Differences in Physical Movement between the Techniques Used on the Marimba and the Vibraphone

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UNIVERSITY OF MIAMI

DIFFERENCES IN PHYSICAL MOVEMENT BETWEEN THE TECHNIQUES USED
ON THE MARIMBA AND THE VIBRAPHONE

By

Ruo-Ying Ke

A DOCTORAL ESSAY

Submitted to the Faculty
of the University of Miami
in partial fulfillment of the requirements for
the degree of Doctor of Musical Arts

Coral Gables, Florida

December 2014
A dissertation submitted in partial fulfillment of
the requirements for the degree of
Doctor of Musical Arts

DIFFERENCES IN PHYSICAL MOVEMENT BETWEEN THE TECHNIQUES
USED ON THE MARIMBA AND THE VIBRAPHONE

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Differences in Physical Movement between the Techniques Used on the Marimba and the Vibraphone.

(December 2014)

Abstract of a doctoral essay at the University of Miami.

Doctoral essay supervised by Professor Svetoslav R. Stoyanov.
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The purpose of this essay is to explore the physical and technical approaches based on the characteristics of the marimba and the vibraphone. This essay includes research about the instruments’ structures and materials, observations of performances and some conversations with mallet-keyboard percussion players. In addition, the essay also describes my own performance experiences with the two instruments.
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CHAPTER 1

Introduction

For a majority of percussionists, musical and technical studies begin on the snare drum. Once a degree of technical proficiency is mastered, students are often introduced to the study of mallet-keyboard instruments by way of the marimba. A popular solo instrument, the marimba is only one of many mallet-keyboard instruments with which percussionists must be familiar. However, little time is spent developing techniques required to master other mallet-keyboard instruments, in particular the vibraphone, which except for pedaling, is taught to be played in the manner of a marimba.

Some view mallet-keyboard instruments as “percussion instruments” with keyboard arrangements, believing that playing a mallet-keyboard instrument is as easy as hitting any other percussion instrument. However, it is essential appropriate attention is given to the unique characteristics that define each of the mallet-keyboard instruments.

While studying piano in Taiwan, my teachers emphasized musical expression and timbre over mechanical techniques. This education has proven useful when performing on mallet-keyboard instruments because it allows for a player to focus on the qualitative aspects of the music rather than just the mechanics of the piece. Despite this educational approach, physical movements and how these movements affect the characteristics of the marimba and vibraphone are rarely mentioned. It is often through trial and error that
keyboard percussionists learn the proper touch between these two instruments. As an experienced percussionists, I believe that different physical movements are required when playing either a marimba or a vibraphone and this project examines this concept.

Historical Background

According to *Grove Music Online*, the marimba developed from a trough-resonated xylophone, which is made of bamboo, wood, synthetic material, logs or tubes.¹ The modern marimba was first used in the orchestra in 1910.² Since that time, the marimba has developed into one of the most popular solo percussion instruments in the world; Paul Creston and Darius Milhaud have composed virtuoso pieces, while Claire Omar Musser revolutionized the modern instrument.³ Consequently, percussionists have worked hard to bring the marimba to mainstream musical culture, resulting in a growing number of marimba competitions, festivals, and an increase in literature.

Like the marimba, the vibraphone is classified as an idiophone, but features metal bars. In the late 1920s, instrument manufacturers experimented to develop a metal xylophone, resulting in the creation of the vibraphone. Since its introduction, motor-

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³ Paul Creston, (*b* New York, 10 October 1906; *d* San Diego, 24 August 1985) was an American composer of Italian parentage. One of the first composers to produce serious concert works for marimba; Darius Milhaud, (*b* Marseilles, 4 September 1892; *d* Geneva, 22 June 1974) was a French composer and pioneered the use of percussion, polytonality, jazz; Claire Omar Musser, (*b* Mannheim, 14 October 1901; *d* 7 November 1998) was a famous marimba performer, conductor and promoter of marimba orchestra. The most noble marimba orchestra that he formed inspired many factories to produce new marimba models.
driven rotating blades were mounted under the bars to produce a tremolo effect. The resulting fluctuation in amplitude created a “vox humana effect” and fuzzy vibrato quality. After War World I, the vibraphone was considered best-suited as a melody instrument in jazz groups and its popularity quickly spread.

Due to the unique sounds of each instrument, the marimba and the vibraphone have undergone a transformation in the last century and today play a significant role in the modern orchestra. It was with Paul Creston’s *Concertino for Marimba and Vibraphone* in 1940 that the marimba and the vibraphone became popular and serious solo performance instruments.4

Because of the increased amount of solo repertoire composed and performed during the last quarter of the twentieth century, the marimba and the vibraphone became central instruments in percussion education and performance. For many percussion students, from elementary levels to colleges and universities, the marimba and the vibraphone are the primary mallet-keyboard instruments studied. Many percussion educators and performers have published popular method books focused on various mallet techniques and provide exercises for technical development; these include but are not limited to Gary Burton’s *Four Mallets Studies*, Anthony Cirone’s *The Orchestra Mallet Player*, Gordon Stout’s *Ideo-Kinetics*, and Morris Goldenberg’s *Modern School*.

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for Xylophone, Marimba, and Vibraphone. The various methods introduced in these texts are applicable to all mallet-keyboard instruments. Additionally, there are many vibraphone specific methods that include information and exercises for mallet and pedal dampening, such as Gary Burton’s Introduction to Jazz Vibes, Julius Wechter’s Play Vibes, and Jon Metzger’s The Art and Language of Jazz Vibes.

Problem

Materials used in the construction of bars and resonators for marimbas and vibraphones differ, producing a variety of unique colors and tones. Because of each instrument’s unique characteristics, performers should vary their approach to learning and performing on each of these instruments.

For most percussionists, formal keyboard percussion studies begin on a marimba, and concentrate on techniques such as two and four mallet techniques, scales, stroke types, dynamic control, and interval control. Students are then asked to apply many of the same techniques to other keyboard percussion instruments, including vibraphone, xylophone, and glockenspiel. The idea is that unique features of these instruments, like pedaling or mallet dampening on the vibraphone, will only require minor adjustments

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when applying the technical skills developed on the marimba. However, due to the diverse qualities of each instrument, different technical and material considerations are necessary in performance. These considerations should include the type of mallets and techniques used to strike the instruments as well as the physical movements and gestures of the performers.

**Purpose of Study**

The purpose of this study is to explore the physical and technical approaches to marimba and vibraphone performance based on the characteristics of each instrument. Specifically, this study is meant to address the following research questions:

1. Are different physical movements and technical approaches necessary in marimba and vibraphone performance?
2. What are the different physical movements needed for playing a marimba and a vibraphone?
3. How are different physical movements chosen when approaching pieces?

In conducting research into the different physical and technical approaches to the marimba and the vibraphone, I examined the design and materials used to construct each of these instruments and how these elements affect sound quality. Once these characteristics were defined, I studied different technical approaches towards these two instruments and their impact on creating a larger sound palate based on my personal experiences and my cultural background, which includes philosophies and movements associated with Tai Chi. Additionally, observations of recorded performances and interviews with renowned keyboard percussionists are utilized to demonstrate similar and
opposing perspectives regarding the use and variation of physical movements and
gestures in marimba and vibraphone performance. The aim of this essay is to provide
percussionists with information, analysis, and expert perspectives that will assist in
applying different physical and technical approaches to these two diverse keyboard
percussion instruments.
CHAPTER 2

Literature Review

In this chapter, I analyze significant literature that assisted in examining the questions posed in the Introduction. The sources reviewed are divided into three categories: (1) general keyboard percussion methods, (2) marimba and xylophone methods, and (3) vibraphone methods.

In the first section, I examine technical methods written between 1954 and 2010 that present general principles that are applicable to all mallet-keyboard percussion, not only marimba or vibraphone. Because these are general keyboard percussion studies, there was no discussion of differences in physical movement required when performing on either a marimba or a vibraphone. Section two emphasizes methods focused solely on marimba and xylophone technique. The majority of these methods were written by famous marimba artists, and provide detailed instructions and exercises for developing individual technical approaches to the marimba or the xylophone; some marimba-specific physical movements are discussed. Finally, section three of this review examines instructional methods for the vibraphone that were written between 1900 and 1996.
General Keyboard Percussion Methods

As keyboard percussion grew in popularity during the late twentieth century, instructional method books began to appear. These materials provide percussion students with instructions and exercises to develop technical skills like gripping/holding the mallets, stroke types, and body positions. Additionally, these methodologies also provide students with exercises to develop an understanding of scales, chord progressions, and harmony.

Many of the general methods include the word “mallets” in their titles and the information provided is applicable to the vibraphone, marimba, xylophone, and bells (glockenspiel). Examples of significant general keyboard percussion methods published during the second half of the twentieth century include: Strelsin’s *New Method of Velocity for Xylophone, Marimba and Vibraphone Based on the Double and Bouncing Beat*; Deven’s *Lesson Plan for Mallet Instruments*; Kraus’s *Modern Mallet Method for Vibes, Xylophone, and Marimba*; Burton’s *Four Mallet Studies*; Wickstrom’s *Keyboard Mastery for the Mallet Percussion*; Whaley’s *Fundamental Studies for Mallets*; and Kostowa and Giesecke’s *Compendium of 4-Mallet Techniques*. In all of these methods, little or no information is provided regarding necessary physical movement for the development of a keyboard percussionist.

Regarding keyboard percussion methods that do discuss physical movement as essential in the development of a keyboard percussionist, the following are significant: McMillan’s *Percussion Keyboard Technic*, Cirone’s *Orchestral Mallet Player*, Peters’
In *Percussion Keyboard Technic*, published in 1962, Thomas McMillan only provides details for wrist positions in executing various strokes. Three types of strokes are examined as essential to help performers achieve a fine performance through different amounts of wrist snap: up-strokes, staccato strokes, and legato strokes.

Anthony Cirone examines the use of the wrist by comparing keyboard percussion instruments with drums in *The Orchestral Mallet Player*. He states that the primary technique for mallet playing is a wrist motion, instead of a finger-wrist motion that is used on the snare drum and timpani, due to the lack of natural rebound and flexibility of the mallets. Cirone explains that the “proper execution, will be a down-up motion of the wrist.” This “down-up stroke” is described as striking the instruments and returning the mallet to the up position by using the wrist.

As I stated earlier, the majority of general keyboard percussion methods include the vibraphone in the same technical discussion with marimbas, xylophones and glockenspiels. In *Fundamental Method for Mallets*, Mitchell Peters states that “there are many technical fundamentals which are applicable to the playing of all the keyboard instruments, with the exception of the chimes. There are, however, specific musical and

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technical practices which are unique to each instrument.”\textsuperscript{9} However, aside from making this comment, Peters provides no specific musical or technical approach for any of the individual instruments.

A recent method that provides general instruction for mallet technique is \textit{Modern School for Mallet-Keyboard Instruments}, by Jim Sewrey, Ben Hans, and Tom Schneller.\textsuperscript{10} Written from a pedagogical perspective, the authors make an effort to bridge the gap between various conceptual approaches for playing the different keyboard percussion instruments. This book provides technical and melodic studies, in addition to selected excerpts from standard orchestral repertoire, to help students become more musically literate and technically proficient on keyboard percussion. In the performance techniques section of this book, the authors provide three different articulations—legato, marcato, and staccato—in relation to physical movements. Legato is described as being achieved by gently manipulating the mallet with the wrist and forearm; marcato by using a hinge action of the wrist; and staccato, in a similar manner to the legato stroke. Only the motion of the wrist is mentioned in regards to achieving these distinct articulations.


\textsuperscript{10} Jim Sewrey, Ben Hans, and Tom Schneller, \textit{Modern School for Mallet-Keyboard Instruments}.
Marimba and Xylophone Methods

In 1937, Howard Peterson published *Xylophone and Marimba Studies*. In the text, he mentions physical movements in regard to playing the instruments only twice. The first mention is about turning the body and hands when some chords featuring accidentals are played with four mallets. The second mention of physical movement addresses how raising the hands or wrists aid in producing softer dynamics. It is worth noting that both of these points are applicable to a vibraphone performance.

In *The Complete Xylophone and Marimba Method*, Duane Thamm considers the marimba as the foundation of all mallet keyboard instruments. His only mention of physical movement in this book is in regard to striking the bars. Thamm believes that “the power behind each stroke of the mallet is a combination of finger, wrist, and forearm, all working together taking advantage of the natural rebound of the mallet.” However, he does not explain how this stroke is executed and how to combine these motions to achieve mallet rebound.

In the previous two methods, all of the general concepts related to physical movements associated with playing xylophone and marimba are applicable to all keyboard percussion instruments. At this point, I will examine marimba specific literature.

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13 Peterson, *Peterson’s Xylophone and Marimba Studies*, 5.
Compared to general mallet-keyboard technical studies, the methods focused on the marimba alone are fewer in number. It was not until 1995 that the first book devoted to four-mallet marimba technique was published. Leigh Howard Stevens’ *Method of Movement for Marimba* is the most comprehensive four-mallet marimba method available. Stevens is a well-known marimbist credited with developing a new four-mallet grip for use in “classical” marimba performance. The “Stevens grip” was based on an earlier grip advanced by the renowned marimbist Claire Omar Musser. Stevens developed his method in the 1970s because he found earlier methodologies inadequate for playing contemporary music.

*Method of Movement for Marimba* is considered revolutionary in its approach to the study of four-mallet marimba technique, and provides information and exercises to assist students and advanced performers in developing general technique (stroke types, performing scales, and negotiating interval changes), tone production, and efficient movement around the instrument. Many of the exercises for producing tone and developing efficient strokes assist performers in using everything from the fingers to the whole body in order to increase basic methods of movement.

Nancy Zeltsman, an internationally recognized marimba performer, published her method, *Four-Mallet Marimba Playing*, in 2003 with assistance from Rick Mattingly. Zeltsman has premiered over 125 solo and chamber works, and since 1993, has taught

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marimba at the Berklee College of Music. Her method presents musical etudes designed for all levels of playing and she provides helpful guidelines for mallet selection, grip, stroke types, tone production, rolls, stickings, and phrasing among many other important topics. Regarding physical movement, this method focuses on how to produce tone, refine the strokes through subtle shifts of finger pressure and various arm and wrist motions. Zeltsman’s analysis of mallet angles, stroke preparation, and body position are beneficial in helping marimba students achieve numerous articulations and musical nuance.

**Vibraphone Methods**

Although the vibraphone has been a prominent instrument in popular and jazz music for approximately the last seventy years, it is a relatively new to the world of contemporary classical music. As I mentioned earlier, vibraphone technique appears in some of the general keyboard percussion methods, but these rarely address the unique qualities of this instrument. The majority of vibraphone studies are devoted to its use as a jazz instrument. In any case, it is difficult to find methods that address physical movements that are specific to the unique features of the vibraphone.

When it comes to analyzing the difference between the strokes used on a vibraphone and those employed on other mallet keyboard instruments, Harry Robbins—in *Modern Tutor for Xylophone and Vibraphone*—argues that “instead of the ‘vertical’ motion of the wrists, it is better to make a ‘swinging’ movement, from the body outwards,
the bar being struck in the middle of the ‘swing.’” However, his analysis focuses on the mallet techniques as applied to the xylophone. In his discussion of the vibraphone, only vibrato (speed of fans in resonators), dampening through use of the pedal, and playing chords receive attention; no specifics regarding physical movements are mentioned.

In *Play Vibes*, published in 1962, Julius Wechter wrote: “It must be remembered that the Vibraharp is a unique instrument, and therefore must be approached as such.” He strongly suggests that players should acquaint themselves with the various parts of the instrument and facilitate the use of its many special effects and features. Detailed techniques, such as attack, stance, and mallets of the vibraphone are explained in this book. In regard to technique, the physical movements mentioned are all concerned with wrist motions. “The Vibraharp is played with wrist action, not arm motion, and any degree of loudness can be achieved by the use of wrist alone.” In *Introduction to Jazz Vibes* Gary Burton echoes Wechter, stating that “the arm and the shoulder do not actually make any movements.”

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17 Wechter, *Play Vibes*, 5. Wechter uses the capital “Vibraharp” to name the vibraphone in his book. Based on the history of the development of this instrument, he chose the word, Vibraharp, to show that the vibraphone played now is a copy of Deagan’s Model 145 which is registered as a vibraharp in every basic, functional aspect.


In 1973, David Friedman published *Vibraphone Technique: Dampening and Pedaling*. Controlling sustain is the only topic that Friedman explores in this book, with sections devoted to “Mallet Dampening,” “Pedaling,” and “Pedaling and Dampening.” Friedman views the vibraphone as a unique instrument: “the vibraphone is a rather cold and limited instrument, which makes smooth phrasing quite difficult.”

In his book *Contemporary Vibraphone Technique*, Dave Samuels presented practical approaches for mastering vibraphone performance through a combination of both physical and theoretical principles. The topics he advances include how to hold the mallets, sticking, striking the instrument, and shifting the players’ weight in order to achieve a more powerful stroke. In this two-volume collection of exercises, Samuels emphasizes sound production and provides building blocks for improvisation within the context of jazz performance.

One of the most comprehensive studies on learning to play vibraphone in jazz is Jon Metzger’s *The Art and Language of Jazz Vibes*. This book not only offers approaches to assist players in developing improvisation skills and jazz vocabulary, but also techniques and strategies for playing the vibraphone. In the section detailing how to strike the bars, Metzger states that “as incongruous as it may seem in light of the traditionally perceived vertical down-up or piston-like stroke on a percussion instrument,

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21 Ibid, 1.


23 Metzger, *The Art and Language of Jazz Vibes*. 
it is actually very helpful to think of having the hands move horizontally instead of vertically when playing fast.\textsuperscript{24}

The reviews above are not an exhaustive list of available literature, but instead touch on many of the most popular methods available. What is clear between all of the method types—general, marimba (with xylophone), or vibraphone specific—is that wrist and arm motions are the only concern for the majority of the authors in regard to physical movement. This review demonstrates the dire need for instructional methodologies that emphasize the importance of physical movements when learning and performing on mallet-keyboard instruments. My aim is to fill this void by proposing additional methods of movement that will assist in achieving a greater technical and musical performance when presenting works on both the marimba and the vibraphone.

\textsuperscript{24} Ibid, 15.
The purpose of this study is to advance concepts which assist keyboard percussionists in developing different physical and technical approaches to playing the marimba and the vibraphone. My aim is to enhance existing keyboard percussion methods that primarily focus on wrist motions that are applicable to the majority of mallet-keyboard instruments, including the marimba and the vibraphone. Additionally, this study emphasizes Tai Chi philosophies and physical movements as applied to the performance of contemporary solo marimba and vibraphone literature.

To carry out this objective, I first analyzed video performances by two well-established marimba and vibraphone performers. Through my observations, I was able to assess and compare various technical approaches to each instrument. Additionally, I spent time interviewing percussionists and composers who specialize on one, or both, of these keyboard percussion instruments. The interviewees selected were chosen because they incorporate physical movement into their playing or have developed unique technical approaches and musical philosophies to the marimba, the vibraphone, or both.

Finally, I include my own perspectives for the application of techniques and physical movements specifically for the marimba and the vibraphone. My twenty years of percussion and piano experience, coupled with culturally influenced philosophies and Tai
Chi practices, allow me to illustrate practical approaches for applying these techniques and movements to marimba and vibraphone performances. These illustrations include explanations as to why certain movements are not effective on both instruments.

**Performance Analysis**

With video streaming platforms like YouTube and Vimeo, many outstanding marimba and vibraphone performances are available on the Internet. Through repeated viewings, and with the ability to watch at slower speeds, nuances in the movements of various performers are easily observed. For this essay, I selected two performers for analysis:

1. Ney Rosauro, performing movements one and two from his own composition, *Serenata for Marimba/Vibraphone and Orchestra*.25

2. Nathan Daughtrey, performing the third movement of David R. Gillingham’s *Concerto for Marimba and Percussion Orchestra*; and the second movement from his own work, *Concerto for Vibraphone and Percussion Ensemble*.26

I chose these pieces because compositions that involve both the marimba and the vibraphone executed by one player offer an opportunity to observe different physical approaches to playing each instrument within a homogenous compositional style.

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Born in Rio de Janeiro, Brazil in 1952, Ney Rosauro began studying percussion in 1977. Today, he is a successful percussionist, composer, and pedagogue whose more than 100 compositions and method books have become standards in the percussion repertoire. Rosauro’s compositional style is greatly influenced by his musical studies on the guitar, his first instrument. Moreover, as a graduate student at the University of Miami, he studied jazz improvisation, which he now frequently incorporates into his compositions. Rosauro is in demand worldwide as a concert soloist, specifically in regard to performing his own compositions for percussion. His concertos for marimba and vibraphone are some of the most popular percussion works of all time, having been performed over 2,500 times by distinguished orchestras worldwide.

*Serenata for Marimba/Vibraphone and Orchestra* was published in 2007 and dedicated to Rosauro’s late mother, Nylsa Luzzi Rosauro. The piece is in four movements, titled: *The Continent, In Heaven, The Journey*, and *Finale*. The composition is based on the rhythm of Guarani, one of the most popular South American styles. The performance of *Serenata* that I reviewed was given on January 30th, 2013, by Ney Rosauro and the Orquestra do Theatro São Pedro in Porto Alegre, RS, Brazil.

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29 Ney Rosauro, *Serenata: for Marimba/Vibraphone and Orchestra*. Rosauro composed this piece based on the rhythm of Guarania, one of the most popular styles from South America, and it is inspired by an old choral composition of his.

30 “Ney Rosauro’s Serenata, First Movement,” YouTube, Flash video file, https://www.youtube.com/watch?v=9x3ETb0htVg (accessed July 14, 2014); “Ney Rosauro ‘Serenata for Marimba/
Additionally, I chose this piece and recording because they are a strong representation of both Rosauro’s unique compositional style and his physical approach to marimba and vibraphone performance.

The second and third recordings I chose for analysis are of Nathan Daughtrey performing marimba on David R. Gillinham’s *Concerto for Marimba*, as well as vibraphone on his own concerto composition. Daughtrey, born in 1975, is an esteemed percussionist, composer, and educator. As a performing artist and clinician, he has performed and given master-classes and clinics throughout the United States and abroad.

*Concerto for Vibraphone and Percussion Ensemble* was commissioned by Dr. Lisa Rogers, professor of Percussion at Texas Tech University. The piece is in two movements—I. “Night’s song (El Canto de la Noche)” and II. “Enchanted Light (La Luz Encantada)”—which were inspired by two opposing poems by Pablo Neruda that depict night and day: *Ode to Nighttime* and *Ode to Enchanted Light*. Commenting on his attempt to capture the rich and vivid imagery of the poems, Daughtrey stated: “one of my favorite sources of inspiration for my compositions is poetry – especially that of Pablo

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33 “Poet: Pablo Neruda – All Poems of Pablo Neruda,” Poemhunter, http://www.poemhunter.com/pablo-neruda/ (accessed July 14, 2014). Pablo Neruda (b Parral, Chile, 12 July 1904; d Santiago, Chile, 23 September 23, 1973) was a poet and diplomat. Neruda wrote in a variety of styles including surrealist poems, historical epics, overtly political manifestos, a prose autobiography, and erotically-charged love poems such as the ones in his 1924 collection *Twenty Love Poems and a Song of Despair*. In 1971 Neruda won the Nobel Prize for Literature.
Neruda. It is so passionate and filled with vivid imagery that it is just a blast to try and portray his words with music.\textsuperscript{34} My analysis focuses on the second movement. The performance I selected was given by the University of Oklahoma Percussion Ensemble featuring Nathan Daughtrey as vibraphone soloist.\textsuperscript{35}

Finally, David R. Gillingham’s \textit{Concerto for Marimba and Percussion Orchestra} was a commission by a consortium of schools and performers headed by Professor Marc Wooldridge of Northwestern College in Iowa.\textsuperscript{36} The composer writes that “the work exploits the full range of the technical and expressive ability of the five-octave concert grand marimba.”\textsuperscript{37} The performance I analyze was given by Mt. Lebanon Percussion Ensemble with Daughtrey performing the solo marimba part.\textsuperscript{38}

My observations of the performances by Ney Rosauro and Nathan Daughtrey focus on the contrasts between their physical movements when playing on a marimba versus their performances on a vibraphone. The following are the physical movements I focus on: the shift in center-of-gravity, stroke height, and stroke rebound.


\textsuperscript{36} David Gillingham, Concerto for Marimba and Percussion Orchestra (Greensboro, N.C.: C. Alan Publications, 2008).


\textsuperscript{38} “Concerto for Marimba & Percussion Orchestra,” YouTube, Flash video file, https://www.youtube.com/watch?v=s_MD9AZmXeE (accessed July 14, 2014).
The shift in center-of-gravity refers to how performers move their entire body when adapting to each instrument; specifically how they control their bodies and establish their foundation. The center-of-gravity also relates to the means in which a performer’s body position assists in establishing balance, which in turn affects muscle tension. Since marimba and vibraphone performers are required to stand and move, they must alleviate muscle tension in order to harness power from their entire body.

In many ways, stroke height and rebound are related concepts. Stroke height is the distance from which the player strikes the bar, and stroke rebound refers to how a player lifts the mallets after making contact with the bars. Studying rebound also provides detail as to how a player prepares and connects strokes when executing successive notes.

Other elements for consideration include tone production through a variation in mallet shaft materials (e.g. birch or rattan dowels), stroke angle, and bar materials (metal or wood used in fabrication). Additionally, dynamics and tempo require different stroke heights and stroke velocities, which can affect the range of physical motion possible. Yet, by using different parts of the body to produce stroke heights, velocity, and changes in weight, players can create a wider spectrum of dynamics and timbres.

**Interviews**

Aside from analyzing the three performances mentioned in the previous section, I interviewed several renowned marimba and vibraphone performers. Each of the interviewees were asked questions that I developed to assist in understanding a wide range of technical and musical approaches to these two keyboard percussion instruments.
The questions address each performer’s personal philosophy and expert opinion regarding the application of technique and physical motion, and consequently, the effect of each on sound production and musical interpretation. The questions asked are as follows:

- In general, what kinds of different motions do you use to explore the best sound on each instrument?
- Is there a primary muscle group (type of body movement) that you use more on the marimba versus the vibraphone?
- Are there differences in how you strike the bar for the marimba versus the vibraphone?
- Do you use a different grip with mallets on the marimba versus the vibraphone? Why or why not?
- How would you describe the difference in touch between the marimba and the vibraphone? How does it affect your respective techniques?
- What role does the rebound play into this?
- Do you use more horizontal or vertical motions when playing the marimba versus the vibraphone?
- How do the differences in the handles of the mallets affect your motion?
- Is there a difference in the speed of your downstroke and upstroke for each instrument when playing on the same dynamic and articulation?
- Is there a difference in the way you come off the bar after making contact on the marimba and the vibraphone respectively?
- In general, do you strike the bar of the marimba and the vibraphone from different heights?
- When playing the same piece on both instruments, what are the differences in the touch of strokes or in other physical motions?

As was mentioned previously, the performers I interviewed are highly regarded percussionists, recognized for their musical and technical abilities on both the marimba
and the vibraphone. In addition to Ney Rosauro, who I discussed in the previous section, I conducted interviews with, or received responses to the questionnaire from Svet Stoyanov, Gwendolyn Burgett, and Anders Åstrand.

Bulgarian-born Svet Stoyanov has captivated audiences internationally with his virtuosic technique both on the marimba and a wide variety of other percussion instruments.\(^\text{39}\) He is the winner of the 2003 Concert Artists Guild International Competition in New York, as well as numerous other competition awards. As a soloist, Stoyanov is a driving force in the art of modern concert percussion, and praised by \textit{The New York Times} for his “understated but unmistakable virtuosity” along with a “winning combination of gentleness and fluidity.” Stoyanov is very passionate about music, and this passion is often displayed through his physical gestures. As a student of Stoyanov at the University of Miami, his views and ideas on adding physical gestures to assist in musical expression have been profoundly influential on me and this study.

Gwendolyn Burgett began her musical career studying piano and violin at the age of two.\(^\text{40}\) An active solo, chamber, and orchestral musician, Burgett is the Assistant Professor of Percussion at Michigan State University and has been an instructor at the Interlochen Arts Camp since 2005. Burgett is the winner of the Keiko Abe Prize at the second World Marimba competition in Japan, and the top prize winner at the National Foundation for Advancement in the Arts’ ARTS competition. While at the University of


Miami, I had an opportunity to work with Burgett; it was a privilege to gain insight from regarding the performance of J.S. Bach’s works on mallet-keyboard percussion. Her ideas about applying different physical movements when performing on the marimba or the vibraphone are an invaluable contribution to this essay.

My final interview was with Anders Åstrand, a mallet keyboard specialist and composer from Sweden.\footnote{Anders Åstrand, “Anders Åstrand – About Me,” Anders Åstrand, http://www.andersastrand.com/About_Me.html (accessed July 14, 2014).} He performs, conducts clinics, and has toured extensively with his percussion ensemble, Global Percussion Network, throughout the U.S., Latin America, Australia, and Europe. Åstrand’s music focuses on melodic and rhythmic improvisation, which is also an essential feature in his compositions. I had an opportunity to meet and interview Åstrand in 2014, when he shared his unique approach to keyboard percussion with the University of Miami percussion studio.

**Personal Approach and Philosophy**

Finally, in this study I incorporate my personal approach and philosophy regarding variations in physical movements when approaching both the marimba and the vibraphone in performance. In discussing my approach to these instruments, I must note that I have been profoundly influenced, both personally and artistically, by my Chinese culture. In particular, Laozhuang’s Taoism—and its reflection in everyday life, Chinese art, and culture—is the most important philosophy of my cultural life.\footnote{Taoism, or Daoism, is a philosophical, ethical, and religious tradition of Chinese origin that emphasizes living in harmony with the Tao. The term, Tao, in Chinese means “way,” “path,” or “principle.”}
Taoism emphasizes wu-wei (action through non-action), naturalness, simplicity, liberty, and spontaneity. Laozi, the founder of philosophical Taoism, explained that beings or phenomena that are wholly in harmony with the Tao behave in a completely natural, uncontrived way. This philosophy explains how fighters block punches without conscious thought and merely through body reflex.

Taoism is easily applied to music, especially to the study of percussion performance, where body movements resemble those found in martial arts, specifically Tai Chi Chuan: a unique Chinese system of exercise developed over eight centuries ago. Its founders combined martial arts with the concepts of Chinese Taoist and Confucian Chinese philosophies. Tai Chi is the physical expression of Taoism; finding balance and harmony of the mind and body through slow, continuous, circular, rhythmic, deliberately even, and well-balanced movements.

Envisioning music in this way reflects the internal processes that are the embodiment of Taoism, where the cultivation of focus and calm through meditation is seen as necessary in maintaining optimum balance. For a percussionist these philosophies and movements can help alleviate muscle tension and calm the mind during performance. In performance, percussionists are like martial artists, who pursue “effortless playing” by releasing conscious control over the instruments. By applying Tai Chi techniques, a musician is able to perform without wasting energy and with a greater sense of awareness.

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43 Tao Te Ching by Laozi and Zhuangzi by Zhuangzi are the two books that build the philosophical foundation of Taoism. It generally emphasizes the three treasures: compassion, moderation, and humility. Also, Taoist thought focuses on nature, men-cosmos correspondence, health, longevity, wu wei (effortless action), liberty, immortality and spontaneity.
of their body and overall musical experience. From this perspective, the goal of this study is to present an effortless approach to marimba and vibraphone performance.

In addition to Tai Chi influences, many of the methods applied in this essay are based on my background as both a pianist and percussionist, and reflect the philosophies of my early percussion teachers in Taiwan, including Bor-Nien Hsu, Ya-Wen Lien, and Chi-Hun Chen. Since all three studied music in France, they brought to my early music lessons strict, European philosophies on education. Each of these teachers emphasized critical thinking and attention to even the smallest of details, sparking my early interest in the topic of this essay.

While possible to play a marimba in the same manner as a vibraphone, and vice versa, exploring the diverse qualities of each instrument through physical movement creates profound opportunities for unique musical experiences. The different approaches I set forth in the following chapter will enhance the means by which keyboard percussionists manipulate their arms, wrists, hands, torso, legs, and overall stance at these instruments.
CHAPTER 4

The Differences in Physical Movement between the Techniques used on a Marimba and a Vibraphone

In this chapter, I provide considerations for varying physical movements that will assist percussionists in the study and performance of marimba and a vibraphone literature. These considerations are supported by the interview responses and performance observations I detailed in the previous chapter. I have divided this chapter into four sections, each emphasizing a concept or body area: center of gravity, lower body, and upper body.

Center-of-Gravity

Center of gravity refers to a percussionist’s foundation; the axis of the entire body. This concept emphasizes an understanding of weight distribution and its effect on stability, which in turn affects efficiency. With a firm foundation, percussionists can achieve the best body position in relation to the instruments, allowing for more relaxed and effortless performances.

Laying a proper foundation, through the practice of postures, is an important principle in Tai Chi. In T’ai Chi Ch’uan for Health and Self-Defense, T.T. Liang states that “it is like an axletree of a cartwheel; if the axletree is not on center and is not adapted to the center of gravity of the cart, then the turning of the cartwheel as it goes forward or
backward will lose its usefulness.”

Loss of the pivot point, or the center of gravity, will require the use of excess energy, resulting in more rapid muscle fatigue. For keyboard percussionists, a strong understanding of their personal center of gravity is essential to achieving balance when performing.

Classic writings on Tai Chi emphasize relaxation and movement from the waist. Here, the waist refers to a very large area of the body: the lower transverse section of the abdomen, or the lower dantian (the chi center, or center-of-gravity), as well as the spine (Figure 1). In this context, the center of gravity should be rooted in the feet, released through the legs, controlled by the waist, and manifested through the fingers; and by extension for a marimbist, from the fingers through the mallets.

![Figure 1. The lower dantian in this picture shows the location of the lower transverse section of the abdomen.](image)

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When approaching the vibraphone and marimba, the two greatest factors affecting center of gravity are instrument size (a marimba is much larger than the vibraphone) and the inclusion of a sustain pedal on a vibraphone. These factors are key in examining the range of motion possible on each instrument.

At between 74 to 86 inches wide, the length of a 4.5 octave concert marimba is often much longer than the length of a performer’s open arms. Although a comfortable range varies depending on the individual, it is impossible for a player to stand in a fixed position when playing a marimba, as much of the contemporary literature incorporates the entire range of the instrument. For me, a comfortable range is around two octaves. Therefore, to execute most modern marimba literature, I must reach beyond those two octaves by moving my entire body and maintaining balance through shifts in my center-of-gravity. On marimba, maintaining balance through a shift in the center of gravity is more important than simply moving the upper or lower body. Shifting the center of gravity will help the performer place their entire body in the most efficient position.

Evelyn Glennie illustrates this concept, stating: “The marimba is really a long instrument to negotiate, and therefore our body posture is very important for us to consider. So, I see my body like the engine in a way. So, constantly it is on the move. It is always on the move.”

Anders Åstrand discusses using the knees to increase the range

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46 Evelyn Glennie, “Evelyn Glennie – Biography,” Evelyn Glennie, http://www.evelyn.co.uk/biography.html (accessed July 16, 2014). Evelyn Elizabeth Ann Glennie (b Aberdeenshire, Scotland, July 19, 1965) is a virtuoso percussionist. Glennie performs with a wide variety of orchestras and contemporary musicians and plays in many countries. She has been profoundly deaf since the age of 12, as she started to lose her hearing from the age of 8. This does not inhibit her ability to perform at an international level. She regularly plays barefoot during both live performances and studio recordings in order to feel the music better. She also gives over 100 concerts a year as well as master
of motion and maintaining balance while playing marimba, relating the motions to those employed by professional table tennis athletes.

However, on vibraphone, large shifts in the center of gravity are not necessary since the instrument is smaller in length than a marimba; generally three octaves and between 42 to 65 inches wide. Moreover, the inclusion of a pedal confines a performer’s range of lower body motion. The pedal is often operated with the tip of the right foot, while the majority of a performer’s weight is placed on the right heel. The left leg remains relaxed and is used to assist in making adjustments when shifting entire body to the right or left. The ability to sustain notes on vibraphone also creates issues for percussionists in regard to controlling that sustain using mallet dampening when the pedal is often engaged. For that reason, Stoyanov noted that he generally plays the vibraphone a little bit lower [than the marimba], “because muffling the vibraphone bars requires the sticks to be used at a very different angle, compared to the one generally used when playing marimba.”

One of the first considerations for any keyboard percussionist is regarding stance and distance between the body and the instrument. Rosauro explained that when he stands at a marimba, he keeps a lot of distance between his body and the instrument. He also maintains that in order to play as relaxed as possible, a marimbist should simply lift the mallets over the keyboard from the elbow, leaving the upper part of the arm aligned

classes and frequently commissions percussion works from composers and performs them in her concert repertoire.

with the body. Evelyn Glennie takes this idea even further, stating that a performer should “try whenever possible to keep the mallets in front of [the body].” 48

How these concepts are applied in actual performance is demonstrated by Nathan Daughtrey. When performing the *Concerto for Marimba and Percussion Orchestra* by Gillingham, he is able to keep his arms by his side and mallets in front of his body as he navigates horizontally across the range of the marimba. However, when playing his *Concerto for Vibraphone and Percussion Ensemble*, he often stretches his arms out and tilts his body to the right or left to accommodate constant contact with the vibraphone pedal; these larger arm motions are especially noticeable when both hands are playing in the upper register (Figure 2 and 3).

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Figure 2. The player tilts his body to accommodate a vibraphone.\textsuperscript{49}

Figure 3. The player tilts his body to play on a vibraphone.\textsuperscript{50}


\textsuperscript{50}https://www.youtube.com/watch?v=Uq4IP_QJyV4. Video from 09:29.
A shift in a performer’s center-of-gravity is often directly related to footwork, which refers to elements related to foot position and motion. Obviously, based on instrument size alone, the marimba requires that percussionists use their feet to assist in navigating the entire range of the instrument. In order to easily shift the center-of-gravity, the upper body should coordinate with the lower body, instead of having the body follow the mallets. Evelyn Glennie appropriately summarizes: “I find that I move my body first of all, and the mallets will follow. If I did it the other way around, where the mallets move first, and then I have this huge mass I have to try to move.”

Regarding the sustain pedal on the vibraphone, Rosauro said that a performer is required to “stay in the same position, so you pretty much move your [upper] body to the right or to the left.” He also commented on the need to open the stance for greater balance and how to distribute weight:

…if you keep the feet together you can lose balance. So open the [left] foot … some people say that hurts this leg, the left leg, because all the weight is here. But that’s not correct, is it? You put 60 percent of your weight [on the left leg] and 40 [percent on the right leg]. So you distribute it, that’s very important. If you’re well centered you pretty much move your torso to the left to the right.

Differences in footwork are easily observed by comparing Nathan Daughtrey’s handling of rapid ascending and descending scalar patterns, as well as wide leaps across the entire range of each instrument. Consider Example 4.1 and 4.2 from the second movement of the *Concerto for Vibraphone and Percussion Ensemble*; Daughtrey is able to execute each passage with a single stride of the left foot.


52 Interview responses have been edited or paraphrased for clarity when necessary.
Example 4.1 Daughtrey, *Concerto for Vibraphone & Percussion Ensemble, Mvt. 2* (mm. 17-25).\(^{53}\)

Example 4.2 Daughtrey, *Concerto for Vibraphone & Percussion Ensemble, Mvt. 2* (mm. 100-116).\(^{54}\)


However, when Daughtrey plays similar passages on the marimba, he takes multiple steps to negotiate the range of a five octave instrument. In Example 4.3, he takes three steps to the right to perform three measures. Yet, in Example 4.4, he is required to move up and down the instrument several times. He begins with two steps to the right for three measures, two to the left for two measures, and two to the right for three measures. Each redirection requires control over his center of gravity to maintain overall balance and assist in note accuracy.

Example 4.3 Gillingham, *Concerto for Marimba and Percussion Orchestra, Mvt. 3* (mm. 92-94).  

55 https://www.youtube.com/watch?v=s_MD9AZmXeE. Video 16:40-16:45.
Example 4.4 Gillingham, *Concerto for Marimba and Percussion Orchestra, Mvt.3* (mm. 237-251).\textsuperscript{56}

\begin{center}
\includegraphics[width=\textwidth]{example4.4.png}
\end{center}

\textsuperscript{56} https://www.youtube.com/watch?v=s_MD9AZmXeE. Video 21:20-21:39.
Unlike the marimba, crossover steps are common when playing the vibraphone, as is bending and tilting at the waist to achieve appropriate angles when performing in the upper register (Figure 4 and Figure 5).

Figure 4. The player keeps crossover steps and plays both hands on a high register.\textsuperscript{57}

\textsuperscript{57} https://www.youtube.com/watch?v=Uq4IIP_QJyV4. Video from 09:38.
Example 4.5, from the second movement of Daughtrey’s *Concerto for Vibraphone and Percussion Ensemble*, is a perfect example of a musical passage requiring a vibraphonist to employ and maintain the tilted body angle and crossover step for an extended period.

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Example 4.5 Nathan Daughtrey, *Concerto for Vibraphone & Percussion Ensemble, Mvt. 2* (mm. 57-67).\(^{59}\)

Maintaining a balanced center of gravity is a key component to performing on a large marimba. In order to keep the entire instrument range within easy reach, performers should not constantly maintain their full weight on a single foot. By resting the full

weight on one foot, the center of gravity is off balance and will require a greater amount of energy to shift the body. This concept relates to the Tai Chi Chuan principle of differentiating between the heavy (insubstantial) and the light (substantial). For instance, if the majority of body weight is resting on the right leg, then the right leg is considered substantial and the left insubstantial. It is believed that when one can separate the substantial and insubstantial, one can step lightly without using strength; if one cannot separate them, then the step becomes heavy and slow. 60

**Lower Body**

Evelyn Glennie states: “What happens from [the waist] downward is very important because my feet are constantly moving and I am keeping this wonderful flow and that … helps me create the sound and control the sound that I want.” 61 Although the feet are part of the lower body, in keyboard percussion performance they are a means of establishing the center of gravity or a means of moving the full body along the length of a keyboard instrument. In this section I focus on the use of additional elements of the lower body, particularly the knees.

Since marimba performance requires more footwork, it is essential that the performer keep the knees bent slightly more than when playing vibraphone, in order to assist in relaxed movement of the feet and legs. This additional bend assists marimba players in achieving a balanced center of gravity by evenly distributing the weight over

60 Benjamin Pang Jeng Lo, *The Essence of T’ai Chi Ch’uan: The Literary Tradition.* (Richmond, Calif: North Atlantic Books, 1979), 86.

the balls of the feet, as opposed to the variation in weigh distribution required when playing vibraphone. Rosauro discussed this concept by associating it with Tai Chi positions. He states that “when I play [marimba], my legs are not locked [at the knees], not straight. They’re always [bent a little bit]. That’s what we call in Tai Chi ‘horse riding position.’”

By maintaining a relaxed bend in the knees, marimba players can also take advantage of the counterforce from the ground to save energy when moving or jumping to perform a passage. Prior to making a move or a jump, the knees bend and act like a spring. Similar to many tennis or ping pong players, who are taught to retreat in order to advance, the spring-like action of the knees not only increases stability, but can provide a player with additional power.

When analyzing a performer’s motions from the knees on a marimba or vibraphone, working back from the last note of a musical passage is a productive place to begin, since the approach to the final note is partially decided according to the musical phrase.

Take Rosauro’s performance of his composition _Serenata_: in measures 1-29 of the first movement, there is a rhythmic pattern utilizing chromatic scales that is repeated seven times between the marimba and the vibraphone (Example 4.6). When he plays the ending note on the marimba he jumps, utilizing his entire body in the execution of the final stroke to create the illusion of a longer sustain. However, when playing a similar passage on the vibraphone, this jump is not necessary or possible, since pressing down the pedal is required for sustaining sound.
Example 4.6 Rosauro, *Serenata for Marimba/Vibraphone and Orchestra, Mvt. 1* (mm. 3-25).

Jump high

Arms only

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62 https://www.youtube.com/watch?v=9x3ETb0htVg. Video 00:07-00:40.
Upper Body

Moving to the upper body, the waist also plays different roles in allowing percussionist to maneuver on each instrument. Often the waist can assist a player in turning the upper body to reach notes without the need to take additional steps. On this point, Rosauro stated:

My concept is this: I stand in the middle of the instrument … and I turn the torso. So without moving my [entire] body, I can pretty much reach almost all the instrument. If I need, I do one step [to the left] and one step here [to the right].

Expanding on upper body movement, Rosauro continued that because of the restrictions placed on performers by maintaining contact with a pedal, on vibraphone “you just use your torso to the right and left.” Additionally, throughout my talks with Ney Rosauro, he stressed maintaining flexibility with turning the torso in combination with lower body movements, specifically on marimba:

So you learn how to rotate and sway the body very gently. And I use [my waist] all the time. This! Rotation! So you need to move, move your torso, move your hips, go a little down, put your body down … dance rock and roll here. You have to be flexible.

As with the lower body, instrument size necessitates different motions of the upper body, particularly in the arms. Svet Stoyanov states:

“I move my arms more when I play the marimba, since the 5.0 octave instrument is rather lengthy. I also use the weight of my arms … to produce more/fuller sound from the instrument …...”

An analysis of Ney Rosauro’s performance on his composition Serenata for Marimba/Vibraphone can illustrate this point here. When playing the same dynamic level, Rosauro’s average stroke heights vary between the marimba and the vibraphone.
Example 4.7 and 4.8 are both solo sections featuring similar musical material without any dynamic changes written. A comparison of his average stroke heights on each of excerpts demonstrates that mallet heights are higher when striking the marimba than the heights used when striking the vibraphone. In executing the passage shown in Example 4.7, Rosauro maintains relatively low mallet heights, with the forearms never coming above the elbow.
Example 4.7 Rosauro, *Serenata for Marimba/Vibraphone and Orchestra, Mvt. I* (mm. 176-196).

https://www.youtube.com/watch?v=9x3ETb0htVg. Video 03:17-03:40.

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63 https://www.youtube.com/watch?v=9x3ETb0htVg. Video 03:17-03:40.
However, during the marimba solo he lifts his forearms much higher, using much of the arms. In addition to greater arm motion, he bends his upper body more than he did while playing the vibraphone. (Example 4.8).

Example 4.8 Ney Rosauro, *Serenata for Marimba/Vibraphone and Orchestra, Mvt. 1* (mm. 197-217).64

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64 https://www.youtube.com/watch?v=9x3ETb0htVg. Video 03:40-04:02.
Greater motion in the arms, elbows, and waist were adopted by marimba players, especially in lower register, as the bars gradually became wider and longer. On a marimba, the tone changes depending on where the bar is struck. When struck in the center of the bar, the fundamental is accentuated while the higher harmonics are suppressed. Since this tone quality is ideal for both the performer and listener, bigger motions are necessary to cover the distance between the center of the bars on the upper and lower rails.

However, when executing rapid musical passages, striking the center of the bar on the upper rail is often not possible, so players compensate by striking the edge of the bar closest to the player, since that tone quality is relatively similar to the tone produced when striking slightly off center of the bars. Performers often avoid striking the edge of the bar though, since space is minimal, and if the bar is struck at the nodal point, minimal vibration occurs, in turn producing a dull, or dead sound quality.

Furthermore, materials used in the fabrication of marimba and vibraphone bars affect how a player uses the arms and wrists. When comparing how to strike each instrument, Rosauro believes that on the vibraphone the performer need only “drop the mallets.” However, he states that when playing the marimba, players “need to strike a little bit.”

As previously stated, this variation in stroke type has much to do with variation in bar fabrication: marimba bars are typically made of rosewood or padauk, and the
vibraphone is generally constructed of aluminum.\textsuperscript{65} Compared to the wood of the marimba, the aluminum bars of the vibraphone have much longer decay times. The decay is a physical process by which a sound gradually disappears from the audible spectrum until it no longer exists. A short decay means it takes less time for a note to die away once the musician has stopped producing the sound.\textsuperscript{66} The sound of an instrument like the marimba, with a short decay-time, is dry and rhythmic. For marimba players, this short decay time poses challenges in regard to musical phrasing.

The concept of using continuous motions to achieve smoothness and maintain energy is found in Tai Chi Chuan. Movements flow from one to the next continuously, like smooth running water in a long river; the end of one movement begins the next, as any break between movements will result in a sense of disharmony. To achieve continuous movements when playing on marimba, the performer must properly apply and connect bigger motions appropriate to the speed of the composition.

Aside from the decay time of the bars, there are other differences in mallet response when striking aluminum or wood. Aluminum is more elastic than the wood; elasticity refers to the ability of a deformed material body to return to its original shape and size when the forces causing the deformation are removed.\textsuperscript{67} It is like a spring: when compressed, it exerts a restoring force, which generally brings it back to its original

\footnotesize{\textsuperscript{65} “Percussion – Musical Instruments – Products – Yamaha United States,” Yamaha United States.}


length. According to the Young’s Modulus, a material whose elastic modulus is higher is more rigid.\(^{68}\) The elastic modulus of aluminum is around 69 Gpa; on the other hand, Honduran Rosewood, popular in the construction of marimba bars, is only around 22 Gpa.\(^{69}\) Therefore, the aluminum bars of a vibraphone are more elastic than marimba bars made of wood.

Take baseball bats for instance; the differences between wooden and aluminum bats are important concerns when playing baseball. When hitting a ball, the hardness and resilience of aluminum can result in much greater speeds when the ball comes off the bat. That is because aluminum has a higher coefficient of restitution (\(\text{COR}\)). The \(\text{COR}\) is the ratio of speeds after and before an impact from two colliding objects. The higher the \(\text{COR}\), the more energy from the bat is transferred to the ball. The aluminum absorbs the energy from the ball when contact is made and sends it right back.\(^{70}\) This generates a bounce effect that gives extra power to a hit ball, known as the trampoline effect, which results in

\(^{68}\) *Encyclopedia Britannica Online*, s.v. “Youngs-modulus.” http://www.britannica.com/EBchecked/topic/654186/Youngs-modulus (accessed July 21, 2014). Young’s Modulus, also known as Elastic Modulus, is a measure of the ability of a material to withstand changes in length when under lengthwise tension or compression. It is defined as the ratio of stress along an axis over the strain along that axis in the range of stress.


less energy, loss of impact, and greater velocity off of the aluminum bat.\textsuperscript{71} This means that when you hit a ball with an aluminum bat you are not only using the energy from your swing -- you are also using the ball’s own energy. This allows a batter to actually benefit from a fast pitch, if he is able to hit it.

While the velocity of striking the bars of the marimba or the vibraphone is not as high as when hitting a baseball, the trampoline effect still influences a player’s reaction. This effect explains why a performer need only “drop the mallets” when playing vibraphone, since the aluminum bars respond with greater rebound. A decrease in the trampoline effect on marimba also supports the need for greater physical motions in performance.

Gwendolyn Burgett states that “rebound is the main thing that makes the two instruments feel different. The metal bars and the wooden bars react very differently and feel different.” Svet Stoyanov elaborated, stating that “vibraphone has a bit better rebound capacity, because the instrument’s metal bars are denser than the marimba bars.” He also felt rebound improves on the lower register bars of the marimba, stating: “They are much thinner and more flexible: obviously the qualities of the rebound will change.”

Anders Åstrand feels differently: “it is always easier to get faster on the marimba then the vibe; part of it is that the wood gets more rebound.” In some ways, Burgett agreed, but related playing rapidly to the general velocity at which she moves her mallets:

\begin{footnotesize}
\end{footnotesize}
“I think my vibraphone stroke is probably a little slower than the one I use for marimba.”

However, she noted that even she changes stroke speeds on all instruments depending on
the sound color that she is trying to achieve.

Noticing variations in stroke speed and rebound off the bars is difficult to
distinguish when analyzing marimba and vibraphone performances. However, many
visual differences occur after strokes have been executed, particularly when performing a
slower or more lyrical musical phrase. Take example 4.9: when playing marimba,
Rosauro immediately returns the mallets in the right hand to the same height on almost
every note in the phrase.
Example 4.9 Ney Rosauro, *Serenata for Marimba/Vibraphone and Orchestra, Mvt.2* (mm. 1-9).\textsuperscript{72}

\begin{center}
\includegraphics[width=\textwidth]{example4_9.png}
\end{center}

In Example 4.10, Rosauro lifts the mallets to their highest point after striking the #G\textsuperscript{4} on the 214\textsuperscript{th} measure; he does not lift to the same height again until after striking the next quarter note B\textsubscript{3} in the following measure (Example 4.10). As a result, an arched motion occurs after the long notes to assist in manipulating the large intervals.

Example 4.10 Rosauro, *Serenata for Marimba/Vibraphone and Orchestra, Mvt.1* (mm. 212-217).\textsuperscript{73}

\begin{center}
\includegraphics[width=\textwidth]{example4_10.png}
\end{center}

\textsuperscript{72} https://www.youtube.com/watch?v=JK4YikH2myA. Video 00:19-00:40.

\textsuperscript{73} https://www.youtube.com/watch?v=9x3ETb0htVg. Video 03:56-04:01.
In contrast, when playing on a vibraphone, Rosauro keeps the mallets close to the bars after striking until just before the next stroke. This difference is illustrated in Example 4.11: after the third beat on E₃ in measure 181, he keeps the mallets low until the next note on measure 182; he repeats this in the following measures.

Example 4.11 Rosauro, *Serenata for Marimba/Vibraphone and Orchestra, Mvt.1* (mm. 176-191).⁷⁴

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⁷⁴ https://www.youtube.com/watch?v=9x3ETb0htVg. Video 03:18-03:33.
In the second movement of *Serenata*, Rosauro changes this pattern, choosing not to lift the mallets after playing quarter notes; see measures 28 through 30, and measures 32 through 34 (Example 4.12).

Example 4.12 Ney Rosauro, *Serenata for Marimba/Vibraphone and Orchestra, Mvt.2* (mm. 27-35).\(^{75}\)

Further variation in rebound on both instruments is evident in performances by Nathan Daughtrey. After striking the bars of a vibraphone, he lets the mallets linger before lifting them slowly away from the instrument, as is illustrated in the cadenza

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\(^{75}\) https://www.youtube.com/watch?v=JK4YikH2myA. Video 02:17-02:45.
section of his *Concerto for Vibraphone*. When playing the notes with a fermata, Daughtrey’s arms and elbows lift before the wrists, keeping the mallets downward (Example 4.13). In contrast, on marimba, he generally pulls the mallet heads up right away after striking. However, when performing the marimba cadenza in David Gillingham’s *Concerto*, he executes a whip-like stroke on the first three notes of m. 206 and final two notes in m. 221 (Example 4.14).
Example 4.13 Daughtrey, *Concerto for Vibraphone & Percussion Ensemble, Mvt. 2* (mm. 147-160).\(^{76}\)

Example 4.14 Gillingham, *Concerto for Marimba and Percussion Orchestra*, (mm. 206 and 220-221). 77

Another important factor when considering mallet rebound on both a marimba and a vibraphone are the horizontal motions that link large intervals. When playing on a vibraphone, the mallets are often not lifted immediately after striking the final note of a pattern. It is common for performers to keep the mallets low as they move horizontally across the keyboard until they are over the register where the next musical sequence begins, then the mallets are lifted to strike. This approach is employed by Daughtrey in Example 4.15:

77 https://www.youtube.com/watch?v=s_MD9AZmXeE. Video 19:44 and 20:11.
Example 4.15 Daughtrey, *Concerto for Vibraphone & Percussion Ensemble, Mvt. 2 (mm. 45-53).*

Daughtrey also applies this motion earlier in the same movement, as he uses his right hand to play the main melodic voice (Example 4.16).


However, when Daughtrey is faced with similar leaps in the Gillingham *Concerto for Marimba*, he uses both an arched motion that moves vertically and horizontally as he moves between the high and low registers (Example 4.17).
Example 4.17 Daughtrey, *Concerto for Marimba and Percussion Orchestra, Mvt.3* (mm. 141-154).  

In general, less arm motions are required when performing on the vibraphone. Stoyanov agrees, stating: “Generally, I use far less ... sizable strokes and smaller muscle [groups] on the vibraphone, because the instrument requires [the player to remain] more grounded, in order to play the instrument [utilizing] the pedal.” He continued, noting that the design of the vibraphone “allows [the performer] to operate slightly looser overall, because the accidentals are not elevated above the naturals;” the flat playing surface lets players “move closer to the bars and technically flow with a bit more ease, compared to the marimba.”

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80 https://www.youtube.com/watch?v=s_MD9AZmXeE. Video 18:01-18:24.
Aside from the more relaxed body movements, there is less need for larger body motions on the vibraphone due to the ability for a performer to control sustain through the use of the pedal.

I noted previously that the aluminum bars of a vibraphone are harder, denser, stronger and more elastic than the wooden bars of a marimba. Because of the weaker and inflexible character of the wood, it is possible to crack marimba bars, particularly in the lower octaves. Often, this damage occurs because players are applying poor technique or have selected inappropriate mallets.

Regarding technique, different muscle movements allow for different applications of power. When the muscles have not been trained to control these variations in power, the result is often what the Chinese refer to as man-li, or “brute force,” which indicates that the use of power is clumsy, awkward, or turbid. Eliminating the use of “brute force” is essential for a keyboard percussionist, since it can lead to damaging both the instrument and the performer.

Contrary to brute force is Chin, which is found in Chinese martial arts through relaxation, nature, and bounce. To understand Chin, an individual should have knowledge of physics, mechanics, ergonomics, nature, and meditation. From a percussionist’s perspective, the body should maintain more bounce and sensitivity to the vibrations of the bars, particularly in finding Chin on a marimba. The bars of the marimba are soft and fragile, making them vulnerable strokes delivered with brute force. Therefore, the application of Chin to marimba players will help a player relax and save more energy, not to mention avoid damaging the bars.
Developing *Chin* is an exercise for the whole body and applies principles found in Tai Chi Chuan. The entire body be relaxed to allow an unobstructed flow of energy; from the top of the head to the toes, in the muscles and the joints. This energy is focused and released through the wrist when playing marimba. During the process of striking the bars, the wrist controls the direction of the force, and focuses the power. The wrist should react to gravity from the drop of the mallet through the rebound after the bar is struck. Even when performing tense musical passages, it is important that the wrist motions help the body control and focus the energy used to strike the bar rather than apply damaging brute force by striking the bars with larger muscle groups that will require greater tension to apply the same amount of energy.

However, since the bars of the vibraphone are stronger than those of the marimba, a performer’s motions will vary. While a relaxed body is still desired to harness the power behind a stroke, the focus on rebound from the wrist is less important than when striking a marimba bar, as the use of the sustain pedal allows the energy to be passed down through the bars and audibly continue responding through the resonators. A final consideration for exploring the different rebound characteristics of the marimba and the vibraphone are through choice of mallet shafts. Generally, there are two main types of shafts used: birch on marimba and vibraphone; and rattan on vibraphone. Burgett feels that “the reason people often feel more comfortable with rattan mallets on vibraphone is because they help with the rebound much more than birch mallets.” Stoyanov further illustrated this point, noting:
“Birch is less flexible material than rattan. In other words, birch is much more accurate when used for a mallet shaft, because it doesn’t bend dramatically in any direction when played. When I use rattan shaft mallets, I’m a bit more careful/limited in my motions, as sometimes rattan tends to flex beyond the intended stroke. Rattan, however has its positive sides too. When it comes to vibraphone, rattan actually does bend and provides a nice foundation for playing and muffling. Additionally, birch and rattan shafts produce a different tone, based on their different flexibility characteristics.”

As a result of the differences in elasticity of rattan and birch mallet shafts, many of the physical adjustments that players are making are to both the instruments and the mallet shafts.

Grip, or how a player holds the mallets is a key issue here. Stoyanov noted that he “tend[s] to hold [rattan] a little bit tighter, as it bends more.” Yet, with birch mallets, he knows that the “wooden bars of the [marimba] give-in at contact with the mallet” and he is more comfortable maintaining a looser grip on the sticks without having any loss of control. Rosauro noted a preference for rattan saying that he uses a lot of arm motion when he plays [marimba and vibraphone], because he feels “the rattan follows the arm motion better. With a birch stick, you don’t have the bounce.” Burgett agrees, but says that she strikes “the vibraphone from a lower height than the marimba … because the mallets [used] are heavier than marimba mallets and the rattan mallets help with the rebound more..
CHAPTER 5

Conclusion

In this study, I explored the differences in physical movement between the techniques used on two similar instruments: the marimba and the vibraphone. Even though the two instruments share the same keyboard layout, players must adapt their physical movements to variations in each instrument’s design and bar materials.

The production of sound results from three main factors: the instrument, the mallets, and the motions of the performer. Mallet selection allows a player to create different sound characteristics between the two instruments. Adjustments in physical movements based on the unique characteristics of each instrument will further enhance the sound of the instruments. Variation in physical motion is determined by three factors: instrument size, sustain ability, and bar materials (wood or metal).

In order to keep the body adaptable to the various ranges of each instrument—from three octave vibraphones to five octave marimbas—a percussionist needs to have adept footwork, control of their center-of-gravity, and the ability to vary motions from small to large using elbows and arms.

The vibraphone’s pedal is an important difference that affects physical movements. The pedal confines the player’s shifts in center-of-gravity and limits the
lower body. In contrast, marimba performers need greater vertical and horizontal motions from the full body to engage the entire instrument.

Finally, the materials of the bars generate different levels of rebound and produce contrasting timbres. Compared to wooden marimba bars, the sound of the metal bars on a vibraphone is colder, harder, and stiffer. When playing the vibraphone, the performer can use more force when striking the instrument. Moreover, the elasticity of the metallic bars on the vibraphone assists performers by sending the energy back to the mallet after striking, assisting in rebound. However, with the marimba’s fragile character and shorter decay time, more fluid and rounder body motions are conducive to achieving the desired sounds.

On these concepts, particularly the effect of sustain on creating sound on each instrument, Stoyanov explained:

If a player wishes to create a very connected legato line and move fluidly on the marimba ... one literally has to add extra-fluidity and directionality to their movement/musical intent, overall. Elements, such as extra-fluidity and directionality would certainly affect the musical line, if applied properly. In my opinion, the above is also truth for the vibraphone. However, as this instrument has a significantly longer sustain than the marimba does, it is generally easier to create legato lines on the vibraphone, also the help of its sustain pedal.

Admittedly, because both instruments are idiophones and share similar features many techniques are applicable to both. However, although percussionists can approach the two instruments in the same manner, the only means of expanding musical expression and fully take advantage of the unique features of each instrument is to make adjustments in physical movements.
BIBLIOGRAPHY


APPENDIX A

Conversation with performers - Interview Form

Performer: Ney Rosauro
Interviewer: Ruoying Ke
Date: July 28, 2014
Type of Interview: In person in Miami
Topic of Dissertation: The Differences in Physical Movement Between the Techniques used on a Marimba and a Vibraphone

Questions 1: In general, what kinds of different motions do you use to explore the best sound on each instrument?
A: I think the main difference is because when you play the vibes we tend to stay in the same position, so you pretty much move your body to the right or to the left. I think we can talk about this with proper position, but I think, in the vibes, I think it is important my shoulder be low, as low as possible. And I normally use most of the people use the right foot, but just the tip, not going further then this. And here is an important thing [point to his left foot] that to open this lightly… the feet, because if you stay with the feet together you can lose the balance. So open the foot, and some people play vibraphone they say that hurts this leg, the left leg, because all the weight is here. But that’s not correct, isn’t it? Like you put 60 percent of your weight here [he pointed to his left leg] and 40 still here [he pointed to his right leg]. So you distribute it, that’s very important. So if you’re well centered what you need to do is pretty much move your torso go to the left to the right. But on the marimba is the more difficult thing. The biggest difference is because you start going from one side to another. That’s the way I approach. It’s…for example, A lot of people when they go they use to do one, two to three steps. So I … my concept is this: I stand in the middle of the instrument, and you find one, say to the lower notes, I put my weight here and I turn the torso. This torso here [he turned his torso to the left side], and then I turn go another side, turn the torso. So without moving my body, I can pretty much, reach almost all the instrument. If I need I do one step go here [he step to the lower side] and one step here [he step back to the higher side]. That’s pretty much all I need. That’s the basic, the basic posture in terms of the body.
There’s another thing that I think helps a lot also, the Tai Chi movements. So, for example, when you do this, called “cloud hands.” So you learn how to rotate, sway very gentle your body. And this I use here [he pointed to his waist] all the time. This! This rotation. Another thing that I think is very important. In terms of … the vibraphone you stand, but in the marimba, at first, my concept is this: you should try to play as relaxed as possible. So if you’re ready to play, you just turn your elbows, and leave the upper part of the arm aligned with the body, then you take the sticks, and go with this position, go to the middle of the bar. And you see in this position, you see, we have a lot naturally, we should have a lot of distances here [he pointed the distance between the bar and his body]. I don’t know if it’s a lot, but a considerable distance. Most of the people when they play the marimba, they play like this [he played pretty close to the marimba and acted his elbows beyond the torso]. So they are very… yeah? Especially the guys, the younger guys that come from the marching band. I usually said go and do my Brazilian class to learn how to lose it. So sometimes I like just to mix a four sticks, just learn how to move your torso here, a little bit Tai Chi thing here. So, important to be these, here [he pointed to waist], to be able to move. And another thing also very important, also in the marimba, for example, when I play, my legs are not locked here [he pointed to his knees], not straight. They’re always like this [He bent knees a little bit]. That’s also what we call in Tai Chi, “horse riding position.” You are horse riding, especially me; I’m a tall guy. So me in this horse riding position and me away from the instrument. We have to be also flexible here [he pointed to his arms]. Because, see, when you play… a… b flat chord and you want to play a b nature, you don’t have the space. So what you need to do: go a little bit further. So you need to move, move your torso, move your hips, go a little down, put your body down. So you have to start, like I said, dance rock and roll here. You have to be flexible. And I think all this is a very marimba thing, not in a vibe. A vibraphone, you stay still. Here what is important [he pointed to his waist] to rotate the torso up and down to be…have a considerable, the right distance, and to be flexible here, just sometimes you need to do this. So that’s it. It’s a long answer for you, of course, but I think that’s in terms of the position.

Questions 2: Is there a primary muscle group (type of body movement) that you use more on the marimba versus the vibraphone?
A: Yeah, like I told you, for example, in the marimba I would use more… here is I would to use hips. I use more perhaps I would stand more in my legs, and definitely also the arm movements … the arm movement together with the torso here. In the vibraphone, you still use the arms and so on, but you don’t use much the leg movement and you don’t use much, probably hips. You just use your torso to right and left. Not much.

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81 “Cloud hands” is one of Tai Chi Chuan movements. The motion is to wave hands like moving clouds.
Questions 3: Are there differences in how you strike the bar for the marimba versus the vibraphone?
A: I think the basic stroke in the vibes and the marimba is almost the same. So, what I do, I use a lot of arm [he played on the marimba to show me] or in the vibes too, but what I try to do is play to the outside of the instrument, like this. So, for example, when I play, let’s play inside, so imagine, if I would karate stroke, if I have a piece of wood and I want to break this, [he acted breaking a wood]. With the bunch, if I punch too hard I may break my arms, so I have to go like this [he acted like a whip motion]. So it goes exactly to the point and come back. And that’s the nice [he played a note on a marimba]. That’s, for me, is a proper stroke, rather than the marimba and the vibes. And I think that helps a lot … for the sound quality, if you go [he played hard and stiff on a vibraphone]. So if you really try to… so this come back off the arms is very important. I think inside the same music, that’s… I may use different strikes, so I may use more arm movements. For example, you found the complement I have very little weight. Sometimes I … yeah, probably in the vibes… that’s a good question. In the vibes when we are doing some kind of thing, we just drop the mallets [he played a chord on a vibraphone with only drop]. We don’t need to strike, just dropping the mallets is enough. The marimba maybe you need to strike a little bit. But in the same music, sometimes if you have a soft, you have to punch harder. You have to use and more … I don’t know if you’re going to ask this later too, but I don’t use much to change a lot of the sticks when I play in the same piece. Because I think, with the proper arm movements we can do a lot of … a lot of differences … just the arm movements… if you want stronger, if you want softer, just use more your arms.

Questions 4: Do you use a different grip with mallets on the marimba versus the vibraphone? Why or why not?
A: I use all the same.

Questions 5: How would you describe the difference in touch between the marimba and the vibraphone? How does it affect your respective techniques?
A: No, it’s the same. I think the same touch.

Questions 6: What role does the rebound play into this?
A: I don’t see much difference. One is metal, and the other one is wood. The rebound mostly when I need the rebound, the rebound is … here. So if I have … Because, rebound as I understand, is like drums. If you make a rebound, but this, I don’t use this on the marimba, if I need a rebound, I would use this [he showed a double stroke on a table]. I will use this when they call … is not two strokes with the wrist, but down and up. So with one movement of the arm, you have two or three strokes. But try to answer what role the rebound, I think, the main cause of a rebound … since the stick doesn’t really bounce, that’s the word, it didn’t bounce. I don’t use this bounce in the sticks. But here, needs more motion on the wrist than the arm. This is what I think. So and then, the rebound all
come from a very loose arm movement and the use of the wrist. But rebounding each the bounce of sticks that I don’t use. And I’m wondering if someone use it in the mallets.

**Questions 7:** Do you use more horizontal or vertical motions when playing the marimba versus the vibraphone?
A: Vertical, up and down, we use … almost … probably the same. But horizontal, the marimba we use much more.

**Questions 8:** How do the differences in the handles of the mallets affect your motion?
A: I personally prefer the rattan. Why? Because it bounces a little bit. But the rattan have to be steady, can not to be too thin, because we lose the control. But you have the rattan steady, and … I think, for me, why? Rattan is better. At first, because of the concept that I told you, you should play and come back. I think this, the flexibility helps to have this beautiful sound. And another thing is when I play I use a lot of arm motions, and I think the rattan follows the arm motion better. If I take a birch stick, you don’t have the bounce. It’s very hard. I believe, like … It’s interesting even to see here for example. I have my mallets; I have some of them in the rattan and in the birch at the same time. It’s interesting to compare both of them. Because you can feel the rattan is much more natural sound. The birch is very tough, very directed sound. So I prefer rattan. I believe like birch would be better for Musser and Stevens probably. But I think for cross grip and especially for vibraphone, I would say play with the rattan. Also when people play with just two mallets, xylophone or orchestra and so on, I think the rattan will give you a much better sound. It’s more natural. It follows better. Think, for me, the birch is just …

*So you don’t use birch to play vibraphone?*
A: Never. Marimba I don’t use. I use birch to play when I play 6 mallets.

**Questions 9:** Is there a difference in the speed of your downstroke and upstroke for each instrument when playing on the same dynamic and articulation?
A: It’s the same

**Questions 10:** Is there a difference in the way you come off the bar after making contact on the marimba and the vibraphone respectively?
A: No

**Questions 11:** In general, do you strike the bar of the marimba and the vibraphone from different heights?
A: No, that’s… Yeah! I use different heights while I’m playing the piece. But that would depend on from the dynamic.

*So even if they are in the same dynamic you just use the same height?*
A: Ok, in the vibraphone if I want a pianissimo I can use less height probably. But normally, it’s the same, I think. It’s more an intuition thing that a technical thing. I would not think: now I have to use higher or left have to go back earlier. I don’t use. I don’t know if some of the people use it.

Questions 12: When playing the same piece on both instruments, what are the differences in the touch of strokes or in other physical motions, like a slow movement from Bach’s suites?
A: I in the same … I would use different mallets for different instruments, for sure. But … I would not … I don’t know … I don’t think … I think the stroke is the same. I’m very soft in the hands.

Comments:
APPENDIX B

Conversation with performers - Interview Form

Performer: Svet Stoyanov
Interviewer: Ruoying Ke
Date: July 25, 2014
Type of Interview: By phone
Topic of Dissertation: The Differences in Physical Movement Between the Techniques used on a Marimba and a Vibraphone

Questions 1: In general, what kinds of different motions do you use to explore the best sound on each instrument?
A: Basically, three kinds of motions you can use. One is to play into the instrument with some weights, to literally try to play through the bars. Another one is to literally play and a certain specific keyboard is hot and you try to get away from it. So basically, literally play with a lot of velocity going away from the bars. And the third one is to literally just create the stroke that … is a combination of a general playing and the rebound, in other words you just let the stick touch the instrument, you don’t push it, you just let it use its own weight and velocity to support it without necessary pressing. And when the stick has come off you take it away and the rebound and you basically retreat it. So it’s a very usual approach. In other words, you have come into the bars in the instruments, away from the instrument and with the instrument. And this is basic technique needed with those of us play timpani.
And any motion I use is a combination of these three basic concepts. Sometimes could be one of them only, sometimes it could be more than one, but basically it’s following idea these three concepts.
I create sound based on what I hear and the way I move has to with the understanding of the instrument that I have, and with exactly the sound that I try to purchase.

So, do you think when you play a marimba you use which way more than a vibraphone?
A: Generally the marimba, if you think about it, is a very different instrument. In a sense, especially comes from the resonance, also if you think about it, the instrument is much larger in size in certain registers. So I would say that I tend to use more weight when I play a larger instrument, and I tend to use less weight when I play on the vibraphone. That’s because it’s a smaller instrument in the size and not so much weight, and also it
has resonant that sustains very different effects the way you use first of all. Sometimes you also use weight for elastic sound that you try to create. And I would say therefore use more weights, generally speaking on the marimba than I will use on the vibraphone.

Questions 2: Is there a primary muscle group (type of body movement) that you use more on the marimba versus the vibraphone?
A: Again, I would say generally because the size of the instrument I would use my body a lot of more sideways that I would play on a vibraphone because in order to cover really the area, they real estate of the marimba you have to play a wider range. And I would say I move my arms more when I play the marimba, since the 5.0 octave instrument is rather lengthy. I also use the weight of my arms ... to produce more/fuller sound from the instrument. Other than that I would say that the vibraphone is actually top of the minimum, because you have to use the pedal. So technically speaking, it is exactly the opposite I actually far less movement sideways when I play the vibraphone because it’s a small instrument I can reach and reach without moving, but then I have to use my feet to play on the pedal. So completely weight distribution change. Generally, I use far less ... sizable strokes and smaller muscle on the vibraphone, because the instrument requires more grounded, in order to play the instrument the pedal.

Questions 3: Are there differences in how you strike the bar for the marimba versus the vibraphone?
A: In essence, you are dealing with different surfaces, so again there are differences because one is wooden surfaces and one is metallic surfaces, one has complete different color, attack and sustain than the other. They have very different qualities. And I think a lot of the sort of the approach to these different types comes most of the stick and mallet that is used. That’s why the design of the mallets are very different. Actually a lot of vibraphone mallets are much lighter. So I would say there is some difference, but generally though I trust the choice that I making of mallets and probably a lot of the muscle use that I have to support this. Generally though, I guess a lot of the differences come from the sticks that I use and maybe is not so much that I play differently on the different instruments, but with a different stick I probably have different results playing on ...let’s say vibraphone. In other words, I play differently but that is because I mostly use different sticks and I am hoping for different results. The instruments have different designs, so it’s like saying the marimba to me is like the double bass and the vibraphone is like the piano. You are comparing the double bass and the piano. So obviously, both have strings, but at the same time they have very different sound qualities. So for me I feel like there is a subtle difference in color with approach, the different kind of string per se, and the different kind of surface, but it’s much more about the sort of tool I use to approach the and knowing what the surface sound like. Because after all, the instruments are part of the same group and they share the design. So I would say the differences come from the stick I use and from the design of the instruments much more than I think come from the sort of the approach that I would have. I would approach the instruments as
naturally as they could, and not really dramatically different what I just said to strike one of the bars. It still goes back to the same concept that I told you which is into the bars, out of the bars, and with the bars. It is just different result and maybe using different tools to itself.

*When you say the different stick, that means the birch and the rattan?*

**A:** Even the marimba people play with rattan or birch, vibraphone players obviously rattan. It’s more internal design of the ball of the sticks. I think that is much more to me about the very body the touch of the instrument, also the weight of the sticks is very different. Vibraphone sticks are much lighter, so it’s sort of helps completely from still one place using one play lighter sticks. And also, you are correct, the birch and the rattan are making the different to me at the end of the day. But that I think comes much more to me when I am muffling than anything else.

*Questions 4: Do you use a different grip with mallets on the marimba versus the vibraphone? Why or why not?*

**A:** No, I don’t and the reason why I don’t is because I believe that it is much more important to master one grip very well. It’s much more important to me that I use one grip very very well and master that. Because I think all grips are capable of using the vibraphone extremely well if they are well mastered. So I don’t use different grips. It’s more that I try to adapt my grip to what the instrument needs. So if I play vibraphone I will adapt my grip to that type of playing that type of instrument. Remember that the rails the accidentals are not higher, it’s much easier to sort of flow over the instrument, and so that would probably change and loosen my grip a little bit.

So basically, I do not choose different grip, but I do use my grips differently. And that’s much more important. Because the grip is basically like a translator between what I want to do and what I hear, and basically what comes out of the instrument. So it’s much more about having a correct translation rather than having many different fixtures.

So a lot of times people would go ahead and really try to learn different grips, but think about it. It’s like I saying that you want to learn English from many many different dictionaries. One of them is sufficient enough as long as you really learn it well. You really study it well, because that is really more important itself. I change the way I use my grip much more. And I go ahead and ever change my grip to play the vibraphone, I think that’s not necessary.

*What kind of changes do you use?*

**A:** Again, I told you, I did it basically adapt to the instrument. You know the instrument design is different. One needs to be muffled more so, I have to probably use sticking differently being able to sort of cover sometime that I need to muffle maybe change the sticking. Also, the vibraphone, the design of it, allows to operate slightly looser overall, because the accidentals are not elevated above the naturals; the flat playing surface lets
players move closer to the bars and technically flow with a bit more ease, compared to the marimba. But those are basically the things I change as far as I can remember.

Questions 5: How would you describe the difference in touch between the marimba and the vibraphone? How does it affect your respective techniques?
A: Generally speaking, if you are dealing with a really really good instrument, either vibraphone or marimba, I feel that it really depends on the register of the instruments, because to my opinion, in some registers the instrument absolutely sort of coincide and you can use the same touch and play pretty well on both instruments. So I feel the question is not really say use different touch on both instruments, but to say basically even on the same instrument I use different touch over different registers. And that goes for both the marimba and the vibraphone. Since both of them actually do have also dramatic difference in bar sizes and resonance, quality, etc. So yes I do not only between both of them, but also even on that instrument alone I do that.

Questions 6: What role does the rebound play into this?
A: Generally, I try to use rebound always when I play. In other words, rebound is to me related to the natural strokes, so even if I’m listening when I play into the instrument I always try to sort of rebound away from the instrument, so come back from the instrument. For me especially rebound has always very important, natural factor of creating sound.

Do you think marimba and vibraphone have different rebound?
A: Yes, they do. And it’s very in different portions of the instruments. Technically speaking, I would imagine that the vibraphone has a bit better rebound capacity, because the instrument’s metal bars are denser than the marimba bars, and it has kind of provides a better rebound, and also if you go to the really low bars of the marimba I think those really don’t…they are much thinner and more flexible: obviously the qualities of the rebound will change. I would imagine that if anything, the vibraphone may have a little, but in reality this is something that hasn’t been scientifically proven, so I don’t know that answer.

Questions 7: Do you use more horizontal or vertical motions when playing the marimba versus the vibraphone?
A: I would say I use just as much as I need to. I would not imagine that it is more or less than the other. I think it’s just the right amount that I think I need. I would say I can use ….comparable amount on either instrument when necessary.

Questions 8: How do the differences in the handles of the mallets affect your motion?
A: I would imagine first of all if you using rattan, there are certain amount of continuity that you get from the sharpen of the sticks, so they kind of continue trampolining with you when you play that kind of hopefully maybe supports the…continuity of the playing.
For me, I generally find myself to use birch, obviously marimba I play with birch, so for me, birch is less flexible material than rattan. In other words, birch is much more accurate when used for a mallet shaft, because it doesn’t bend dramatically in any direction when played. When I use rattan shaft mallets, I’m a bit more careful/limited in my motions, as sometimes rattan tends to flex beyond the intended stroke. Rattan, however has its positive sides too. When it comes to vibraphone, rattan actually does bend and provides a nice foundation for playing and muffling. Additionally, birch and rattan shafts produce a different tone, based on their different flexibility characteristics.

*When you use rattan or birch do you use different wrist to control it?*

**A:** Yes, I probably catch myself sometime when I really want to control rattan, I actually tend to hold a little bit tighter, as it bends more. With birch as I know that the instrument the wooden bars of the give-in at contact with the mallet, I am much more comfortable just staying looser around the sticks and not holding it too tight, even if I want to control them.

**Questions 9:** Is there a difference in the speed of your downstroke and upstroke for each instrument when playing on the same dynamic and articulation?

**A:** I would say that maybe interesting to compare for you, because for me when I play the instruments I’m not really thinking about comparing it to another one. I’m just bonding with that instrument and trying to really produce sound on it. Maybe that is something that you can test yourself, but for me it is much more about the final result, in other words, I’m not thinking of comparing it is much just from outcome and I want a specific sound outcome and I literally don’t really know if it is the surface or not.

I would imagine if you are approaching the surface literally you can imagine some differences because one is wood and one is metal, but that is much more connected to the same approach different result. And that doesn’t mean however that you can approach about surface differently and that you can not approach specifically. In other words, I can use the same approach to the surfaces and get different results. But the point is that is something you probably can test yourself. In other words, you get experiment playing staccato with the certain stick and ball on the instrument since you deliver the same. I would imagine know because again the stick design is different and the surface and density is different.

**Questions 10:** Is there a difference in the way you come off the bar after making contact on the marimba and the vibraphone respectively?

**A:** Frankly, not in a general context to me no, because maybe sometimes on a vibraphone I’m a little bit more sort of… I would imagine that… for me… no, that it is not about this. It’s about the kind of sound I’m trying to create. In other words, if I’m playing into the bars, then I get out the same pretty much the same way. The result may sound different again. They might be different results. But basically, I try to approach the instrument a lot of more similarly than not. and I know your paper is trying to separate
them, but the thing for me is, I actually think about the connection between the instruments rather than the differences. So a lot of times, I would just encounter the differences and try to overcome them rather than separate them. I get off pretty much as naturally as they could and most of the time I catch myself probably the result is different that is different, but I get out a lot of time just more resonance when I play vibraphone. But I think that is just, that is enough for math. In other words, that is ... Generally for me, if I want to play a neutral sound on that instrument I play exactly the same way.

Questions 11: In general, do you strike the bar of the marimba and the vibraphone from different heights?
A: Yes, a little bit. Generally speaking I play the vibraphone a little bit .... I put it a little bit lower. Because muffling the vibraphone bars requires the sticks to be used at a very different angle, compared to the one generally used when playing marimba. But you know the design is a little bit more conch shaped. And so if the vibraphone is really high that would be really difficult that would make you have to really change my mechanism of playing. So I do tend to keep the vibraphone slightly lower in front of me than I would with the marimba. And that relates again to quality of sustain on the vibraphone that sometimes we have to be able to control and muffle certain pitches.

Questions 12: When playing the same piece on both instruments, what are the differences in the touch of strokes or in other physical motions, like a slow movement from Bach’s suites?
A: Well, I believe that a lot of times the way we move is based also on not only what we want to create but also what we hear. If a player wishes to create a very connected legato line and move fluidly on the marimba … one literally has to add extra-fluidity and directionality to their movement/musical intent, overall. Elements, such as extra-fluidity and directionality would certainly affect the musical line, if applied properly. In my opinion, the above is also truth for the vibraphone. However, as this instrument has a significantly longer sustain than the marimba does, it is generally easier to create legato lines on the vibraphone, also the help of its sustain pedal. So there is difference I think mostly in that areas so that create sort the fluid phrase on the marimba and dealing with the lack that the marimba has and have approach to create that sustain. It is not really more sustain but the way we create the line.

Comments:
APPENDIX C

Conversation with performers - Interview Form

Performer: Gwen Burgett
Interviewer: Ruoying Ke
Date: July 28, 2014
Type of Interview: Email
Topic of Dissertation: The Differences in Physical Movement Between the Techniques used on a Marimba and a Vibraphone

Questions 1: In general, what kinds of different motions do you use to explore the best sound on each instrument?
A: I use a very relaxed motion. The main power in the motion comes from my wrist, but sometimes my arm moves as well. I actually use the same technique to play marimba and vibraphone, but for me, the main difference between the two instruments is that they respond differently. Playing in a relaxed way helps me feel and play with the different response of each instrument.

Questions 2: Is there a primary muscle group (type of body movement) that you use more on the marimba versus the vibraphone?
A: I use my wrist muscles as the primary type of movement for both instruments.

Questions 3: Are there differences in how you strike the bar for the marimba versus the vibraphone?
A: I think there are differences in how the bar responds. I am not sure I can describe it well. I sometimes feel that I need to play more into the vibraphone bars to get the sound I want out of them.

Questions 4: Do you use a different grip with mallets on the marimba versus the vibraphone? Why or why not?
A: I use the same grip for marimba and vibraphone. Mainly because I am most comfortable with Steven’s grip and I am so comfortable with it that I feel I can play what I want to on either instrument.
Questions 5: How would you describe the difference in touch between the marimba and the vibraphone? How does it affect your respective techniques?
A: The marimba feels softer to me than the vibraphone. I stay as relaxed as I can for both instruments and this helps me feel how I need to deal with the response of each instrument.

Questions 6: What role does the rebound play into this?
A: I think rebound is the main thing that makes the two instruments feel different. The metal bars and the wooden bars react very differently and feel different. The mallets used for the two instruments are often different. I think the reason people often feel more comfortable with rattan mallets on vibraphone is because they help with the rebound much more than birch malletspecifics.

Questions 7: Do you use more horizontal or vertical motions when playing the marimba versus the vibraphone?
A: I try to use both motions when playing both instruments. For me, I think it is pretty equal between both instruments.

Questions 8: How do the differences in the handles of the mallets affect your motion?
A: I already spoke about this in a question above, but I think using rattan mallets helps with rebound, which is why they are great for vibraphone which has much less rebound. Rattan mallets can be a little tricky for Steven’s grip, but I have never had an issue using them on vibraphone. I almost always use birch mallets on the marimba.

Questions 9: Is there a difference in the speed of your downstroke and upstroke for each instrument when playing on the same dynamic and articulation?
A: Probably, although I haven’t ever thought about it before! As I think about it now, I think my vibraphone stroke is probably a little slower than the one I use for marimba, but I also change stroke speeds on all instruments depending on the sound color I am trying to get.

Questions 10: Is there a difference in the way you come off the bar after making contact on the marimba and the vibraphone respectively?
A: This also depends on the sound color I am going for.

Questions 11: In general, do you strike the bar of the marimba and the vibraphone from different heights?
A: I think I often strike the vibraphone from a lower height than the marimba. This is probably because the mallets I am using are heavier than marimba mallets and the rattan mallets help me with the rebound more.
Questions 12: When playing the same piece on both instruments, what are the differences in the touch of strokes or in other physical motions, like a slow movement from Bach’s suites?
A: I don’t think there is too much difference for me. I would move slow and stay very relaxed for playing Bach on either instrument. I might actually be more concerned with flowing physical motions on the marimba since it does not sustain, but I play pretty similarly on both instruments!

Comments:
APPENDIX D

Conversation with performers - Interview Form

Interviewer: Ruoying Ke
Performer: Anders Åstrand
Date: July 17, 2014
Type of Interview: Email
Topic of Dissertation: The Differences in Physical Movement Between the Techniques used on a Marimba and a Vibraphone

Questions 1: In general, what kinds of different motions do you use to explore the best sound on each instrument?
A: I really let the mallets do the work so that means, using the wrist and fingers. I think as a piano player together with the drum language. In other words piano with the drummers hands.

Questions 2: Is there a primary muscle group (type of body movement) that you use more on the marimba versus the vibraphone?
A: The body movement on the marimba need more feet work and on the vibe I use my right toe on the pedal to describe it in a easy way. I use my knees, picture it like a table tennis player. That is very much how I treat both instruments.

Questions 3: Are there differences in how you strike the bar for the marimba versus the vibraphone?
A: The difference is when I do the dampening on the vibes that means need to go after and dampen when I play a new note. OR in the slide dampening I play a note and slide over to a new with the same mallet. It is not really need for that on the Marimba, But it happen that I use that for specific phrasing and colors.

Questions 4: Do you use a different grip with mallets on the marimba versus the vibraphone? Why or why not?
A: I use the Burton grip with my own little tweak, meaning I include the fingers a lot and also use all the four mallets for lines. The grip fit me well coming from a piano background I like the feel of the hand position. If I only was focusing on the Marimba, I would maybe get in to the Stevens or Musser grip.
Questions 5: How would you describe the difference in touch between the marimba and vibraphone? How does it affect your techniques?
A: I use the same technique on both instruments. The big difference from my point of view is on Marimba you can play forward and not think of what you played, Vibes you need to go after and clean up. The picture is almost you play and you have the towel ready to dry up.
Again I really focus on to get the mallets do the work that also means I use heavy mallets. Which give me a full sound.

Questions 6: What role does the rebound play into this?
A: Quick motion with the wrist and fingers create a shorter sound and the opposite legato I stay longer on the bar. Maybe not the real answer you looking for. My mallets is really built with a rubber head and some different layers of latex. That give me a good rebound.

Questions 7: Do you use more horizontal or vertical motions when playing the marimba versus the vibraphone?
A: I would say Horizontal, again I think piano! I just like when the hands are close to the bars and I think the mallets like brushes painting the sounds. Big dynamics big brush and soft the tiny brush etc. (painting brushes)
PLUS on vibes I really use brush motions from my drum playing it really help my dampening. Everybody who experienced brushes know that the best sound is when you are connected to the head. So that is almost what I use.

Questions 8: How do the differences in the handles of the mallets affect your motion?
A: I like little thicker rattan not so it get stiff but some flexibility really help my motion.

Questions 9: Is there a difference in the speed of your downstroke and upstroke for each instrument when playing on the same dynamic and articulation?
A: It is always easier to get faster on the marimba then the vibe, part of it is that the wood get more rebound. I do not think I have any difference in the speed of down or up stroke.

Questions 10: Is there a difference in the way you come off the bar after making contact on the marimba and the vibraphone respectively?
A: That all depends on the musical situation and the choose of mallets and in what range.

Questions 11: In general, do you strike the bar of the marimba and the vibraphone from different heights?
A: No
Comments:
I use a lot of skiing motion in my body work with the instruments. As well Table tennis. Another good thing who helped is to stand in the pool with the hands under the water and create circles, different kinds of movement that for me is the wonderful legato. And then the opposite up with the hands above the water and use fingers and hands play fast notes, short notes with distance etc that give me a great feel for staccato. If I play a quick run from the low to the high end or the other way. I think a downhill ski where you come down and then up again on next hill. As soon as you can imagine that you use your knee to get down and up. It help me to breath in my phrasing. We can learn a lot from the sports above, and dancers etc. The daily walking is a good example, I think that my legs are the arms, meaning: when we walk we prepare the next step with the legs that means that the knee and the foot do the work. Many times in the playing we can see stiff arms, that means walk with stiff knees. And that is not a nice feel, but it happens many time when we would like to confirm the notes we play.
Again this is my tools and that is not rules it is TOOLS!!!