groningen, Utrecht Conservatory, Fontys Conservatory in Tilburg, and the Royal Conservatory of Brussels.

[18] Photo supplied by Leo De Neve.

As performer, he played principal viola in deFilharmonie, Antwerp, and La Monnaie-Opéra, Brussels for 16 years. He is also viola player of the Spiegel String Quartet – supported by the Flemish Government and the string quartet in residence at the Muziekcentrum De Bijloke in Gent and the Koninklijk Vlaams Muziekconservatorium in Antwerp – and he plays in the Arpae Ensemble, a Belgian ensemble that consists of flute (Aldo Baerten[19]), viola (Leo De Neve), and harp (Sophie Hallynck[20]). As a promoter of the viola, he organised the *Dag van de Altviool*[21] at de Singel in 1996 and 1998, where instruments and sheet music was exhibited, viola concerts were given, and a viola ensemble of about 80 viola players performed together.

Leo de Neve is also an active soloist, performing and recording music of all eras – including post-20th century music – in Europe, Asia, and South Africa. He is professor of viola and coordinator of the lower strings at the Royal Conservatory of Antwerp where he teaches and presents master classes in viola. He plays an Italian viola built by David Tecchler (1666-1748) that dates back to 1702.

[19] Aldo Baerten is also the principal flautist of the Royal Flemish Philharmonic.
[20] Sophie Hallynck is the President of the Mosan Harp Association and the Félix Godefroid International Harp Competition. She teaches harp and chamber music at the Royal Flemish Conservatory in Antwerp and at the Institut Supérieur de Musique et de Pédagogie in Namur, Belgium.
[21] Day of the viola.

4. Jorrit Tamminga (b. 1973) – Short Biography

Jorrit Tamminga was born in 1973 in Goes and studied music technology at the HKU University of the Arts in Utrecht and sonology at the Royal Conservatory in The Hague. He specialised in electronic composition, live electronics, and sound synthesis.

Image C-4

Jorrit Tamminga[22]

His music has been heard all over the world and he is often employed by composers to assist with live electronics for compositions and productions.

[22] Photo supplied by Jorrit Tamminga.

In 2007 Tamminga was commissioned to write an electronic composition for Erik Bosgraaf[23] that was heard at the opening of the Festival Oude Muziek[24]. In 2010 he composed the music for a multimedia theatre production *Jane* with Izhar Elias, Erik Bosgraaf, Paul de Nooijer, and Menno de Nooijer.

Tamminga is currently a lecturer of electronic music composition at the Conservatorium van Amsterdam, teaches sound design at the HKU Utrecht's Conservatorium, and is a lecturer in electronic composition at the annual SoundMine course held in Neerpelt with Wim Henderickx as main lecturer in orchestration.

[23] Erik Bosgraaf (b. 1980) is considered to be one of the world's leading recorder players, and he often commissions composers for new works.
[24] An annual music festival held in Utrecht that celebrates early European art music.

ADDENDUM D

Wim Henderickx's *Raga I*, *Raga II*, and *Raga III*

1. Background of Wim Henderickx's *Raga I*

In this section I discuss the different versions of Wim Henderickx's *Raga I* and specify the dates, instrumentation, commissioning, and dedication of each version. Details of the first performances and recordings of each version are also be provided here as well as existing literature on *Raga I*.

1.1 Different Versions of Wim Henderickx's *Raga I*

Wim Henderickx's *Raga I* exists in three versions:

1) *Raga I* for percussion and two pianos (1994);

2) *Raga I* for percussion and orchestra (1996);

3) *Raga I* for percussion solo (1996); and

4) *Raga I* for percussion and concert band (2016).

1.2 Instrumentation of Wim Henderickx's *Raga I* for Percussion and Orchestra (1996)

The instrumentation of the orchestra is as follows: 2 (+picc), 2 (+cor angl), 2 (+bass cl), 2 (+cbsn) / 4, 3, 3, 1 / hrp / perc (solo) / str (12.10.8.6).

The selection of solo percussion instruments is as follows: Glockenspiel, seven crotales, seven Thai gongs or tubular bells, 'energy chime' or suspended finger cymbal, dobachi, finger cymbals, high sounding whistle, Indian bells, Indian metal chimes, Indian shell chimes, large tamtam, Peking gongs, Chinese cymbal, four octobans, five rototoms, two bongos, quinto, djembe or tumba, large pedal bass drum (calf head), high and medium bass drums or large floor toms, two timpani (26' and 32'), hyoshigi, three temple blocks, African slit drum and bamboo chimes.

1.3 Instrumentation of Wim Henderickx's *Raga I* for Percussion and Concert Band (2016)

The instrumentation of the concert band is as follows: piccolo, two flutes, two oboes, cor anglais, two bassoons, contrabassoon, clarinets in E♭, solo clarinet 1+2 in B♭, clarinets in B♭ 1, clarinets in B♭ 2, clarinets in B♭ 3, bass clarinet in B♭, alto saxophone 1, alto saxophone 2, tenor saxophone, baritone saxophone, four trumpets in B♭, four horns in F, two tenor trombones, bass trombone, two euphoniums in C, bass in C, contrabass, harp, solo percussion, three percussion players.

The solo percussion instruments are the same as shown above in §1.2.

The percussion instruments are as follows:

- Percussion 1: crotales, xylophone, marimba, medium cymbal, snare drum, two bongos, finger cymbals.
- Percussion 2: vibraphone, large Chinese cymbal, small/medium cymbal, three tomtoms (large, medium, small), five temple blocks, tubular bells, triangle.
- Percussion 3: Glockenspiel, bass drum, large tamtam, medium cymbal, two bongos, claves, tambourine.

See Table D-1 for a comparison between the instrumentation between *Raga I* for percussion and orchestra (1996) and *Raga I* for percussion and concert band (2016).[1]

Table D-1

Instrumentation of Raga I *for percussion and orchestra versus version for percussion and concert band*

***Raga I* for Percussion and Orchestra (1996)**	***Raga I* for Percussion and Concert Band (2016)**
1 Piccolo 2 Flutes 2 Oboes 1 Cor Anglais 2 Clarinets 1 Bass Clarinet 2 Bassoons 1 Contrabassoon	1 Piccolo 2 Flutes 2 Oboes 1 Cor Anglais 1 E♭ Clarinet & Solo Clarinets 1+2 / Alto Saxophone 1+2 1 Bass Clarinet / Tenor + Baritone Saxophone 2 Bassoons 1 Contrabassoon
4 Horns 3 Trumpets 2 Trombones & Bass Trombone 1 Tuba	4 Horns 4 Trumpets 2 Trombones & Bass Trombone 1 Bass in C
Percussion Solo	Percussion Solo
	Percussion 1+2+3
1 Harp 12 Violins 10 Violas 8 Violoncellos 6 Contrabasses	1 Harp Clarinets 1+2 Clarinets 3 Euphonium 1+2 in C Contrabass

[1] This table is merely an indication of how most of the instruments in the version of *Raga I* for percussion and orchestra (1996) were orchestrated in the version of *Raga I* for percussion and concert band (2016) with some anomalies.

1.4 Commissioning and Dedication of Wim Henderickx's *Raga I*

Raga I for percussion and two pianos (1994) was commissioned by the Royal Antwerp Conservatory of Music and financially supported by the Flemish Community (Henderickx, 1994).

Raga I for percussion and orchestra (1996) was commissioned by the BRTN Filharmonisch Orkest and financially supported by the Flemish Community (Henderickx, 1996).

Raga I for percussion solo (1996) was a suggestion by Gert François but it was not formally commissioned (François, 2015; Henderickx, 2015b).

Raga I for percussion and concert band (2016) was commissioned by the Royal Symphonic Band of the Belgian Guides.

All four versions of *Raga I* are dedicated to the percussionist Gert François, with the version for percussion and concert band dedicated to Gert François and the Royal Symphonic Band of the Belgian Guides.

1.5 First Performances of Wim Henderickx's *Raga I*

Raga I for percussion and two pianos (1994) was first performed on 26 January 1995 at deSingel International Arts Campus in Antwerp by Gert François (percussion), Levente Kende (piano) and Heidi Hendrickx (piano).[2]

The version of *Raga I* for percussion solo (1996) was first performed on 21 November 1996 at the Royal Conservatory of Brussels[3] by Gert François (percussion).

Raga I for percussion and orchestra (1996) was first performed on 28 October 1996 at deSingel International Arts Campus in Antwerp by Gert François (percussion) and the BRTN Philhamonic Orchestra Brussels (conductor Koen Kessels).

Raga I for percussion and concert band (2016) was first performed on 1 December 2016 at the Bozar in Brussels by the Royal Symphonic Band of the Belgian Guides (conductor Yves Segers) and Gert François (percussion).

See § 1.9 for a complete list of performances of *Raga I*.

[2] Levente Kende and his wife, Heidi Hendrickx, have been performing as a piano duo since 1974.
[3] Koninklijk Conservatorium Brussel.

1.6 Recordings of Wim Henderickx's *Raga I*

A compact disc[4] of *Raga I*[5], *Raga II* and *Raga III*[6] was recorded between 7 and 10 July 1998 at De Blauwe Zaal, deSingel International Arts Campus in Antwerp by VRT Mobile Studio for Radio 3. The compact disc was released in 1999 and features The Royal Philharmonic Orchestra of Flanders, conducted by Grant Llewellyn, and soloists Gert François[7] and Leo De Neve[8]. On this recording, the first movement of *Raga I* is 9 minutes and 14 seconds, and the second movement 8 minutes 54 seconds (Culot, 1999).

A recording for Radio Klara was made in 2016 by Jaume Santonja (percussion), Mathias Coppens (piano), and Geert Callaert (piano).

A video recording of *Raga I* for percussion and two pianos (1994) – Part 1: c. 7 minutes, Part 2: c. 9 minutes– was also made by Ruud Roelofsen (percussion), Lan Thanh Cao (piano), and Ivan Kerekosvky (piano) (Roelofsen, 2013a; Roelofsen, 2013b). Another video of *Raga I* for percussion and two pianos (1994) was made by Bart Vanderbeke (percussion), Dasha Vogeleer (piano), and Martin Gallez (piano) (Vanderbeke, 2015).

[4] Compact disc number: MDC7833.
[5] Second version for percussion and orchestra (1996).
[6] First version for viola and orchestra (1995).
[7] Percussion in *Raga I*.
[8] Viola in *Raga III*.

Image D-1

Front page of the concert program of the first performance of Raga I *for percussion and two pianos*

An unpublished live recording of the first performance of *Raga I* for percussion and two pianos (1994) by Gert François, Levente Kende, and Heidi Hendrickx was also made. This recording was provided to me by Wim Henderickx to support this research project.

There is no recording of *Raga I* for percussion solo (1996) yet (François, 2015).

A video recording was made of *Raga I* for percussion and concert band during the first performance by the Royal Symphonic Band of the Belgian Guides on 1 December 2016 at the Bozar in Brussels.

1.7 Literature on Wim Henderickx's *Raga I*

In an interview with Kathleen Snyers (2000), Wim Henderickx mentions that his first fascination with non-Western music was through percussion. This explains the vast number of non-Western percussion instruments that is used in *Raga I*. Henderickx (2014) writes the following about the form and material of *Raga I*: "The composition contains two contrasting movements[9]: the first part is slowly meditating, picturing, poetic, ... The second part is fast and possesses an enormous rhythmical drive. For the [melodic] material I was inspired by the Indian modi, which determine the atmosphere of the music. This work combines the Morning rāga and the Evening rāga.[10] The rhythmical material is based on the Indian tāla structure. This is a period of a certain number of beats, in which – through the use of accents and ornaments – different variations are obtained. The instrumentation[11] has been inspired [by] Oriental, as well as [...] African percussion instruments."

[9] Widdess (2001:753) writes that rāga's are "associated with a season or time of day at which it is normally performed."

[10] These two ragas are based on one scale that consists of seven notes and consequently the percussionist needs seven tuned gongs and seven tuned crotales (Knockaert, 1995).

[11] See the instrumentation at §1.2.

Yves Knockaert (1995) writes that "Henderickx has an absolute need for structure as a carrier of his music; he does not give an improvisational impression of Indian music in his pieces. The structure of his work is simple and clear, derived from a principle of development: something that was stated is gradually developed into a culminating moment as a provisional end and a new stage of development is turned into a gradual acceleration. This effect of acceleration reflects in some way the conduct of the Indian raga, where the players, like in the case of the tāla and rāga (rhythmic and melodic principles) gradually develop the piece." [Freely translated from the Dutch]. [12]

According to Knockaert (1995), the improvisation on the Indian bells and chimes at the beginning of the first movement refers to the ālāpa, the first part of the Indian rāga where the key of the movement is explored through improvisation. The final part of the second movement refers to the gata, where different sound sources are combined. Knockaert (1998) writes that "[t]he conclusion of *Raga I* is performed at a frantic pace, testing the skills of the soloist to the limit", which is true for all three versions of *Raga I*. Knockaert (1995) also comments on Henderickx's orchestration: "In his Ragas[13] Henderickx proves that he is a unique orchestrator: he uses all instruments in the development and creates rare combinations of timbres." [14] [Freely translated from the Dutch].

[12] "Henderickx heeft een absolute behoefte aan structuur als drager van zijn muziek; hij geeft in zijn stukken niet de improvisatorische indruk van de Indische muziek. De structuur van zijn werken is helder, eenvoudig en duidelijk, afgeleid uit het groeiprincipe: een klaar gesteld uitgangspunt wordt geleidelijk ontwikkeld tot een culminerend moment als voorlopig eindpunt, waarna een nieuwe evolutiefase in een geleidelijke versnelling wordt aangezet. Deze uitwerking met versnelling weerspiegelt in zekere zin het verloop van de Indische rāga, waarin de spelers, vanuit de afspraken van tāla en rāga (ritmische en melodische uitgangscel) geleidelijk het stuk uitbouwen."

[13] Knockaert here refers to Henderickx's *Raga I, Raga II* and *Raga III*.

[14] "In zijn Raga's toont Henderickx zich als een uniek orkestrator: hij betrekt alle instrumenten in de ontwikkeling en laat onwaarschijnlijke timbrecombinaties horen."

An analysis of the structure, pitch class series, and rhythmic structures of *Raga I* for percussion and two pianos was made by Mathias Coppens (2009-2010), one of the pianists who performed this composition.

1.8 The Scale of *Raga I*

The entire composition[15] is based on the following seven tone[16] scale: D, E, F♯, G♯, A, B♭, C, (D) (see Example D-1).

Example D-1

The scale of Raga I

This seven-note scale is not an existing rāga, but a combination of two four-note rāgas: the Kalyan rāga and the Asavari rāga. The Kalyan rāga has the tones D, E, F♯, G♯ and A, and the Asavari rāga has the tones A, B♭, C and D. The A is the common tone of the two rāgas where they are joined to construct the scale of this composition (Thomas, 1995:6; Henderickx, 2015c).

The scale consists of five whole tone intervals (D-E, E-F♯, F♯ -G♯, B♭-C, C-D) and two semitone intervals (G♯-A and A-B♭). The scale starts and ends on D, which is perceived as the tonic of the scale and the most stable pitch class of the scale.

[15] The composition does not modulate.

[16] A seven tone scale is known as a "sampurna" in Indian music.

The neighbouring semitones of A, the G♯ and B♭, make the A a prominent tone of the scale. The G♯ and B♭ have tendencies to resolve with a semitone to the A, governed by melodic gravity and melodic magnetism, and therefore the A is perceived as a stable tone of the scale.

The mediant of the scale – the F♯ – is also perceived as a stable tone in this scale, because the first three tones from this scale (D, E, F♯) correspond with the first three tones of a D major scale starting on the tonic. The mediant of the D major scale – F♯ – is perceived as a stable tone and due to the initial similarities the F♯ is also perceived as a stable tone in this scale.

The tones E, G♯, B♭ and C are the remaining tones and also the unstable tones of the scale. These unstable tones have tendencies, governed by melodic gravity and melodic magnetism, to resolve to more stable tones.

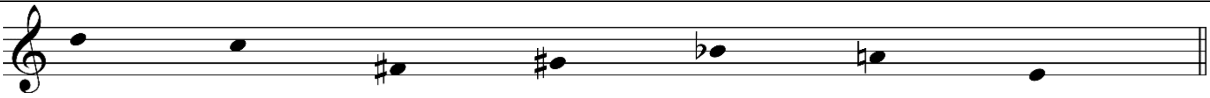
The stable and unstable tones of this scale can be summarised as follows:

Unstable		E		G♯		B♭	C	
Stable	D		F♯		A			(D)

The stepwise tendencies of these unstable tones are E-D, E-F♯, G♯ -F♯, G♯ -A, B♭ -A, or C-D.

1.9 Pitch Class Series of *Raga I*

Raga I is based on three pitch class series: a series of seven pitch classes, ten pitch classes, and twelve pitch classes. These pitch class series are shown below as tone series notated on the sketches of Wim Henderickx.



Example D-2

Seven pitch class series of Raga I

Example D-3

Ten pitch class series of Raga I

Example D-4

Twelve pitch class series of Raga I

1.10 List of Performances of Wim Henderickx's *Raga I*

In this section I compiled a list of all the performances of the different versions of *Raga I*.

1.10.1 Version for Percussion and two Pianos (1995)

Date: 26 January 1995
Percussion: Gert François
Pianos: Levente Kende & Heidi Hendrickx
Place: deSingel, Antwerp

Date: 8 May 1996
Percussion: Gert François
Pianos: Levente Kende & Heidi Hendrickx
Place: Vooruit Theaterzaal, Gent

Date: 11 March 1997[17]
Percussion: Gert François
Pianos: Levente Kende & Heidi Hendrickx
Place: Stadsschouwburg, Antwerp

Date: 25 April 1998
Percussion: Gert François
Pianos: Levente Kende & Heidi Hendrickx
Place: C.C. Plombon, Ninove

Date: 26 October 2000
Percussion: Gert François
Pianos: Levente Kende & Heidi Hendrickx
Place: Tromp Muziek Biënnale, Eindhoven

[17] The second part of *Raga I* for percussion and two pianos were choreographed by students of the Stedelijk Instituut voor Ballet van Antwerpen.

Date: 20 June 2001

Percussion: Bart Vanderbeke

Pianos: Dasha Vogeleer & Martin Gallez

Place: Royal Conservatoire Brussels, Brussels

Date: 1 May 2005

Percussion: Tom de Cock

Pianos: Benjamin van Esser & Saori Oya

Place: PSK-PBA Zaal-Salle O, Brussels

Date: 11 May 2005

Percussion: Tom de Cock

Pianos: Benjamin van Esser & Saori Oya

Place: Royal Conservatoire Brussels, Brussels

Date: 26 June 2009

Percussion: Peter Cools (Exam)

Pianos: Polina Chernova & Kiyotaka Izomi

Place: deSingel, Antwerp

Date: 12 December 2010

Percussion: Peter Cools

Pianos: Nathan Vanden Bulcke & Mathias Coppens

Place: deSingel, Antwerp

Date: 15 June 2011

Percussion: Ruud Roelofsen

Pianos: Lan Thanh Cao & Ivan Kerekovsky

Place: Royal Conservatoire Brussels, Brussels

Date: 14 January 2012

Percussion: Peter Cools

Pianos: Nathan Vanden Bulcke & Mathias Coppens

Place: deSingel, Antwerp

1.10.2 Version for Percussion and Orchestra (1995)

Date: 28 October 1996

Percussion: Gert François

Orchestra: BRTN Philharmonic Orchestra[18]

Conductor: Koen Kessels

Place: deSingel, Antwerp

Date: 6 March 1998

Percussion: Gert François

Orchestra: Koninklijk Filharmonisch Orkest van Vlaanderen and the Symfonish Orkest van het Koninklijk Vlaams Conservatorium Antwerpen

Conductor: Kenneth Montgomery

Place: deSingel, Antwerp

Date: 2 July 2001

Percussion: Bart Vanderbeke

Orchestra: Het Spectra Ensemble

Conductor: Filip Rathé

Place: Hochschule für Musik und Tanz, Köln

Date: 29 March 2002

Percussion: Gert François

Orchestra: Vlaams Radio Orkest

Conductor: Bjarte Engeset

Place: De doos Cultureel Centrum, Hasselt

[18] The BRTN Philharmonic Orchestra is now known as the Brussels Philharmonic Orchestra.

Date: 30 March 2002

Percussion: Gert François

Orchestra: Vlaams Radio Orkest

Conductor: Bjarte Engeset

Place: De Bijloke Stedelijke Concertzaal, Gent

Date: 1 April 2002

Percussion: Gert François

Orchestra: Vlaams Radio Orkest

Conductor: Bjarte Engeset

Place: Theater aan de Parade, 's-Hertogenbosch

Date: 12 April 2002

Percussion: Gert François

Orchestra: Vlaams Radio Orkest

Conductor: Bjarte Engeset

Place: De Spil Cultureel Centrum, Roeselare

Date: 23 November 2009

Percussion: Peter Cools

Orchestra: Symphonic Orchestra Royal Conservatoire Antwerp

Conductor: Ivo Venkov

Place: deSingel, Antwerp

Date: 24 November 2009

Percussion: Peter Cools

Orchestra: Symphonic Orchestra Royal Conservatoire Antwerp

Conductor: Ivo Venkov

Place: deSingel, Antwerp

1.10.3 Version for Percussion Solo (1996)

Date: 21 November 1996
Percussion: Gert François
Place: Royal Conservatoire Brussels, Brussels

Date: 31 October 1997
Percussion: Gert François
Place: Zaal 7, Antwerp

Date: 1 November 1997
Percussion: Gert François
Place: Zaal 7, Antwerp

Date: 2 November 1997
Percussion: Gert François
Place: Zaal 7, Antwerp

Date: 1 May 1998
Percussion: Gert François
Place: Royal Conservatoire Brussels, Brussels

Date: 6 December 1998
Percussion: Gert François
Place: KBC Aquarius Festivaldag, Brussels

Date: 30 October 2000
Percussion: Gert François
Place: Slee Concert Hall of the State University of New York at Buffalo, Buffalo

Date: 28 May 2009

Percussion: Ruud Roelofsen

Place: Concertzaal Artez Conservatorium, Arnhem

1.10.4 Version for Percussion and Concert Band (2016)

Date: 1 December 2016

Percussion: Gert François

Concert band: Royal Music Band of the Belgian Guides

Conductor: Yves Segers

Place: Bozar, Brussels

2. Background of Wim Henderickx's *Raga II*

Raga II is the second work of the three Ragas by Wim Henderickx. This Raga has the subtitle *Tombeau* and was written in 1995 as a commission for the Beethoven Academy. It was performed on 7 March 1995 by the Beethoven Academy (conductor: Jan Caeyers) at the International Arts Centre deSingel in Antwerp, Belgium.

This Raga is based on an Indian morning rāga. Henderickx (2017) writes that "[t]here is a certain atmosphere to a raga. This Morning raga or todi is composed of a series of seven notes, breathing an atmosphere of severity and sadness and at the same time deep love." This composition is approximately 21 minutes in duration.

2.1 Instrumentation of Wim Henderickx's *Raga II*

The instrumentation of *Raga II* is as follows: 2 (+2 picc), 2, 2 (+bass cl), 1 (+cbsn) / 2, 2, 1, 0 / hrp / perc (2 players) / str. The first performance of this composition took place on 7 March 1995 at deSingel in Antwerp by the Beethoven Academy (conductor Jan Caeyers).

2.2 List of Performances of Wim Henderickx's *Raga II*

Date: 7 March 1995
Orchestra: Beethoven Academie Orchestra
Conductor: Jan Caeyers
Place: deSingel, Antwerp

Date: 17 March 1995
Orchestra: Beethoven Academie
Conductor: Jan Caeyers
Place: Lemmensinstituut, Leuven

Date: 26 March 1995
Orchestra: Beethoven Academie
Conductor: Jan Caeyers
Place: Oude Mechelse Vleeshalle, Mechelen

Date: 19 November 1996
Orchestra: Beethoven Academie
Conductor: Jan Caeyers
Place: Aula Piet De Somer, Leuven

Date: 20 November 1996
Orchestra: Beethoven Academie
Conductor: Jan Caeyers
Place: Cultureel Centrum, Hasselt

Date: 17 September 1999

Orchestra: Koninklijk Filharmonisch Orkest van Vlaanderen

Conductor: Etienne Siebens

Place: Onze-Lieve-Vrouekathedraal, Antwerp

Date: 16 April 2000

Orchestra: Koninklijk Filharmonisch Orkest van Vlaanderen

Conductor: Jan Caeyers

Place: Bourlaschouwburg, Antwerp

Date: 27 April 2000

Orchestra: Koninklijk Filharmonisch Orkest van Vlaanderen

Conductor: Jan Caeyers

Place: De Bijloke, Gent

Date: 3 June 2000

Orchestra: Koninklijk Filharmonisch Orkest van Vlaanderen

Conductor: Jan Caeyers

Place: Festival van Vlaanderen, De Velinx, Tongeren

Date: 15 August 2000

Orchestra: Jonge Filharmonie and Jeune Philharmonie, Belgien

Conductor: Peter Rundel

Place: Centre Culturel Marcel Hicter, Namur

Date: 18 August 2000

Orchestra: Jonge Filharmonie and Jeune Philharmonie, Belgien

Conductor: Peter Rundel

Place: Paleis voor Schone Kunsten, Brussels

Date: 20 August 2000

Orchestra: Jonge Filharmonie and Jeune Philharmonie, Belgien

Conductor: Peter Rundel

Place: Konzerthaus am Gendarmenmarkt, Berlin

Date: 22 February 2002

Orchestra: Beethoven Academie

Conductor: Jan Caeyers

Place: Oude Mechelse Vleeshalle, Mechelen

Date: 19 May 2002

Orchestra: Vlaams Radio Orkest

Conductor: Silveer Van den Broeck

Place: Sint-Gummaruskerk, Lier

Date: 12 February 2006

Orchestra: Symfonie Orkest Vlaanderen

Conductor: Etienne Siebens

Place: De Bijloke Concertzaal, Ghent

Date: 23 February 2006

Orchestra: Symfonie Orkest Vlaanderen

Conductor: Etienne Siebens

Place: Concertgebouw, Brugge

Date: 25 February 2006

Orchestra: Symfonie Orkest Vlaanderen

Conductor: Etienne Siebens

Place: Royal Conservatoire Brussels, Brussels

Date: 26 February 2006

Orchestra: Symfonie Orkest Vlaanderen

Conductor: Etienne Siebens

Place: deSingel, Antwerp

Date: 4 November 2008

Orchestra: Staatskapelle Halle & Mitteldeutsche Kammerphilharmonie

Conductor: Hans Rotman

Place: Neues Theater, Halle, Germany

3. Background of Wim Henderickx's *Raga III*

In this section I discuss the different versions of Wim Henderickx's *Raga III* and specify the dates, instrumentation, commissioning, and dedication of each version. Details of the first performances and recordings of each version are also be provided here as well as existing literature on *Raga III*.

3.1 Different Versions of Wim Henderickx's *Raga III*

Wim Henderickx's *Raga III* exists in four versions:

1) *Raga III* for viola and large orchestra (1995);

2) *Raga III* for viola solo (2003);

3) *Raga III* for viola solo and electronics (2010); and

4) *Raga III* for viola and smaller orchestra (2012).[19]

[19] The version of *Raga III* for viola and smaller orchestra (2012) was made with the assistance of conductor Martyn Brabbins, due to an unsatisfactory balance in the orchestra that was identified by Wim Henderickx.

3.2 Instrumentation of Wim Henderickx's *Raga III*

The instrumentation of the first version of *Raga III* (1995) is for viola solo and large orchestra. The instrumentation of the orchestra is as follow: 3 (+2 picc), 2, 2 (+bass cl), 1 (+cbsn) / 4, 3, 3, 1 / hrp / perc (two players) / str (6.6.4.4.2). The percussion sections are as follows: Percussion 1: four timpani, small timbale, three suspended cymbals (small, medium, large), two cymbals (small, medium) on timpani, tubular bells, Glockenspiel (sounding two octaves higher), crotales (tuned E-F-D$^{\#}$-E), small temple block. Percussion 2: triangle, large tamtam, three suspended cymbals (small, medium, large), sizzle cymbal, large Chinese cymbal, vibraphone, Indian bells, metal chimes, large temple block, large African slit drum, five rototoms (tuned approximately E-B-E-B-E), two congas, large timbale, bass drum, tubular bells (shared with player 1).

The second version of *Raga III* is for viola solo (2003) and the third version is for viola solo and electronics (2010). The programming patch of the electronics was developed in SuperCollider[20] by Jorrit Tamminga and is available from Norsk Musikforlag in Oslo (Henderickx, 2010).[21]

The fourth version of *Raga III* is for viola and smaller orchestra (2012). This version is a reduction of the first version for viola and large orchestra and this reduction was made by Wim Henderickx with the following instrumentation: viola solo, 2 (+2 picc), 2 (+engl hrn), 2 (+bass cl), 2 (+cbsn) / 2, 2, 2, 0 / hrp / 5 timp[22], perc (2 players) / str (12.10.8.6.4). The percussion instruments are as follow. Percussion 1: three tuned Thai gongs (D♭, C, G),

[20] SuperCollider is a computer music programme that works with a synthesizer language.
[21] The drone is available as a sound file, a computer code, and a computer program (Tamminga, 2016).
[22] With two Japanese temple bells (tuned D♭, G).

Glockenspiel (sounding two octaves higher), xylomarimba, vibraphone, two timbales, four bongos, two suspended cymbals (small, medium), medium sizzle cymbal, claves, large bass drum. Percussion 2: tubular bells, three tamtams (large, medium, small), marimba, crotales, finger cymbals, triangle, five rototoms (tuned approximately D♭, G, F♯, C, A♭).

See Table D-2 for a comparison between the instrumentation of *Raga III* (1995) and *Raga III* (2012).

3.3 Commissioning and Dedication of Wim Henderickx's *Raga III*

Raga III for viola and large orchestra (1995) was commissioned by the Royal Flemish Philharmonic in 1995, and the version for viola and smaller orchestra (2012) was suggested by Wim Henderickx. The version for viola solo (2003) was inspired by Leo De Neve and the version for viola solo and electronics (2010) was inspired by Marc Tooten, but these two versions were not commissioned (Henderickx, 2016).

Raga III is dedicated to the viola player Leo de Neve.[23]

[23] No dedicatee is indicated for solo viola and electronics version (2010) of *Raga III*, because the other versions of *Raga III* were dedicated to Leo De Neve, but the version for solo viola and electronics (2010) was performed and inspired by Marc Tooten (Henderickx, 2016).

Table D-2

Instrument comparison between Raga III *(1995) and* Raga III *(2012)*

Raga III **(1995)**	***Raga III*** **(2012)**
Woodwind Instruments	*Woodwind Instruments*
3 Flutes (doubling 2 Piccolos)	2 Flutes (doubling 2 Piccolos)
2 Oboes	2 Oboes (2nd doubling English Horn)
2 Clarinets (B♭) (2nd doubling Bass Clarinet (B♭))	2 Clarinets (B♭) (2nd doubling Bass Clarinet (B♭))
1 Bassoon	2 Bassoons
1 Contrabassoon	1 Contrabassoon
Brass Instruments	*Brass Instruments*
4 Horns (F)	2 Horns (F)
3 Trumpets	2 Trumpets
3 Trombones	2 Trombones
1 Tuba	
Orchestra Percussion Instruments	*Orchestra Percussion Instruments*
4 Timpani	5 Timpani
2 Timbales (small, large)	2 Timbales (small, large)
3 Suspended Cymbals (small, medium, large)	2 Suspended Cymbals (small, medium)
2 Cymbals (small, medium) on timpani	2 Japanese Temple Bells (tuned D♭-G) on timpani
Tubular Bells	Tubular Bells
Glockenspiel	Glockenspiel
Crotales (tuned E-F-D♯-E)	Crotales (tuned C-C♯-D-D♯-F-F♯-G-G♯-C)
Temple Blocks (small, large)	
Triangle	Triangle
Large Tamtam	3 Tamtams (large, medium, small)
Sizzle Cymbal	Medium Sizzle Cymbal
Large Chinese Cymbal	
Vibraphone	Vibraphone
Indian Bells	
Metal Chimes	
Large African Slit Drum	
5 Rototoms (tuned approximately E-B-E-B-E)	5 Rototoms (tuned approximately D♭-G-F♯-C-A♭)
2 Congas	
Bass Drum	Bass Drum
	Xylomarimba
	Marimba
	3 Thai Gongs (tuned D♭-C-G)
	Claves
	Finger Cymbals
	4 Bongos
String Instruments	*String Instruments*
1 Harp	1 Harp
6 First Violins	12 First Violins
6 Second Violins	10 Second Violins
4 Violas	8 Violas
4 Violoncellos	6 Violoncellos
2 Contrabasses	4 Contrabasses
Solo Instruments	*Solo Instruments*
1 Viola	1 Viola

3.4 First Performances of Wim Henderickx's *Raga III*

The first performance of *Raga III* for viola and large orchestra (1995) took place at deSingel International Arts Campus in Antwerp on 1 March 1996 with Leo de Neve (viola) and The Royal Flemish Philharmonic (conductor Muhai Tang). The revised version for viola and smaller orchestra (2012) took place on 23 March 2013 at De Roma in Antwerp with Ayako Ochi (viola) and the Royal Flemish Philharmonic (conductor Martyn Brabbins).

A fragment of the version for viola solo (2003) was performed in 2009 by Leo De Neve for an episode of Canvas Klassiek in 2009. *Raga III* for viola solo and electronics (2010) was first performed on 10 March 2011 by Marc Tooten (viola) with electronics by Jorrit Tamminga at de Kanaal Wijnegem in Belgium.

3.5 Recordings of Wim Henderickx's *Raga III*

Raga III for viola and orchestra (1995) was recorded by Leo de Neve (viola) and The Royal Flemish Philharmonic (conductor Grant Llewellyn) on the album *Meesterlijk Strijkers*, released in 2004.[24] The duration of this recording is ca. 27 minutes. The version for viola solo and electronics (2010) was recorded by Marc Tooten (viola) with electronics by Jorrit Tamminga for the album *Disappearing in light*. This album was recorded in 2011 at the Crescendo studio, Genk and Studio C in Antwerp, Belgium. The duration of this version on the recording is 14 minutes and 54 seconds. A video fragment of *Raga III* for solo viola and electronics (2010) was recorded in 2009 by Leo de Neve at Kanaal Wijnegem (Henderickx, 2013).

[24] Label code: KVCA2204.

Image D-2

Front page of the concert program of the first performance of Raga III *for viola and orchestra*

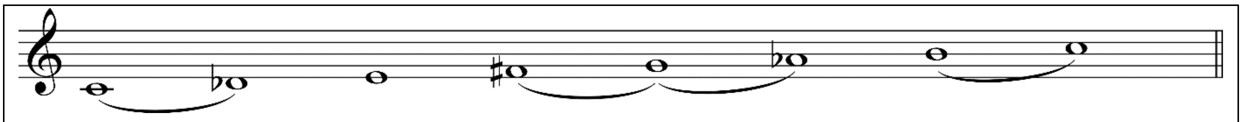
3.6 Literature on Wim Henderickx's *Raga III*

Hubert Culot (1999) writes that *Raga III* for viola and orchestra (1995) is "based on a mid-day raga, [and] the viola evokes the Indian fiddle sarangi while the orchestra supports the soloist in tabla-like fashion. The first part again begins dreamily, though in a somewhat darker mood. The first entry of the viola clearly has an improvisatory character (repeated notes, quarter-tone glissandi) before taking flight in long melodic lines. The mood becomes more impassioned and the first part then fades into the second one. The music now dances along with much energy and rhythmical vitality. After a long cadenza, the music briefly regains its impetus before reaching the peaceful, ecstatic coda Evening Prayer."

Knockaert (1998) writes that "[t]he viola in this Raga is marked by Indian melodic configuration in its use of micro-intervals and quarter tone trills, that hint at the division of the Indian scales in shruti (22 micro-intervals of varying length [within] one octave, completely different from our division in twelve semitones of equal length). The capriciousness of the ornaments alternates with sustained notes that form the keynotes of the lyrically carried melody." Knockaert (1998) also mentions Henderickx's impressive use of percussion instruments in this composition.

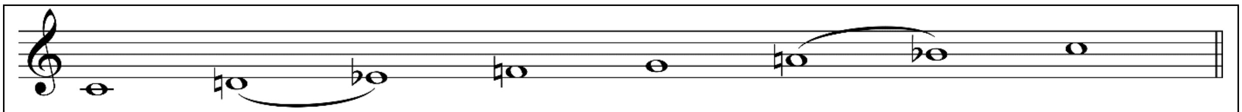
3.7 <u>The Scale of *Raga III*</u>

The entire composition[25] is based on the following seven tone[26] scales: C, D♭, E, F♯, G, A♭, B, (C) (see Example D-5) and C, D♮, E♭, F♮, G, A♮, B♭, (C) (see Example D-6), of which the first scale can be considered as the primary scale of the composition.



Example D-5

The first scale of Raga III



Example D-6

The second scale of Raga III

The first scale consists of one whole tone intervals (E-F♯), four semitone intervals (C-D♭, F♯-G, G-A♭, B-C), and two minor third intervals (D♭-E, A♭-B). The second scale consists of five whole tone intervals (C-D, E♭-F, F-G, G-A, B♭-C) and two semitone intervals (D-E♭, A-B♭). Both scales start and end on C, which is perceived as the tonic of the scale and the most stable pitch class of the scale.

[25] The composition does not modulate.

[26] A seven tone scale is known as a "sampurna" in Indian music.

Henderickx (2016) said the following about the first scale of *Raga III*: "I was led by the open strings of the viola: I had an open C and an open G, thus an open fifth that was the starting point of the composition. I also wanted to create as many leading notes as possible. Therefore, I created a B and a D♭ to neighbour the C, and an F♯ and A♭ to neighbour the G. This scale offered me various possibilities: the D♭ is a lowered second that is like a Neapolitan second, the F♯ creates an augmented fourth, the A♭ is like a lowered sixth chord. The C and the G are the most stable tones, but the E is on a different level of stability."[27]

The stable and unstable tone of the scales can be summarised as follows:

Unstable		D♭		F♯		A♭	B	
Stable	C		E		G			(C)

First scale of Raga III

Unstable		D♮		F♮		A♮	B♭	
Stable	C		E♭		G			(C)

Second scale of Raga III

The stepwise tendencies of the unstable tones in the first scale are D♭-C, F♯-G, A♭-G, B-C, and the stepwise tendencies of the unstable tones in the second scale are D-C, D-E♭, F-E♭, F-G, A-G, B♭-A, B♭-C.

[27] In an interview with Roland Broux (1996), Wim Henderickx highlighted the C, D♭, and G as central tones, but he did not mention the roles of these tones in terms of stability and instability.

3.8 List of Performances of Wim Henderickx's *Raga III*

In this section I compiled a list of all the performances of the different versions of *Raga III*.

3.8.1 Version for Viola and Orchestra (1995)

Date: 1 March 1996
Viola: Leo De Neve
Orchestra: Royal Flemish Philharmonic
Conductor: Muhai Tang
Place: deSingel, Antwerp

Date: 2 March 1996
Viola: Leo De Neve
Orchestra: Koninklijk Filharmonisch Orkest van Vlaanderen
Conductor: Muhai Tang
Place: De Velinx, Tongeren

3.8.2 Version for Viola Solo (2003)

Date: 2009
Viola: Leo De Neve
Place: Canvas Klassiek Studio

3.8.3 Version for Viola Solo and Electronics (2010)

Date: 10 March 2011
Viola: Marc Tooten
Place: 19 Stokerijstraat, Wijnegem

Date: 5 April 2012

Viola: Marco Fusi

Place: Thorley Recital Hall, Southern Utah University, Cedar City, USA

Date: 5 May 2012

Viola: Frans Vos

Place: Urban Museum Wuyts-Van Campen and Baron Caroly

Date: 10 January 2013

Viola: Marc Tooten

Place: Barber Concert Hall, Birmingham

Date: 11 January 2013

Viola: Marc Tooten

Place: Barber Concert Hall, Birmingham

Date: 27 June 2014

Viola: Marc Tooten

Place: International Art Festival at the Kanaal, Strokerijstraat in Wijnegem, Antwerp

3.8.4 Version for Viola and Orchestra (2012)

Date: 23 March 2013

Viola: Ayako Ochi

Orchestra: Royal Flemish Philharmonic & Re-mix XXL by nonprofessional musicians[28]

Conductor: Martyn Brabbins

Place: De Roma, Borgerhout, Antwerp

[28] Paul Griffiths and Wim Henderickx worked on this orchestral piece from 14 to 22 March 2013 with nonprofessional musicians and soloists of the Royal Flemish Philharmonic during the social project Re-Mix XXL.

ADDENDUM E

Events of Importance concerning the Research Project

In this addendum I highlight important events that concerned this research project.

1. Formal Interviews

Formal interviews were conducted with research participants:

- Wim Henderickx, *Royal Flemish Conservatory of Antwerp* (2015-2016)
- Gert François, *Royal Conservatory of Brussels* (2015)
- Leo De Neve, *Royal Flemish Conservatory of Antwerp* (2015)
- Jorrit Tamminga, *Conservatory of Amsterdam* (2015-2016)

2. Colloquia

The research project in progress was presented for input from peers at the following research colloquia:

- Research Colloquium of the School of Music and Conservatory, North-West University, Potchefstroom, 15 May 2014. *Musical analysis and research*.
- Research Colloquium of the School of Music and Conservatory, North-West University, Potchefstroom, 27 April 2015. *Enlarging the scope of Steve Larson's theory of musical forces*.

- Research Colloquium for staff members, School of Music and Conservatory, North-West University, Potchefstroom, 7 September 2017. *Chapter 1, abstract and research procedures*.

3. Conferences

I delivered research papers relating to this research project at the following conferences:

- South African Society for Research in Music (SASRIM), 16th Conference, 19-21 July 2012, Tshwane University of Technology, Pretoria. *To be heard and not to be seen: Why music is gesturing in the dark to analysts*.
- South African Society for Research in Music (SASRIM), 18th Conference, 12-14 September 2014, University of the Witwatersrand, Johannesburg. *Understanding* Syrinx *by Claude Debussy differently - Gestures and perception*.
- National Institute for the Humanities and Social Sciences (NIHSS), National Doctoral Conference, 2-3 November 2016, Birchwood Hotel, Johannesburg. *Expanding Steve Larson's theory of musical forces*.
- South African Society for Research in Music (SASRIM), 21st Conference, 31 August 2017, North-West University, Potchefstroom. *Steve Larson's Theory of Musical Forces: Expanding the Theory.*
- International Conference of Students of Systematic Musicology (SysMus), 10th Conference, 14 September 2017, Queen Mary University of London, London. *Musical Forces save Analysts from Cumbersome Explanations.*

4. <u>Workshops and Courses</u>

I attended the following workshops:

- *SoundMine* course in composition and orchestration (Neerpelt, Belgium, 2016) which was led by
    - Wim Henderickx,
    - Jorrit Tamminga, and
    - Diederik Glorieux.
- NIHSS-SAHUDA Regional Workshop on research methodology which was led by
    - Derik Gelderblom,
    - Jessica Murray, and
    - Johann van der Walt.

5. <u>Informal Discussions</u>

Informal discussions took place with the following persons:

- Research participants who were formally interviewed (2015-2016)
- Bea Henderickx-Steylaerts, Wim Henderickx's wife and administrator (2015-2017)
- Robert Hatten, *University of Texas at Austin* (2015-2017)
- Willem Boshoff (2015-2017)
- Diederik Glorieux, Wim Henderickx's music assistant (2016-2017)
- Bianca Van Roosbroeck, *Musica Impulscentrum voor Muziek* (2016)
- Christo Venter, *North-West University* (2016)
- Matthew BaileyShea, *University of Rochester* (2017)
- Katja Gentric, *Université de Bourgogne* (2017)
- Chris van Rhyn, *North-West University* (2017)

- Mathias Coppens, *Royal Flemish Conservatory of Antwerp* (2017)
- Catrien Wentink, *North-West University* (2017)
- Janelize van der Merwe, *North-West University* (2017)
- June Boyce-Tillman, *University of Winchester* (2017)
- Andile Khumalo, *University of the Witwatersrand* (2017)
- Clare Loveday, *Rhodes University*, *Africa Open – Institute for Music, Research and Innovation* (2017)
- Shiva Rajiv Shrivastava-Saxena, *Crawford Sandton* (2016-2017)

ADDENDUM F

Ethics Approval Certificate of Research Project

Please turn over.

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa 2520
Tel: (018) 299-4900
Faks: (018) 299-4910
Web: http://www.nwu.ac.za

Institutional Research Ethics Regulatory Committee
Tel +27 18 299 4849
Email Ethics@nwu.ac.za

ETHICS APPROVAL CERTIFICATE OF PROJECT

Based on approval by **Research Ethics Committee of the Faculty of Arts**, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby approves your project as indicated below. This implies that the NWU-IRERC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: *Expanding Steve Larson's theory of musical forces: Wim Henderickx's Raga I and Raga III*

Project Leader: Prof Hannes Taljaard
Student: J. Meyer

Ethics number:	N	W	U	-	0	0	3	2	1	-	1	5	-	A	7
	Institution				Project Number						Year			Status	

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Approval date: 2015-08-26 **Expiry date**: 2017-12-01 **Category** N/A

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-IRERC:*
  - *annually (or as otherwise requested) on the progress of the project,*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-RERC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-IRERC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-IRERC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the NWU-IRERC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC for any further enquiries or requests for assistance.

Yours sincerely

Linda du Plessis

Digitally signed by Linda du Plessis
DN: cn=Linda du Plessis, o=NWU, ou=Vaal Triangle Campus, email=linda.duplessis@nwu.ac.za, c=ZA
Date: 2015.09.21 18:16:26 +02'00'

Prof Linda du Plessis
Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)

ADDENDUM G

Informed Consent Form Template

Please turn over.

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private bag X05, Potchefstroom, Noordbrug
South Africa, 2522

Tel: +27(0)18 299-2000
Fax: +27(0) 299-2999
Web: http://www.nwu.ac.za

Shool of Music and Conservatory
Tel: +27(0)18 2991689
Fax: +27(0)18 1991707
Email: [email of candidate]

[date]

Dear [name]

I provide you with the following information so that you can decide whether you would like to participate in my Ph.D. research project. You were chosen to participate in this study because you are the [involvement] of *Raga I* and *Raga III*, which I use as exemplars in my research project.

The purpose of my instrumental case study is to enlarge the scope of, and to develop and expand Steve Larson's theory of musical forces. I will do this by analysing the interaction of musical forces in more complex contexts than those presented in Larson's theory. I chose to analyse the complex relationships between musical forces and orchestration, using *Raga I* and *Raga III* as exemplars.

Your participation in my study will be in the form of interviews regarding your biographical details and involvement in the composition of *Raga I* and *Raga III*. The interview questions will be send to you in advance in order to prepare for the interviews. The interviews will be digitally recorded, transcribed, and the transcriptions might be published as an addendum to my thesis. As professional persons, your names will be mentioned in the thesis.

Your involvement in this research project do not hold any discomfort or negative impact at all and the following is important:

- Participation in this project is completely voluntary.
- The knowledge gained from your participation will not only benefit me as researcher, but will also enable me to expand the theory of musical forces which will benefit scholars in music theory, music analysis, and music performance.
- As researcher, I will cover all my personal costs to do the interviews with you in Europe.
- You are free to withdraw from the project at any time, without stating your reasons for withdrawal, and you or your relationship with the researcher, institution and other research participants will not harmed in any way by so doing.

- Before publication of the thesis, you may request that your data no longer be used in this research project.
- By agreeing to participate in this research project, you are also giving consent for the data that will be generated to be used for research purposes as the researcher sees fit.
- The NWU Ethics Committee may request access to information to ensure the ethical responsibility of practices, in the interest of participants and the public.
- You will be given access to your own data upon request.
- You are allowed to correct yourself during the interview and only the corrected parts of the interview will then be transcribed.
- You are encouraged to ask questions you may have regarding the project and the related procedures at any stage. The supervisor and/or research will gladly answer your queries and discuss the project with you in detail.

Exact dates and times when the interviews will take place will be discussed with you in order to find a suitable time. These interviews will take place between [date] and [date], which is when I plan to visit Europe.

Contact details of the researcher and supervisor are as follow:

Researcher	**Supervisor**
[full names and surname of candidate]	[full names and surname of supervisor]
[qualifications of candidate]	[qualifications of supervisor]
[postal address of candidate]	[postal address of supervisor]
[telephone number of candidate]	[telephone number of supervisor]
[email address of candidate]	[email address of supervisor]

If you are willing to partcipate in this study, please sign the consent form attached to this document and return it to [email address of candidate].

Kind regards,

Jaco Meyer

Consent to Participate

I, the undersigned____(full names and surname) have read the information provided in connection with the research project as discussed in this consent form. I declare that I understand this document. I have initialled every page of the document and I was given the opportunity to discuss relevant aspects of the project with the researcher and/or supervisor. I also declare that I am voluntary taking part in this research project.

____

Participant Signature

Signed at______________________________(place) on this_____day of ____________ 20______.

ADDENDUM H

Elizabeth Lee's Expansion of Larson's Theory of Musical Forces

1. <u>Overview of Elizabeth Lee's Work on the Theory of Musical Forces</u>

Elizabeth J. Lee (2014) completed her PhD at the University of Oregon. She worked with Larson's theory of musical forces and relied much on Hatten's expansion of Larson's theory of musical forces (Hatten, 2012b) and Hatten's (2004) theory of agential energies in her thesis entitled *Patterns, Containment, and Meaning in Hugo Wolf's Mörike-Lieder*.

Lee (2014:1) aimed to answer the following research questions:

- How can our knowledge of musical patterns reveal meaning within selected songs of the collection?
- How can these patterns lead to a better understanding of some of the ways that the individual songs of the collection relate to one another?

Lee (2014) uses Larson's (2012) theory of musical forces, Brower's (2000) theory of musical meaning, Schenker's analytical methods, and Lakoff and Johnson's (1980) cognitive[1] metaphor theory in order to analyze Wolf's compositions.

[1] Lee (2014) refers to Lakoff and Johnson's (1980) "cognitive metaphor theory". However, Lakoff and Johnson's (1980) theory is a *conceptual* metaphor theory.

In order to apply these theories in her analyses, Lee (2014:59) aimed to expand on three original theories:

- She aimed to expand on Larson's theory of musical forces by adding new additional forces such as momentum, friction, melodic elasticity, and by differentiating between local and global gravity (Lee, 2014:63-70).
- She aimed to expand on Brower's diatonic melodic conventions by discussing conventions for chromatic melodies (Lee, 2014:71-80).
- She suggested schematic containers for the operation of chromatic melodies (Lee, 2014:80-87).

I briefly discuss each part of Lee's (2014) work on Larson's theory of musical forces below.

1.1 Momentum

Lee (2014:63) provides a short description for her metaphoric interpretation of momentum: "Momentum is understood as the impetus gained by a moving object, thus we understand musical momentum as a force that builds once melody, harmony, and rhythm are set in motion. Furthermore, we typically recognize that moving downward is a motion that gathers momentum, much like a stone rolling down a hillside. Therefore, we understand momentum not as an environmental agent acting on its own, but rather as a force that works in cooperation with the environmental forces of gravity, inertia, and magnetism."

Hatten's (2012b) expansion of Larson's theory of musical forces already includes momentum. Hatten claims that momentum can be achieved if energy is provided by an independent agent. Lee's (2014:63-65) addition of momentum is thus not Lee's unique addition to Larson's theory of musical forces.[2]

1.2 Friction

Lee (2014:65) suggests friction as a virtual agent and defines it as "a type of resistance the music encounters, which slows its progress". However, Hatten (2012b) already added friction in his expansion of Larson's theory of musical forces.

1.3 Melodic Elasticity

Lee's (2014:67-69) melodic elasticity explains how music operates when leaps occur in music, because leaps are understood as a counteraction of Larson's three musical forces. Lee (2014:68) clarifies that melodic elasticity "does not necessarily constitute a primary music force itself. Yet what this concept implies is that there is indeed some force, whether passive or active, being applied to the melodic line so that the melodic line appears elastic." Her melodic elasticity (Lee, 2014:67-69) was, however, already explained in Hatten's (2012b) expansion of Larson's theory of musical forces and is therefore not a new expansion of Larson's theory of musical forces but merely labeled with different terminology.

[2] Lee (2014:63) cites Larson (2012) and writes that he "also discussed momentum and the numerous ways in which momentum could be gained or lost".

Hatten (2012b) claimed that "[m]elodies exhibit at least some degree of freedom" and that if music starts with a leap, that leap would require additional energy that is not provided by the three musical forces. Hatten (2012b) calls it "initiatory energy".

1.4 Local Gravity and Global Gravity

Lee (2012:70) indicates that she will differentiate between local gravity and global gravity. However, she does not differentiate clearly between her conceptualisation of local gravity and global gravity, but rather discusses stable and unstable tones in different tonal contexts. The role of gravity is also unclear in Lee's discussion and her discussion of local gravity versus global gravity relates more to Larson's (1997b:107) discussion of contextual versus inherent stability.

1.5 Music with Texts

Lee (2014:3) claims that her analyses of Wolf's *Mörike-Lieder* will serve as an expansion of Larson's theory of musical forces because her analyses will be the first application of Larson's theory of musical forces to music with texts, with the exception of BaileyShea (2012). Although not specifically applied to Lieder, Larson (2012, 1997b, 2006, 2012)[3] and Johnson and Larson (2003) applied Larson's theory of musical forces to texted music, and BaileyShea (2012) demonstrated an analyses of texted music of which he makes a connection between the operation of musical forces and meaning of the text and music. Therefore, I do not agree with Lee's (2014:3) claim that her analyses of music with texts serve as an expansion of Larson's theory of musical forces.

[3] My belief is that Larson deliberately avoided texted music because the text and the musical forces can be used to explain meaning in music, which will expand the scope of Larson's articles.

1.6 Chromatic Melodies

Lee (2014:3, 14) writes that Larson's theory of musical forces must be expanded in order to be applied to nineteenth-century music or chromatic melodies, even though Larson (2012) provides several guidelines for, and examples of, the application of his theory of musical forces in chromatic music. The nineteenth-century music that Lee (2014) refers to is still affected by stable tones and Larson's musical forces, possibly with the presence of more agential energies. Therefore, an expansion of Larson's theory of musical forces is not a prerequisite to analysis of nineteenth-century music or chromatic melodies. In my opinion it would be possible to analyse this music without first expanding the theory.

1.7 Conclusion

Although Hatten (2012b) is rarely cited in Lee (2014), Lee relies comprehensively on Hatten's expansion of Larson's theory of musical forces. Lee's (2014) additional forces, of which only one – momentum – can arguably be considered as a force, duplicates Hatten's (2012b) expansion of Larson's theory of musical forces and therefore Lee (2012) does not provide new or alternative insights into the field of musical forces.

REFERENCE LIST

Aarden, B. 2003. Dynamic melodic expectancy. Ohio: Ohio State University. (Dissertation – PhD).

Adler, S. 1982. Workbook for the study of orchestration. 1st ed. New York: Norton.

Aiello, R. 1994. Can listening to music be experimentally studied? (*In* Aiello, R. & Sloboda, J.A., *eds*. Musical perceptions. New York: Oxford University Press. pp. 273-282).

Anon. 2011a. Steve Larson. Corvallis Gazette-Times. www.gazettetimes.com/news/local/obituaries/steve-larson/article_705f1118-bccc-11e0-9a96-001cc4c03286.html Date of access: 20 August 2016.

Anon. 2011b. In memoriam: music professor Steve Larson dies. *Ledger lines: newsletter for alumni & friends of the school of music and dance, University of Oregon*, 23:18.

Arnheim, R. 1954. Art and visual perception: a psychology of the creative eye. Berkeley: University of California Press.

Arnheim, R. 1981. Rudolf Arnheim: Lebenslauf. http://www.sozpaed.fh-dortmund.de/diederichs/arnforum/arnheiml.htm Date of access: 5 May 2015.

Arnheim, R. 1984. Perceptual dynamics in musical expression. *The musical quarterly*, 70(3):295-309.

Arnheim, R. 1986. New essays on the psychology of art. Berkeley: University of California Press.

BaileyShea, M.L. 2012. Musical forces and interpretation: some thoughts on a measure in Mahler. *Music theory online: a journal of the Society for Music Theory*, 18(3). http://www.mtosmt.org/issues/mto.12.18.3.baileyshea.html Date of access: 1 March 2016.

Basit, T.N. 2003. Manual or electronic? The role of coding in qualitative data analysis. *Educational research*, 45(2):143-154.

Becker, J. 2004. Deep listeners: music, emotion, and trancing. Bloomington: Indiana University Press.

Belkin, A. 2008. Artistic orchestration. http://www.webdepot.umontreal.ca/Usagers/belkina/MonDepotPublic/bk.O/O.pdf Date of access: 07 April 2011.

Berg, R.E. & Stork, D.G. 1982. The physics of sound. New Jersey: Prentice-Hall.

Berlioz, H. & Strauss, R. 1948. Treatise on instrumentation. Translated from the French by Theodore Front. New York: Dover.

Bharucha, J.J. 1994. Tonality and expectation. (*In* Aiello, R. & Sloboda, J.A., *eds*. Musical perceptions. New York: Oxford University Press. pp. 213-239).

Bharucha, J.J. 1996. Melodic Anchoring. *Music perception*, 13(3):383-400.

Blum, D. 1977. Casals and the art of interpretation. Berkeley: University of California Press.

Boltz, M.G., Ebendorf, B. & Field, B. 2009. Audiovisual interactions: the impact of visual information on music perception and memory. *Music perception: an interdisciplinary journal*, 27(1):43-59.

Boomsliter, P.C. & Creel, W. 1979. Prestimulus perceptual activity in perception of tone in musical sequences. *Journal of acoustical society of America*, 65(1):123.

Boretz, B.A. 1995. Meta-variations: studies in the foundations of musical thought. New York: Open Space.

Brandt, A. Gebrain, M. & Slevc, L.R. 2012. Music and early language acquisition. *Frontiers in psychology*, 3:327. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3439120/pdf/fpsyg-03-00327.pdf Date of access: 05 May 2017.

Bregman, A.S. 1976. Asking the "what for" question in auditory perception. Research paper presented at the seventh international symposium on attention and performance in Marseille.

Bregman, A.S. 1993. Auditory scene analysis: listening in complex environments. (*In* McAdams, S.E. & Bigand, E., *eds*. Thinking in sound. London: Oxford University Press. pp. 10-36).

Bregman, A.S. & Woszczyk, W. 2004. Controlling the perceptual organization of sound: guidelines derived from principles of auditory scene analysis. (*In* Greenebaum, K. & Barzel, R., *eds*. Audio anecdotes: tools, tips and techniques for digital audio. Vol. 1. Natick: AK Peters. pp. 33-61).

Bregman, A.S. & Campbell, J. 1971. Primary auditory stream segregation and perception of order in rapid sequences of tones. *Journal of experimental psychology*, 89(2):244-249.

Bregman, A.S., Liao, C. & Levitan, R. 1990. Auditory grouping based on fundamental frequency and formant peak frequency. *Canadian journal of psychology*, 44(3):400-413.

Broux, R. 1996. Koninklijk filharmonisch orkest van Vlaanderen. *Forum: tweemaandelijks tijdschrift van de hogeschool Antwerpen departement dramatische kunst, muziek en dans*, 3(4):16-18.

Brower, C. 2000. A cognitive theory of music meaning. *Journal of music theory*, 44(2):323-379.

Butler, D. 1992. The musician's guide to perception and cognition. New York: Schirmer Books.

Carpenter, P. 1993. Arnheim and the teaching of music. *Journal of Aesthetic Education*, 27(4):105-114.

Clarke, E. 1989. Mind the gap: formal structures and psychological processes in music. *Contemporary music review*, 3:1-13.

Cogan, R. & Escot, P. 1976. Sonic design: the nature of sound and music. New Jersey: Prentice-Hall.

Coker, J. 1964. Improvising jazz. New Jersey: Free Press.

Collinson, F.M. 1941. Orchestration for the theatre. London: John Lane.

Cone, E.T. 1974. The composer's voice. Berkeley: University of California Press.

Cook, N. 1994. Perception: a perspective from music theory. (*In* Aiello, R. & Sloboda, J.A., *eds*. Musical perceptions. New York: Oxford University Press. pp. 64-98).

Coppens, M. 2009-2010. Analyse: Raga I voor percussie en orkest. (Unpublished).

Corbin, J. & Strauss, A. 2008. Basics of qualitative research: techniques and procedures for developing grounded theory. 3rd ed. Thousand Oaks: Sage.

Cox, A. 2013. Review of Steve Larson, Musical forces: motion, metaphor, and meaning in music (Bloomington: Indiana University Press, 2012). *Music theory online: a journal of the Society for Music Theory*, 19(1). http://www.mtosmt.org/issues/mto.13.19.1/mto.13.19.1.cox.html Date of access: 10 January 2015.

Creswell, J.W. 2014. Research design. Qualitative, quantitative and mixed method approaches. International student edition. 4th ed. Croydon: Sage.

Creswell, J.W. & Miller, D.L. 2000. Determining validity in qualitative inquiry. *Theory into practice*, 39(3):124-131.

Creswell, J.W. & Plano Clark, V.L. 2007. Designing and conducting mixed methods research. Thousand Oaks: Sage.

Cuddy, L.L. & Lunney, C.A. 1995. Expectancies generated by melodic intervals: perceptual judgments of melodic continuity. *Perception & psychophysics*, 57:451-462.

Culot, H. 1999. Wim Henderickx – Raga I II III (Megadisc-MDC7833). http://www.wimhenderickx.com/uploads/articles/Raga%20Cycle%20-%20Hubert%20Culot%20-%20EN.pdf Date of access: 21 February 2015.

Danermark, B., Ekström, M., Jakobsen, L. & Karlsson, J.C. 2005. Explaining society: critical realism in the social sciences. London: Routledge. https://www.taylorfrancis.com/books/9781134737499 Date of access: 19 February 2017.

De Neve, L. 2015. Interview 1/1: Jaco Meyer in conversation with Leo De Neve [personal interview]. 16 December, Royal Conservatoire of Antwerp, Antwerp, Belgium.

Deliège, I. 1987. Grouping conditions in listening to music: an approach to Lerdahl and Jackendoff's grouping preference rules. *Music perception*, 4:325-359.

Densmore, F. 1926. Pawnee music. *Bulletin of the Smithsonian Institution, Bureau of American Ethnology*, 93.

Deutsch, D. 1978. Delayed pitch comparisons and the principle of pitch proximity. *Perception & psychophysics*, 23:227-230.

Deutsch, D. 1982. The psychology of music. New York: Academic Press.

Diaz, F.M. 2011. Mindfulness, attention, and flow during music listening: an empirical investigation. *Psychology of music*, 41(1):42-58.

Diederichs, H.H. 1997. Der Filmkritiker und Filmtheoretiker Rudolf Arnheim. http://www.sozpaed.fh-dortmund.de/diederichs/texte/arnheimb.htm Date of access: 5 May 2015.

Dowling, W.J. 1967. Rhythmic fission and the perceptual organization of tone sequences. Cambridge: Harvard University. (Dissertation – PhD).

Drimatis, J. 2011. Editing Symphony no. 1 by Robert Hughes: problems to solve. *Journal of music research online*, 1-22. http://www.jmro.org.au/papers/Drimatis-Hughes-2011-128.pdf Date of access: 5 January 2017.

Eitan, Z. 1997. Registral direction and melodic implication. Research paper presented at the sixteenth congress of the International Musicological Society in London.

Ellis, C.J. 1969. Structure and significance in aboriginal song. *Mankind, Australia*, 7(5):3-14.

Esser, D. 2009. Componist van de leegte. http://www.wimhenderickx.com/uploads/articles/Componist%20van%20de%20leegte%20-%20Vorm%20en%20Leegte%20-%20NL.pdf Date of access: 21 February 2015.

Fox, M. 2007. Rudolf Arnheim, 102, psychologist and scholar of art and ideas, dies. http://www.nytimes.com/2007/06/14/obituaries/14arnheim.html Date of access: 29 September 2011.

Fachner, J.C. & Aldridge, D., *eds*. 2005. Music and altered states: consciousness, transcendence, therapy and addictions. London: Jessica Kingsley Publishers.

Fraisse, P. 1984. Perception and estimation of time. *Annual review of psychology*, 35:1-36.

François, G. 2015. Interview 1/1: Jaco Meyer in conversation with Gert François [personal interview]. 17 December 2015, Paleis voor Schone Kunsten, Brussels, Belgium.

Garfias, R. 2004. Music: the cultural context. http://www.socsci.uci.edu/~rgarfias/aris/bio-research/SER47_Robert%20Garfias.pdf Date of access: 15 January 2017.

Glaser, B.G. 1978. Theoretical sensitivity. Mill Valley: Sociology Press.

Goris, K. s.a. Wim Henderickx bewerkt Mozart: same same but different. www.wimhenderickx.com/mediafiles/Entf%FChrung%20v4%20kopie.pdf Date of access: 20 April 2011.

Gritten, A. & King, E. 2006. Music and gesture. Burlington: Ashgate Publishing Company.

Gritten, A. & King, E. 2011. New perspectives on music and gesture. Burlington: Ashgate Publishing Company.

Graybill, R. 2012. Review of Steve Larson, Musical forces: motion, metaphor, and meaning in music (Bloomington: Indiana University Press, 2012). *Indiana theory review*, 30(1):103-119.

Hall, D.E. 2002. Musical acoustics. 3rd ed. Pacific Grove: Thomson Learning.

Hanninen, D.A. 2001. Orientations, criteria, segments: a general theory of segmentation for music analysis. *Journal of music theory*, 45(2):345-433.

Hare, A. 2015. The drum set as melody instrument. http://www.themelodicdrummer.com/haredrums/ Date of access: 7 January 2017.

Hasty, C.F. 1997. Meter as rhythm. New York: Oxford University Press.

Hatten, R.S. 2004. Interpreting musical gestures, topics, and tropes. Bloomington: Indiana University Press.

Hatten, R.S. 2012a. Foreword. (*In* Larson, S. Musical forces: motion, metaphor, and meaning in music. Bloomington: Indiana University Press. pp.ix-x).

Hatten, R.S. 2012b. Musical forces and agential energies: an expansion of Steve Larson's model. *Music theory online: a journal of the Society for Music Theory*, 19(1). http://www.mtosmt.org/issues/mto.12.18.3/mto.12.18.3.hatten.php Date of access: 10 January 2015.

Hatten, R.S. 2015. Melodic forces and agential energies: an integrative approach to the analysis and expressive interpretation of tonal melodies. (*In* Maeder, C. & Reybrouck, M., *eds*. Music, analysis, experience: new perspectives in musical semiotics. Leuven: Leuven University Press. pp. 315-30).

Helm, T. 1994. String quartet in A minor, op.132. (*In* Hermeneutic approaches. Vol. 2 of music analysis in the nineteenth-century. Bent, I., *ed.* Translated by Ian Bent. Cambridge: Cambridge University Press. pp. 242-266).

Henderickx, W. s.a. Wim Henderickx.
http://www.flandersmusic.be/identity.php?ID=133697 Date of access: 21 February 2015.

Henderickx, W. 1994. Raga I for percussion and 2 pianos. Brussels: CeBeDeM. [Music score].

Henderickx, W. 1996. Raga I for percussion solo. Brussels: CeBeDeM. [Music score].

Henderickx, W. 2010. Raga III for viola solo and electronics. Oslo: Norsk Musikforlag. [Music score].

Henderickx, W. 2013. Wim Henderickx, Raga III (fragment).
https://www.youtube.com/watch?t=195&v=sDhaKvsZTJ8 Date of access: 20 April 2015. [YouTube video].

Henderickx, W. 2014. Biography.
http://www.wimhenderickx.com/index.php?page=biography Date of access: 19 February 2015.

Henderickx, W. 2015a. Interview 1/4: Jaco Meyer in conversation with Wim Henderickx [personal interview]. 16 December 2015, Royal Conservatoire of Antwerp, Antwerp, Belgium.

Henderickx, W. 2015b. Interview 2/4: Jaco Meyer in conversation with Wim Henderickx [personal interview]. 18 December 2015, Floris Street, Antwerp, Belgium.

Henderickx, W. 2015c. Interview 3/4: Jaco Meyer in conversation with Wim Henderickx [personal interview]. 21 December 2015, Floris Street, Antwerp, Belgium.

Henderickx, W. 2015d. Short questions for research [email]. 15 April 2015.

Henderickx, W. 2016. Interview 4/4: Jaco Meyer in conversation with Wim Henderickx [personal interview]. Musica, Impulscentrum voor Muziek, Toekomstlaan 5, Neerpelt, Belgium.

Henderickx, W. 2017. Raga II (Tombeau) for orchestra. http://www.wimhenderickx.com/index.php?page=raga-ii Date of access: 14 April 2017.

Hindemith, P. 1940. Unterweisung im Tonsatz. Mainz: B. Schott's Söhne.

Hennion, A. 2002. Music and mediation: towards a new sociology of music. (*In* Clayton, M., Herbert, T., and Middleton, R., *eds*. The cultural study of music: a critical introduction. London: Routledge. pp. 80-91).

Hindemith, P. 1945. The craft of musical composition. Book 1, Theory. Translated from the German by Arthur Mendel. New York: Associated Music Publishers.

Holmquest, H.J. 2014. Structure, musical forces, and musica ficta in fourteenth-century monophonic songs. Oregon: University of Oregon. (Dissertation – PhD).

Hubbard, T.L. 1995. Cognitive representation of linear motion: evidence for representational friction and gravity analogues. *Journal of experimental psychology: learning, memory, and cognition*, 21:241-254.

Hubbard, T.L. 1998. Some effects of representational friction, target size, and memory averaging on memory for vertically moving targets. *Canadian journal of experimental psychology*, 52:44-49.

Huron, D. 2006. Sweet anticipation: Music and the psychology of expectation. Cambridge: MIT Press.

Hurwitz, R. & Larson, S. 1994. Step collections in aural theory. Presentation to a special panel, "Applying a theory of expressive meaning in the written-and aural-theory classrooms", at the national meeting of the College Music Society in Savannah.

Jacob, G. 1962. The elements of orchestration. London: Jenkins.

Jacob, G. 1977. Orchestral technique: a manual for students. 2nd ed. London: Oxford University Press.

James, W. 1950. The principles of psychology. New York: Dover.

Jensen, K.B. 1995. The social semiotics of mass communication. London: Sage.

Johnson, M. & Larson, S. 2003. "Something in the Way She Moves." *Metaphor and symbol*, 18(2):63-84.

Keesecker, J. 2016. Into the bends of time and musical forces in jazz: group interaction and double time in "My foolish heart" as performed by The Bill Evans Trio with Scott LaFaro and Paul Motian. Durham: Duke University. (Thesis – PhD).

Kekeya, J. 2016. Analysing qualitative data using an iterative process. *Contemporary PNG studies: Divine Word University research journal,* 24:86-94.

Kennaway, J. 2012. Musical hypnosis: sound and selfhood from mesmerism to brainwashing. *Social history of medicine*, 25(1):271-289.

Kennan, K. & Grantham, D. 1997. The technique of orchestration. 5th ed. New Jersey: Prentice-Hall.

Knockaert, Y. 1995. Een tolk voor het Oosten: Wim Henderickx. http://www.wimhenderickx.com/site/default.asp?id=45-22-0-0-0-56-&lang=en&menutitle=Knockaert1995 Date of access: 25 March 2011.

Knockaert, Y. 1998. Wim Henderickx – Raga I II III (Megadisc-MDC7833). http://www.wimhenderickx.com/site/default.asp?id=45-22-0-0-0-54-&lang=en&menutitle=Knockaert1998 Date of access: 25 March 2011.

Knockaert, Y. 2005. Wim Henderickx. http://www.wimhenderickx.com/uploads/articles/Wim%20Henderickx%20-%20Yves%20Knockaert%20-%20NL.pdf Date of access: 21 February 2015.

Koechlin, C. 1955. Traité de l'Orchestration. 4 Volumes. Paris: Max Eschig.

Koehler, W. 1947. Gestalt psychology. New York: Liveright.

Kovács, G. & Spens, K.M. 2005. Abductive reasoning in logistics research. *International journal of physical distribution & logistics management*, 35(2):132-144.

Kreitler, S. 2017. The many faces of consciousness. *Psychology*, 8:119-130.

Krumhansl, C.L. 1995. Music psychology and music theory: problems and prospects. *Music theory spectrum*, 17(1):53-80.

Krumhansl, C.L. & Kessler, E.J. 1982. Tracing the dynamic changes in perceived tonal organization in a spatial representation of musical keys. *Psychological review*, 89:334-368.

Lake, W. 1987. Melodic perception and cognition: the influence of tonality. Eugene: University of Michigan. (Dissertation – PhD).

Lakoff, G. & Johnson, M. 1980. Metaphors we live by. Chigaco: University of Chicago Press.

Lakoff, G. & Johnson, M. 1999. Philosophy in the flesh: the embodied mind and its challenge to Western thought. Chicago: University of Chicago Press.

Larson, S. 1981. Some aspects of the album "Out of the Woods" by the Chamber Ensemble 'Oregon'. Eugene: University of Oregon. (Thesis – MMus).

Larson, S. 1982. 'Yellow Bell' and a jazz paradigm. *In theory only*, 6(3):31-46.

Larson, S. 1987a. A tonal model of an 'atonal' piece: Schoenberg's Opus 15, number 2. *Perspectives of new music*, 25:418-433.

Larson, S. 1987b. Questions about the *Ursatz*: a response to Neumeyer. *In theory only*, 10(4):11-31.

Larson, S. 1987c. Schenkerian analysis of modern jazz. Ann Arbor: University of Michigan. (Dissertation – PhD).

Larson, S. 1987d. Integration in jazz performance: concealed repetition in Oscar Peterson's performance of Thelonious Monk's "round midnight". Paper presented at the Society for Music Theory annual conference.

Larson, S. 1988. Analyzing jazz 'strategies': two performances by Bill Evans. Paper presented at the Sonneck Society conference.

Larson, S. 1992. Scale-degree function: cognition research and its application to aural-skills pedagogy. Research paper published as Technical Report #67 of The Center for Research on Concepts and Cognition (CRCC). pp. 1-22.

Larson, S. 1993a. On Rudolf Arnheim's contributions to music theory. *Journal of aesthetic education*, 27(4):97-104.

Larson, S. 1993b. Dave McKenna's performance of 'Have You Met Miss Jones?' *American music*, 11(3):283-315.

Larson, S. 1993c. Scale-degree function: a theory of expressive meaning and its application to aural-skills pedagogy. *Journal of music theory pedagogy*, 7:69-84.

Larson, S. 1994. Another look at Schenker's *Counterpoint*. *Indiana theory review*, 15(1):35-52.

Larson, S. 1995. 'Integrated music learning' and improvisation: teaching musicianship and theory through 'menus, maps, and models'. *College music symposium*, 35:76-90.

Larson, S. 1996a. The art of Charlie Parker's rhetoric. *Annual review of jazz studies*, 8:141-166.

Larson, S. 1996b. Strict use of analytic notation. *Journal of music theory pedagogy*, 10:31-71.

Larson, S. 1996c. Jazz recipes. Paper presented at the West Coast Conference of music theory and analysis.

Larson, S. 1997a. Continuations as completions: studying melodic expectation in the creative microdomain *Seek Well*. (*In* Leman, M., *ed*. Music, Gestalt, and computing: studies in cognitive and systematic musicology. Berlin: Springer-Verlag. pp. 321-334).

Larson, S. 1997b. The Problem of prolongation in tonal music: terminology, perception, and expressive meaning. *Journal of music theory*, 41(1):101-136.

Larson, S. 1997c. Triple play: Bill Evans' Three-Piano Performance of Victor Young's 'Stella by Starlight'. *Annual review of jazz studies*, 9:45-56. Response to Forte's questions, pp. 105-107.

Larson, S. 1997-1998. Musical forces and melodic patterns. *Theory and practice*, 22-23:55-71.

Larson, S. 1998. Schenkerian analysis of modern jazz: questions about method. *Music theory spectrum*, 20(2):209-241.

Larson, S. 1999. Swing and motive in three performances by Oscar Peterson. *Journal of music theory*, 43(2):283-313.

Larson, S. 2001. What makes a good bridge? *Tijdschrift voor musiektheorie / Dutch Journal of music theory*, 8(1):1-15.

Larson, S. 2002. Musical forces, melodic expectation, and jazz melody. *Music perception*, 19(3):351-385.

Larson, S. 2003. Recapitulation recomposition in the sonata-form first movements of Haydn's String Quartets: style change and compositional technique. *Musical analysis*, 22:1-2, 139-177.

Larson, S. 2005. Composition versus improvisation? *Journal of music theory*, 49(2):241-275.

Larson, S. 2006a. Musical gestures and musical forces: evidence from music-theoretical misunderstandings. (*In* Gritten, A. & King, E., *eds*. Music and Gesture. Burlington: Ashgate Publishing Limited. pp. 61-74).

Larson, S. 2006b. Rhythmic displacement in the music of Bill Evans. (*In* Gagné, D. & Burstein, P., *eds*. Structure and meaning in tonal music: a Festschrift for Carl Schachter. Hillsdale: Pendragon. pp. 103-122).

Larson, S. 2009. Analyzing jazz – a Schenkerian perspective. Hillsdale: Pendragon.

Larson, S. 2012. Musical forces: motion, metaphor, and meaning in music. Bloomington: Indiana University Press.

Larson, S. & VanHandel, L. 2005. Measuring musical forces. *Music perception: an interdisciplinary journal*, 23(2):119-136.

Lee, E.J. 2014. Patterns, containment, and meaning in Hugo Wolf's *Mörike-Lieder*. Eugene: University of Oregon. (Dissertation – PhD).

Lerdahl, F. 1988. Tonal pitch space. *Music perception*, 5(3):315-350.

Lerdahl, F. 1996. Calculating tonal tension. *Music perception*, 13(3):319-363.

Lerdahl, F. 1997. Issues in prolongational theory: a response to Larson. *Journal of music theory*, 41(1):141-155.

Lerdahl, F. 2001. Tonal pitch space. New York: Oxford University Press.

Lerdahl, F. & Jackendoff, R. 1983. A generative theory of tonal music. Cambridge: MIT Press.

London, J. 2004. Hearing in time: psychological aspects of musical meter. New York: Oxford University Press.

London, J. 2006. Musical rhythm: motion, pace and gesture. (*In* Gritten, A. & King, E., *eds*. Music and gesture. Burlington: Ashgate Publishing Company. pp. 126-141).

MacAyeal, G. 2013. Book review: Musical forces: motion, metaphor, and meaning in music by Steve Larson. *Music reference services*, 16(2):126-127. www.tandfonline.com/doi/abs/10.1080/10588167.2013.785301?journalCode=wmus20#/doi/full/10.1080/10588167.2013.785301 Date of access: 10 May 2015.

Margolis, H. 1987. Patterns, thinking, and cognition: a theory of judgment. Chicago: University of Chicago Press.

Margulis, E.H. 2003. Melodic expectation: a discussion and model. New York: Columbia University. (Dissertation – PhD).

Margulis, E.H. 2013. Book review: Musical forces: motion, metaphor, and meaning in music. *Music perception: an interdisciplinary journal*, 30(4):427-429.

Marshall, E.L. 2016. Musical forces in Claude Vivier's *Wo bist du Licht! and Trois airs pour un opéra imaginaire*. London: The University of Western Ontario. (Thesis – PhD).

Martin, H. 2005. Counterpoint: a species approach based on Schenker's *Counterpoint*. Oxford: The Scarecrow Press.

Mazo, M. 1994. Lament made visible: a study of paramusical elements in Russian lament. (*In* Yung, B., *ed*. Themes and variations: writings on music in honor of Rulan Chao Pian. Hong Kong: Chinese University Press. pp. 161-211).

McKay, G.F. 1969. Creative orchestration: a project method for classes in orchestration and instrumentation. 2nd ed. Boston: Allyn and Bacon.

Merriam, A.P., Whinery, S. & Fred, B.G. 1956. Songs of a Rada community in Trinidad. *Anthropos*, 51:157-174.

Meyer, J. 2009. Acoustics and the performance of music: manual for acousticians, audio engineers, musicians, architects and musical instrument makers. New York: Springer.

Meyer, L.B. 1956. Emotion and meaning in music. Chigaco: University of Chicago Press.

Meyer, L.B. 1973. Explaining music: essays and explorations. Berkeley: University of California Press.

Meyer, R.J. 2012a. To be heard and not to be seen: why music is gesturing in the dark to analysts. Paper presented at the annual congress of the South African Society for Research in Music (SASRIM), Tshwane University of Technology, Pretoria, 21 July.

Meyer, R.J. 2012b. Principles of orchestration and the analysis of musical gestures. Potchefstroom: North-West University. (Dissertation – MMus).

Meyer, R.J. 2014. Understanding *Syrinx* by Claude Debussy differently – musical forces and musical analysis. Paper presented at South African Society for Research in Music (SASRIM) national congress 2014 – University of the Witwatersrand, Johannesburg, 12 September.

Meyer, R.J. 2017a. Steve Larson's theory of musical forces: expanding the theory. Paper presented at the Annual Congress of the South African Society for Research in Music (SASRIM), North-West University, Potchefstroom, 31 August 2017.

Meyer, R.J. 2017b. Musical forces can save analysts from cumbersome explanations. Paper presented at the 10th International Conference of Students of Systematic Musicology, Queen Mary University of London, London, 14 September 2017.

Michon, J.A. 1964. Studies on subjective duration. I. Differential sensitivity in the perception of repeated temporal intervals. *Acta psychologica*, 22:441-450.

Miles, M.B. & Huberman, A.M. 1994. Qualitative data analysis. 2nd ed. Thousand Oaks: Sage.

Molino, J. 1990. Musical fact and the semiology of music. *Music analysis*, 9(2):105-157.

Momigny, J-J. 1806. Cours Complet d'Harmonie et de Composition, d'après une Théorie Nueve et Générale de la Musique. Paris: Bailleul.

Monahan, S. 2013. Action and agency revisited. *Journal of music theory*, 57(2):321-371.

Monsaingeon, B. 1980. Glenn Gould plays Bach: a film by Bruno Monsaingeon. Available in The Glenn Gould Collection XV. An art of the fugue, SHV48426.

Morris, R.O. 1966. Foundations of practical harmony and counterpoint. 2nd ed. London: MacMillan & co.

Narmour, E. 1990. The analysis and cognition of basic melodic structures: the implication-realization model. Chicago: University of Chicago Press.

Newcomb, A. 1997. Action and agency in Mahler's Ninth Symphony, Second Movement. (*In* Music and meaning. Robinson, J., *ed.* Ithaca: Cornell University Press. pp. 131-153).

Nichols, E. 2005. Dynamic melodic expectation in the creative microdomain *Seek Well*. Research paper published as Technical Report #138 of The Center for Research on Concepts and Cognition (CRCC). pp. 1-20.

Oliveira, A.P. 2013. A musical system for emotional expression. Portugal: University of Coimbra. (Thesis – PhD).

Ortmann, O.R. 1926. On the melodic relativity of tones. Psychological monographs 35/1. Princeton: Psychological Review.

Parrott, I. 1957. Method in orchestration. London: Dennis Dobson.

Peirce, C. 1932. Collected papers of Charles Sanders Peirce volume 2, edited by Hartshorne, C. & Weiss, P. Cambridge: Belknap Press.

Peterson, J. 2014. Intentional actions: a theory of musical agency. Florida: Florida State University. (Dissertation – PhD).

Pilch, J.J. 2005. (*In* Fachner, J.C. & Aldridge, D., *eds*. Music and altered states: consciousness, transcendence, therapy and addictions. London: Jessica Kingsley Publishers.)

Piston, W. 1980. Orchestration. London: Victor Gollancz.

Rauscher, D.J. 1963. Orchestration: scores & scoring. London: Free Press of Glencoe.

Read, G. 1976. Contemporary instrumental techniques. New York: Schirmer.

Rimsky-Korsakov, N. 1964. Principles of orchestration with musical examples drawn from his own works, edited by M. Steinberg. Translated from the Russian by Edward Agate. New York: Dover.

Rockower, H. 2011. A psychological and neurological study of glossolalia. *Chrestomathy: annual review of undergraduate research, School of Humanities and Social Sciences, School of Languages, Cultures, and World Affairs, College of Charleston*, 10:258-270.

Roelofsen, R. 2013a. Raga I part I – Wim Henderickx. https://www.youtube.com/watch?v=lmyIGGZCK10 Date of access: 08 March 2015. [YouTube video].

Roelofsen, R. 2013b. Raga I part 2. https://www.youtube.com/watch?v=JNQRwQ1nJGY Date of access: 08 March 2015. [YouTube video].

Roth, H. 1926. Elemente der Stimmführung [Der strenge Satz]. Stuttgart: Carl Grüniger.

Rothfarb, L. 2001. Energetics. (*In* Christensen, T., *ed*. The Cambridge history of Western music theory. Cambridge: Cambridge University Press. pp. 927-955).

Rothstein, W. 2005. Like falling of a log: rubato in Chopin's Prelude in A-flat Major (Op. 18, no. 17). *Music theory online: a journal of the Society for Music Theory*, 11(1). http://www.societymusictheory.org/mto/issues/mto.05.11.1/mto.05.11.1.rothstein_frames.html Date of access: 06 June 2016.

Rouget, G. 1985. Music and trance: a theory of the relation between music and possession. Chicago: University of Chicago Press.

Roy, A. 2015. Music in motion: a metaphoric mapping of forces in piano concertos by Mozart and Schumann. Ottawa: University of Ottawa. (Thesis – MA).

Rule, P. & John, V. 2011. Your guide to case study research. Pretoria: Van Schaik Publishers.

Sachs, C. 1962. The wellsprings of music. The Hague: Martinus Nijhof.

Saldaña, J.M. 2010. The coding manual for qualitative researchers. London: Sage.

Schachter, C. 1995. The triad as place and action. *Music theory spectrum*, 17(2):149-169.

Schellenberg, E.G. 1996. Expectancy in melody: tests of the implication-realization model. *Cognition*, 58:75-125.

Schellenberg, E.G. 1997. Simplifying the implication-realization model of melodic expectancy. *Music perception*, 14:295-318.

Schenker, H. 1987. Counterpoint: a translation of 'Kontrapunkt' by Heinrich Schenker. Edited by Rothgeb, J. Translated from the German by Rothgeb, J. & Thym, J. New York: Schirmer.

Schuller, G. 1998. The compleat conductor. Oxford: Oxford University Press.

Seidman, I. 2006. Interviewing as qualitative research: a guide for researchers in education and the social sciences. 3rd ed. New York: Teachers College Press.

Serafine, M.L., Glassman, N. & Overbeeke, C. 1989. The cognitive reality of hierarchic structure in music. *Music perception*, 6:397-430.

Sethares, W.A. 2005. Tuning, timbre, spectrum, scale. 2nd ed. London: Springer.

Shteyrenberg, I. 2002. Biography: Rudolf Arnheim.
http://fgimello.free.fr/documents/ARNHEIM.pdf Date of access: 5 May 2015.

Sloboda, J.A. 1985. The musical mind: the cognitive psychology of music. Oxford: The Clarendon Press.

Snyder, B. 2000. Music and memory: an introduction. Cambridge: The MIT Press.

Snyers, K. 2000. Interview met Wim Henderickx over invloeden en historische plaatsing.
http://www.wimhenderickx.com/uploads/articles/Interview%20met%20Wim%20Henderickx%20over%20invloeden%20en%20historische%20plaatsing%20-%20Snyers%20-%20NL.pdf
Date of access: 21 February 2015.

Snyers, K. 2001. Interview met Wim Henderickx over intentie.
http://www.wimhenderickx.com/uploads/articles/Interview%20met%20Wim%20Henderickx%20over%20intentie%20-%20Snyers%20-%20NL.pdf Date of access: 21 February 2015

Spies, B.M. 1988. The didactics of harmony. Translated from the Afrikaans by Eileen Pearse. Pretoria: Beria Printers.

Steylaerts-Henderickx, B. 2017. Catalogue of compositions [email]. 28 June 2017.

Straus, J.N. 1987. The problem of prolongation in post-tonal music. *Journal of music theory*, 31(1):1-21.

Straus, J.N. 1997. Response to Larson. *Journal of music theory*, 41(1):137-139.

Svard, L. 2012-2013. Reviewed work: Musical forces: motion, metaphor, and meaning in music by Steve Larson. *American music teacher*, 62(3):52-53.

Tamminga, J. 2016. Interview 1/1: Jaco Meyer in conversation with Jorrit Tamminga [personal interview]. 14 July 2016, Musica, Impulscentrum voor Muziek, Toekomstlaan 5, Neerpelt, Belgium.

Thomas, P. 1995. Wim Henderickx. Concerto voor slagwerk en 2 piano's. *Forum: tweemaandelijks tijdschrift van het Koninklijk Vlaams Muziekconservatorium Antwerpen*, 2(3):3-7.

Thomas, G. & Myers, K. 2015. The anatomy of the case study. London: Sage.

Thoresen, L. 2017. Aural sonology: emergent musical forms. http://www.auralsonology.com/the-signs/chapter-6-time-fields/ Date of access: 15 June 2017.

Toch, E. 1948. The shaping forces in music: an inquiry into the nature of harmony, melody, counterpoint, and form. New York: Criterion.

Van der Merwe, J. 2010. An analysis of the transformation of the most salient musical gestures in *Serioso* by Hannes Taljaard. Potchefstroom: North-West University. (Mini-dissertation – BMus).

Van der Mescht, H. 2002. Four levels of rigour in interpretative qualitative research. *Education as change*, 6(1):43-51.

Van der Speeten, G. 2006. Mozart verdient altijd in de kijker te staan. http://www.wimhenderickx.com/site/default.asp?id=45-22-0-0-0-152-&lang=nl&menutitle=Van+der+Speeten+2006 Date of access: 24 March 2011.

Vandenhouwe, J. 2001. Wim Henderickx. http://www.wimhenderickx.com/uploads/articles/Wim%20Henderickx%20-%20Matrix%20-%20EN.pdf Date of access: 21 February 2015.

Vanderbeke, B. 2015. Raga I (percussion & 2 piano's) Wim Henderickx. https://www.youtube.com/watch?v=wAicwfjf3A0 Date of access: 2 January 2016.

Vines, B.W., Krumhansl, C.L., Wanderley, M.M. & Levitin, D.J. 2006. Cross-modal interactions in the perception of musical performance. *Cognition*, 101:80-113.

Verstegen, I. 1996. The thought, life and influence of Rudolf Arnheim. *Genetic, social and general psychological monographs*, 122(197-213).

Vos, P.G. & Troost, J.M. 1989. Ascending and descending melodic intervals: statistical findings and their perceptual relevance. *Music perception*, 6(4):383-396.

Wagner, J. 1959. Orchestration: a practical handbook. New York: McGraw-Hill.

Widdess, R. 2001. Rāga. (*In* The New Grove Dictionary of Music and Musicians, 20:753).

Widor, C. 1946. The technique of the modern orchestra: a manual of practical instrumentation. Translated from the French by Edward Suddard. London: Joseph Williams.

Wolpert, R. 1990. Recognition of melody, harmonic accompaniment, and instrumentation: musicians vs. nonmusicians. *Music perception*, 8:95-105, 8:95-105.