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Sonic Peace: An Antithesis to Sonic Warfare

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SONIC PEACE: AN ANITHESIS TO SONIC WARFARE

A thesis submitted in partial fulfillment of the

requirements for the degree of

MASTER OF MUSIC

by

Tatiana Maria Schnitman Espindola

2013

To: Dean Brian Schriner
College of Arts and Sciences

This thesis, written by Tatiana Maria Schnitman Espindola, and entitled Sonic Peace: An Antithesis of Sonic Warfare, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this thesis and recommend that it be approved.

_____
Joel Galand

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David Dolata

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Orlando Jacinto Garcia, Major Professor

Date of Defense: November 19, 2013

The thesis of Tatiana Maria Schnitman Espindola is approved.

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Dean Brian Schriner
College of Arts and Sciences

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Dean Lakshmi N. Reddi
University Graduate School

Florida International University, 2013

DEDICATIONS

Dedicated to two extraordinary women in my life:

My fellow artist, best friend, and mama, Sophia von Wrangell, whose constant and unwavering support and love are imprinted on my memory and in my heart. And to Hildegard von Bingen, an inspiration, and a mother, sister, and friend figure to all women trying to make their mark on this world.

Gewidmet den zwei ganz besonderen Frauen meines Lebens:

Meiner Freundin, Mutter und Künstlerin Sophia von Wrangell, deren stete und verlässliche Unterstützung und Liebe Ich für immer in meiner Erinnerung behalte und in meinem Herzen trage. Und Hildegard von Bingen, eine Inspiration und Mutter, Schwester und Freundin im Geiste für alle Frauen, die ihre Spuren auf dieser Welt hinterlassen wollen.

Dedicado a dos mujeres extraordinarias en mi vida:

Mi colega artista, mejor amiga y madre, Sophia von Wrangell, cuyo amor y apoyo firme y constante han quedado impresos en mi memoria y en mi corazón. Y a Hildegard von Bingen, una inspiración y figura materna, hermana y amiga, para todas las mujeres que buscan dejar su huella en este mundo.

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Finally, I would like to thank my mama, Sophia, and step-dad, Eric for their constant support and vigilant editing over the past ten years. I would also like to thank Tom Casey, my biggest fan and patron; without him as a father figure and friend, my studies would not have been realized the way they have. Finally, I would like to thank Dr. Michael Johanson, Dr. Samuel Jones, the Charbonnels, the Allisons, and Paul Eliot for being my music and life mentors and embracing me like family.

ABSTRACT OF THESIS

SONIC PEACE: AN ANITHESIS TO SONIC WARFARE

by

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Florida International University, 2013

Miami, Florida

Orlando Jacinto Garcia, Major Professor

Sonic Peace: An Antithesis to Sonic Warfare explores certain frequencies that have been associated with various healing qualities, and seeks to bridge the sounds of antiquity and modernity. The piece draws on numerology and symbolism and adopts a cross-cultural approach in an effort to advance a cohesive universal healing message. The text featured in the composition is original, except for the use of an ancient Japanese Shinto chant.

TABLE OF CONTENTS

TABLE OF FIGURES

FIGURE PAGE

I. Preface

As a composer, I consider it my obligation to write music from an informed perspective, remaining aware that I do not know everything and sensitive to the biases that my personal story may have bestowed upon me. I hold myself accountable for my creations and for their potential effects on others and on myself.

While music in academia has allied itself with the sciences by treating the art of composition according to the procedures of experimental research, I believe many musicians are nevertheless emotionally tethered to the outcome or reception of their "experiments," or at least they ought to be. The pure sciences aim for objectivity and detachment—this is not negative *per se,* but not entirely congruent with music and art, even (or especially) in those historical moments when politics were governing the output. Music and art can be both intellectually sound and emotionally charged; my artistic motivation stems from the latter.

Sonic Peace: An Antithesis to Sonic Warfare: My title is not meant to imply that one piece of music and its accompanying analysis are able to establish "sonic peace." Rather, it expresses the intentional act with which I, as composer, created a work whose objective is to leave a peaceful impression upon its listeners.

II. Introduction

O VIRTUS SAPIENTIAE

O Moving Force of Wisdom, encircling the wheel of the cosmos,
Encompassing all that is, all that has life,
In one vast circle.
You have three wings: The first unfurls aloft
in the highest heights.
The second dips its way dripping sweat on the Earth.
Over, under, and through all things whirls the third.
Praise to you, O Wisdom, worthy of praise.
~Hildegard von Bingen

I have actively desired to forge a deeper connection with music for some time, but not until recently did I come to realize that being a composer or musician does not lend itself to such a connection automatically. Understandably, composers and theorists have focused on technical studies of musical structure, but this has often been done at the expense of a more humanist discourse. This void has been with me for some time now, accompanied by a desire to lace music with intent and meaning—to form a bond between music, the heart, and the soul. Though some might argue that this bond is transparent — already there—it deserves to be articulated more explicitly; the heartbeat, after all, is what signals to the world that we are alive. *Sonic Peace* was conceived with this objective in mind.

The catalyst for this project was a research paper I wrote recently that explored the practice of using music and sound to torture and subjugate people during wartime, focusing on Adolf Hitler and Mao Zedong's regimes.[1] These two regimes were not the

[1]Written for Dr. David Dolata's seminar "Special Topics in Music History: Performance Practice," Spring 2012.

first, nor the last, to employ sound negatively (or withhold it from its victims entirely, which can yield just as effective and negative an outcome). Sonic Warfare has become an object of scholarly research in its own right; it pertains not only to the relationship between war and sound or music, but extends to other areas in which sound has had an increasing, although not necessarily, positive impact (see, for example, Cubbusen and Nielson 2012).

After having delved into these negative uses of sound, I felt compelled to use sound differently, positively. One thing is certain: everyone has music, not to mention sound, in their lives, always. Modern-day people are confronted with sound through numerous outlets: concerts, car stereos, text message alerts, or booming basses seeping through paper-thin walls and distracting authors attempting to write about noise pollution! Most of our interactions with sound have become as automatic and habitual as driving a motor vehicle. Sound is inescapable. Often we tune it out and stop listening, an ineffective solution in the long run. Not only will the act of not listening become habitual, but if people continuously hear only passively, their general capacity for awareness is bound to be affected adversely.

The overarching premise of my composition is tied to the notion of using music as a healing device, spiritual and otherwise. There were many influences on this piece. Some of the most prominent include systems of musical temperament, the *Solfeggio* frequencies, and St. Hildegard von Bingen, one of my favorite Medieval composers and historical figures. The following analysis of *Sonic Peace* highlights the most relevant

influences and show how they merged with each other and with my personal aesthetics to create *Sonic Peace.*

III. Musical Influences

Hildegard (1098–1179) was a twelfth-century mystic and a remarkable woman. During her eighty-one years on earth, she was a poet and scientist, painter and musician, healer and abbess, playwright, prophet, preacher, and social critic—a true Renaissance woman in the Medieval era. There has been a well-deserved resurgence of support for Hildegard recently, especially since Pope Benedict XVI formally canonized her on May 10, 2012.

Hildegard is a celebrated figure in feminist theory for many reasons, but I will focus on those of aspects of her work that most immediately influenced my work. Her philosophies had an impact on my text, and the neumatic patterns she often employed informed my use of melodic motifs. These motifs dominate the last section of the composition, beginning at rehearsal letter F in the score; here, the text resonates with her professed opinions and beliefs, but, of course, from my modern perspective. As a mystic, Hildegard extolled the concept of wisdom, though the term she often used was *Sapientia.* In Hildegard's *The Holy Spirit as Caritas* (as translated by Barbara Newman), she states:

> I am Wisdom. Mine is the blast of the resounding Word through which all creation came to be, and I quickened all things with my breath so that not one of them is mortal in its kind; for I am Life. Indeed I am Life, whole and undivided—not hewn from any stone, or budded from branches, or rooted in virile strength; but all that lives has its root in Me. For Wisdom is the root whose blossom is the resounding Word…(Newman 1987, p. 64)

I will discuss each of these contributions to my creative process further in Chapters IV and VI, which address the textual and tonal structures of *Sonic Peace*.

The music of Guillaume de Machaut and Giovanni Pierluigi da Palestrina have also left their stylistic imprint on *Sonic Peace*, though their influence was ultimately less decisive than Hildegard's. Machaut's melodic style is most evident in section four of the piece, beginning at rehearsal letter C in the score (please see Figure 1 for a structural outline of the piece). This section is essentially a tenor and bass duet, or rather a trio including the second cello. Machaut's *Messe de Nostre Dame,* probably his most famous work, served as my main inspiration for this section. While there are no direct quotations from the mass, or from any of his pieces for that matter, the melodic material in this section alludes to his melodic writing style as well as to his treatment of the tenor line. Section six, starting at rehearsal letter E, suggests Palestrina's four-part writing style, his approach to polyphony in general, and his use of canonic imitation in particular.

IV. Theoretical approach to the structure of *Sonic Peace*

Overall Structure of *Sonic Peace*

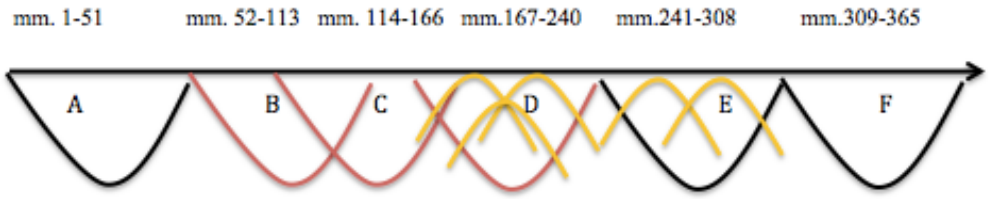
Sonic Peace consists of seven distinct sections; there are however, two sections with overlapping characters, yielding a total of nine sections, as described in the Numerology and Symbolism section of Chapter V. Figure 1 below outlines the overall form of the piece and provides a brief description of each section.

	Association	Temperament	Tonal Center	Dominant Instrumentation	Rehearsal letter	Approximate Mm.
1	Shinto chant line 1	____	____	Body Percussion	Intro	1-8
2	Shinto chant line 1	Solfeggio	A=426Hz	Choir & Solfeggio orchestra	A	8-51
3	Liberating Guilt and Fear	Solfeggio	G=396Hz & Eb=319.5Hz	Choir & Solfeggio orchestra	B	52-113
4	Undoing Situations and Facilitating Change	1/6 comma meantone	A=432Hz	Tenor and Bass duet, Cello	C	114-166
5	Transformation & Miracles Connecting/Relationship Shinto chant line 2	Solfeggio	C=512Hz & Eb=639Hz	Solfeggio orchestra	D	167-240
6	Awakening Intuition Shinto chant line 3	1/6 comma meantone	A=432Hz	Choir & 1/6 comma orchestra	E	241-308
7	Return to Spiritual Order	1/6 comma meantone	D	Soprano and Alto duet & 1/6 comma orchestra	F	309-365

Figure 1–Structural Outline

Form

Sonic Peace does not follow any traditional form, but it is sectional. In addition to the outline above, Figure 2 illustrates the linear progression of material.



Red: showcases overlapping main sections.

Yellow: showcases internal overlapping sections.

Figure 2 – Linear progression of form, also showing density

The piece is seventeen and half minutes in duration, with the structurally densest section, illustrated above, starting at m. 167. This section begins at seven minutes and thirteen seconds, half way through the piece.

Binaural Beating

The *Solfeggio* orchestra and A=432 orchestra are pitched and tuned differently. The latter makes use of 16-comma temperament, while the former only plays the indicated frequency values achieved by using *scordatura*. Since the orchestras are not in the same sound-scape, when they play pitches simultaneously, there will be friction or dissonance. My intention during these sections was to simulate the effect of binaural beating.

Binaural beating is not a new concept. The Monroe Institute defines it as "the sensation that occurs when two coherent sounds of nearly similar frequencies are presented one to each ear."[2] Typically, this effect is achieved using speakers or headphones, allowing sounds to be isolated from one ear to the other. For this effect to occur, the difference between the frequencies has to be relatively small; hertz values that are in the same pitch "range" would be adequate. Research shows that if there is a difference of 7Hz between the pitches the brain creates a binaural beat of 7Hz (see, for example, the Monroe Institute study cited above). *Sonic Peace* does not have an electronic component, and there is no documented evidence the binaural effect is realizable acoustically. The staging of the orchestras however, may just permit the concept of binaural beating to be simulated acoustically, but since acoustic sound will travel farther before reaching the audiences' ears, the end result may differ.

As shown in Figure 3 below**,** the first section in *Sonic Peace* where these beating patterns occur starts at m. 29, when the second orchestra first enters.

[2] The Monroe Institute, http://www.monroeinstitute.org/resources/what-are-binaural-beats, 2013.

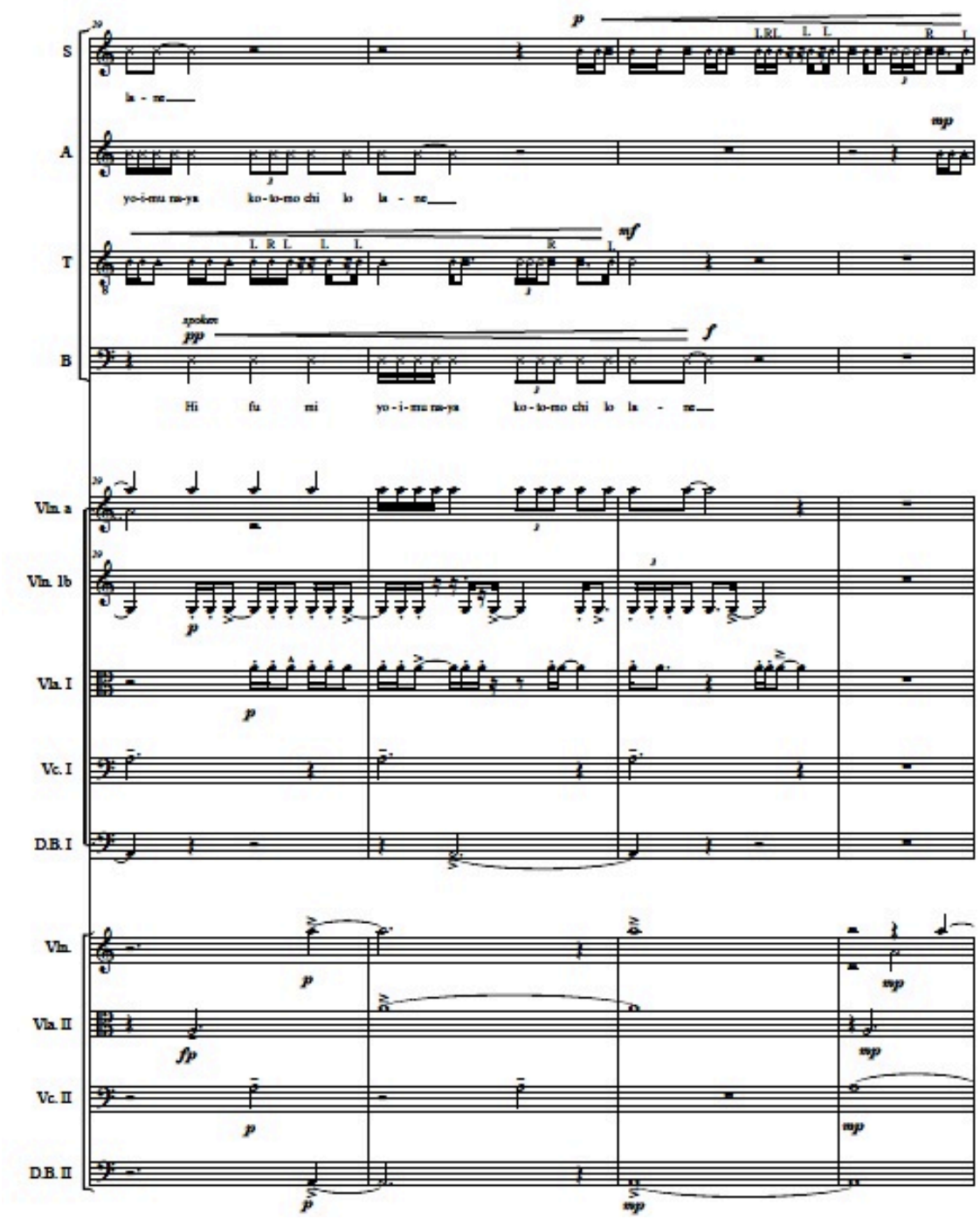


Figure 3 – Introduction of the A=432

The choir speaks or performs percussively during these sections, allowing the texture created between the orchestras to be foregrounded. It will be interesting to hear how the

performers and the audience react to these beating patterns and observe whether or not the effect is actualized, i.e., whether the binaural beat, "a sensed third pitch," occurs.

Schenkerian Analysis of Select Sections found in *Sonic Peace*

Schenkerian theory, while seemingly abstract, is actually a useful tool for comparing and contrasting a piece of music from the micro level to the macro level. Using Schenkerian theory to analyze a section or a piece of music shows how pieces of music arise from a finite set of transformations operating on underlying contrapuntal and harmonic norms. It is a concept that can be reverse engineered and used as a tool for composing (see, for example, Temperley 2011).

Schenkerian theory is hierarchical: rhythmic note values, for example, are used metalinguistically to denote pitch hierarchy. Schenkerian theory is used for the analysis of tonal music belonging to the so-called common-practice period. While *Sonic Peace* is not in any one major or minor tonality, there are three sections that are primarily modal and employ contrapuntal principals, albeit not strictly. A Schenkerian analysis of the last section of the piece follows in Figures 4–6.

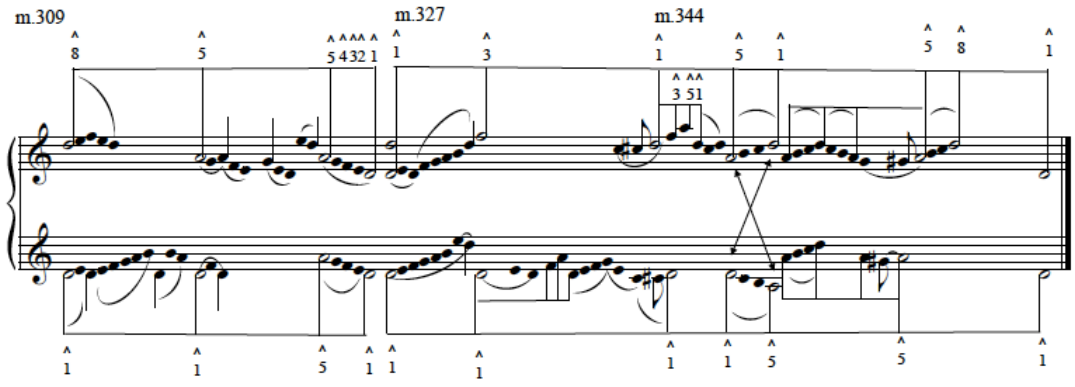


Figure 4 – Schenkerian Foreground Analysis of Section F

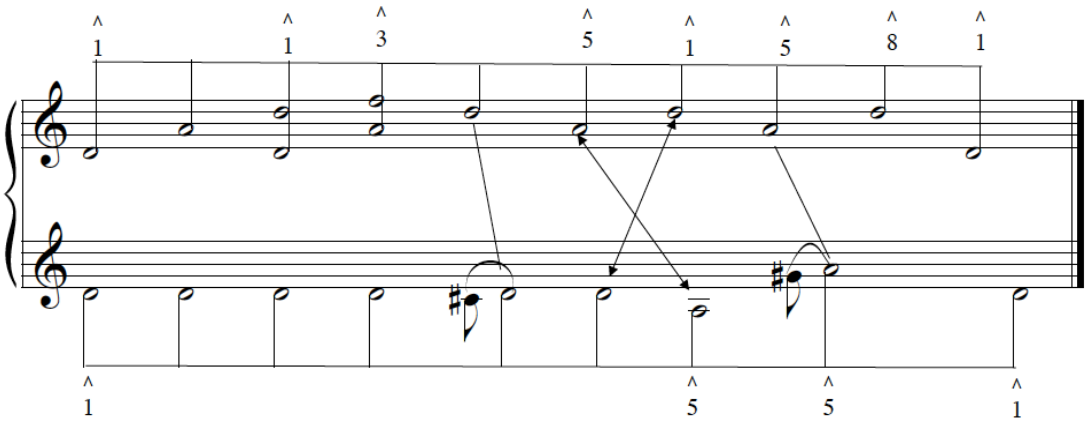


Figure 5 – Schenkerian Middle ground Analysis of Section F

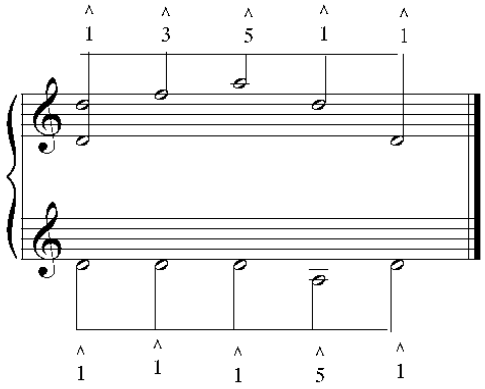


Figure 6 – Background graph of Section F

Figure 4Error! Reference source not found. provides a foreground analysis of section F. It removes all non-essential embellishments, allowing relevant patterns to rise to the foreground. The measure numbers further define the analysis by dividing section F into three parts. In the first part starting at m. 309, D is established as the tonal center, along with A as its dominant. The section ends with a scalar descent from ^5 to ^1. In the second section ^1 rises to ^3. In the third section, starting at m. 344, there is a chromatically altered passing tone that acts as a leading tone to D, the tonal center. Towards the end of the graph there is another chromatically altered passing tone acting as a leading tone to A, the dominant. Since these pitches are chromatic alterations, they do not function as leading tones per se, but the trained musician will hear a tonicizing function. The middle-ground graph reduces the texture further and shows only the half-note level, the cross relationship present at m. 344, and the chromatically altered passing tones. The *Urlinie* shown in Figure 6 is atypical, in that it does not follow the typical scale degree patterns of ^8 to ^1, ^5 to ^1, or ^3 to ^1, but rather is a hybrid of all three and forms the simplest of *arpeggio* figures, as shown in Figure 6.

V. Temperament, tuning and frequency

The Standardization of Pitch and the Solfeggio Frequencies

How musicians name pitches is relative, just as time is relative. Two years ago I did not know about different temperaments, about the variability in pitches performers use to tune to one another, or about the history of these phenomena. I knew through singing that there was flexibility in how to approach pitch and intervals, one prime example being competing *solfège* systems. Consider the use of fixed *do* versus movable *do*. Both systems work as pedagogical tools. Movable *do*, however, works best with equal temperament, where the relationship between intervals is constant, while fixed *do* translates better into temperaments where the interval sizes fluctuate. In fixed *do*, the pitch C is always *do*. If the intervallic relationship between C and G differs from the intervallic relationship between G and D, then it makes sense that the pitch C should always be *do*, and the pitch D always *re*, because in non-equal temperaments, the interval sizes between C and G, and D and A are not necessarily the same. The very qualities that allow moveable *do* to facilitate transposition can make it a hindrance to the practice of non-equal temperaments.

During my first semester at Florida International University, I became aware of historical temperaments and of the lingering, heated debate about which temperaments to use while performing early music. As a composer, I am biased towards the idea that musical performances should approximate as closely as possible the way authors intended their pieces to be heard or the way they were actually realized during their lifetime. (Of course, I allow that intentions and realizations may differ, and I am also

aware of the epistemological difficulties involved in reconstructing intentions of any kind, let alone those of long departed historical agents!) I dedicated much thought to temperament, but I initially focused on the separate issue of the standard tuning pitch, or A=440Hz (a concept I encountered in Haynes 2007). In an earlier publication (2002's *The Story of A*), Haynes scrutinizes the standard tuning pitch and its history in detail. There is a theory popularized by Leonard G. Horowitz (1999) that claims that Hitler's support, with the aid of his Minister of Propaganda Joseph Goebbels, was crucial to the establishment of this standard. This is, certainly intriguing (and infuriating, if true), but it is largely conjecture. The current standard, A=440Hz, was recommended and adopted as the international standard in 1939; some countries in Europe however, still continue to use lower pitch references, or higher ones.

Regardless of its convenience, there were many musicians who protested against the inflation of the standard frequency, many of them singers who claimed that the higher reference pitch placed too much of a strain on their voices (see Isacoff 2001). Indeed, the voice, as an instrument, cannot possibly undergo the same level of modification that technological innovations have made possible for most other instruments.

As I mentioned above, I subscribe to the axiom that early music should be interpreted as closely as possible to how it was originally conceived. A corollary to this axiom is that historical performances should adopt the temperaments and tuning pitches contemporaneous with the composition's genesis. Nowadays, few musicians would perform music from early time periods without adding ornamentation, or use a straight pulse for music that should be swung. Such choices would be considered un-stylistic and

uninformed. I submit that to ignore historical tunings and temperament is just as serious a lapse in judgment.

When I first started this project, I knew I wanted to experiment with tuning frequency and to write a piece of music that used a lower-than-standard frequency as its reference pitch. My coursework and research allowed me to gain a deeper understanding of how people related pitches to one another in the past and how differently they do so today. Shortly after enrolling in Dr. Dolata's Tunings and Temperament course, I decided that the topics of temperament and the tuning frequency were going to be central to my thesis.

Sonic Peace is written for 1/6 comma meantone temperament, with the tuning pitch being A=432. I also make use of a set of frequencies called the *Solfeggio* frequencies. The *Solfeggio* frequencies are a collection of nine frequencies. The first six frequencies were "rediscovered" and popularized by Horowitz. Each of the six frequencies is associated with a different healing quality. Three additional frequencies were added later for a total of nine. These additions were derived through their numerical symmetry. I will discuss this numerical symmetry in the section concerned with Numerology and Symbolism. The frequency values in Hertz, their common names, and the healing qualities attributed to them can be found in Figure 7 below:

UT – 396 Hz – Liberating Guilt and Fear
RE – 417 Hz – Undoing Situations and Facilitating Change
MI – 528 Hz – Transformation and Miracles
FA – 639 Hz – Connecting/Relationships
SOL – 741 Hz – Awakening Intuition
LA – 852 Hz – Returning to Spiritual Order

Later additions:
174Hz
285Hz
963Hz

Figure 7 – Solfeggio Frequencies and associated healing qualities

There is a lot of misinformation concerning the *solfeggio* frequencies, as well as information that remains unsubstantiated. The *solfeggio* frequencies are said to have Christian roots that date back to Gregorian chant, specifically the Hymn to St. John the Baptist. The *solfeggio* frequencies however, may be traceable as far back as Pythagorean tuning.

The *Solfeggio* frequencies have been popularized and marketed for their healing qualities, mostly by new-age healers and promoters of alternative medicines. There are however, a few musicians, as well as academics with a background in music, who discuss these frequencies. One of them is John Beaulieu (2012), a composer, pianist, and naturopathic doctor, who offers an interpretation of the text from which the traditional *solfeggio* syllables (Ut, Re Mi, Fa, So, La) were derived—that of the Hymn to St. John the Baptist:

Utquaent laxis
Resonare fibris
Mira gestorum
Famuli tuorum
Solve pollute
Labii rreatru
Sancte lohannes

The Latin text translates as “So that your servants may sing with clear voices the wonders of your deeds and wash the guilt for their stained lips.” Here is Beaulieu's modified version, based on his knowledge of sound healing:

> So that we, the servants of the divine, may sing with tuned voices, and bring ourselves in resonance with the wonders of your vibrational universe. (Pg. 1)

His translation befits many modern-day spiritual paths. The intersection between discourses concerning the standardization of pitch and the *solfeggio* frequencies led to their inclusion in *Sonic Peace*.

The frequencies and the healing qualities associated with them have garnered a lot of support, but just as adamant an opposition. The opposition proposes that the standard pitch frequency be A=432Hz, and that A=432Hz as a frequency is more consequent with Pythagorean tuning and the Music of the Spheres doctrine than the *Solfeggio* frequencies. *Sonic Peace* explores this duality, employing both the *Solfeggio* frequencies and A=432Hz.

1/6 Comma Meantone Temperament

Different temperaments serve different purposes. Musicologists and theorists agree on one factor when it comes to a successful temperament: octaves must be pure. Any one interval whose component frequencies are related by ratios of small whole numbers is called pure. The two notes in a pure interval belong to the same harmonic series. Most theorists or musicologists who devise temperaments strive to incorporate as many pure intervals as possible. The ideal temperament would consist of all pure intervals, but so far that has been impossible to achieve, as Dr. Dolata's analogy explains:

> It is impossible to fit twelve semitones into an octave in such a manner that they or any other resulting intervals are all pure. Tunings and temperaments are the tools we use to fit thirteen musical inches into the octave foot, striking a compromise between varying degrees of interval purity and serviceability over a range of keys. (Dolata, Forthcoming, 1)

The intention behind equal temperament is to facilitate transposition; anything can be transposed into any other key. Equal temperament allows the playability of all the keys, but sacrifices the purity of all intervals except for the octave. An interval is acoustically pure when there are no beats. Beats are wave patterns that pulse when there is dissonance. Consider the harmonic series, in other words, the collection of partials or overtones that sound in addition to the fundamental, an example of which can be seen in Figure 8:

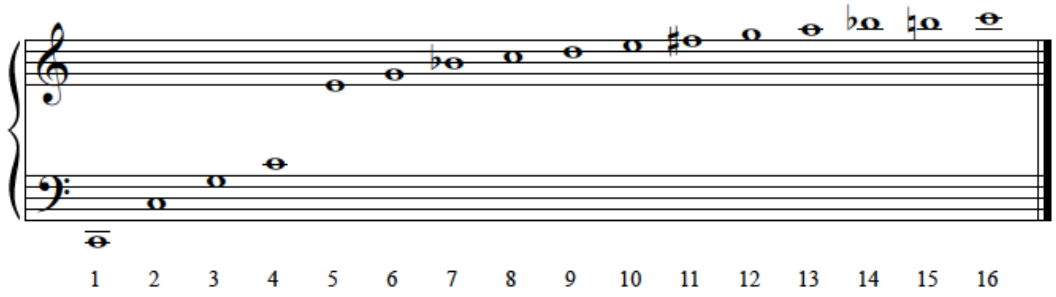


Figure 8 – Harmonic Series with C as the fundamental

In this figure, C is the fundamental, the note that is struck or played. The intervals found in the harmonic series are pure in quality.

Pythagorean tuning featured pure fourths and fifths, which was sufficient for such early music as tenth-century parallel organum (Dolata, Forthcoming, 2). When the interval of a third became compositionally more prevalent than fourths and fifths, however, the need arose for a temperament that would feature pure thirds, resulting in ¼-comma meantone temperament.

I offer next an explanation of 1/6-comma meantone temperament, why it was chosen for this *Sonic Peace*, its characteristics, advantages and disadvantages, how it is derived, and how to tune to it. 1/6-comma meantone temperament is a compromise between ¼-comma meantone and equal temperament. It allows for the use of more key areas than ¼-comma meantone temperament, but it retains more color than equal temperament. Since equal temperament is designed to facilitate transposition, allowing a piece to be performed in any key, some musicologists believe that the sound as a whole is flat, and not as vibrant as other temperaments.

I chose to use 1/6 -comma meantone temperament over any other temperament, because of its versatility, because it happens to be the temperament of choice for many early music ensembles, and, most of all,. because it provides an opportunity to re-explore a sound-world with which we are no longer familiar and which we certainly would not associate with most contemporary music.

Because our ears are so accustomed to equal temperament, different temperaments will no doubt sound strange or even wrong initially. In time, however, we can learn to find other temperaments pleasant-sounding. Many early music performers actually prefer other temperaments to equal temperament because the unequal semitones cause different tonalities to sound distinct. Perhaps this is why composers and musicians in the Medieval and Baroque periods such as Hildegard attributed different emotions to different tonalities or modalities. The proper execution of *Sonic Peace* will undoubtedly prove a challenge, but since the thirds are narrower, closer to the pure third, after some practice it should actually feel more natural, at least for the singers. In order to explain 1/6-comma meantone temperament and how it is calculated, I will begin by providing some useful terminology, summarized in Figure 9 below.

Cents: a logarithmic unit used to measure the size of musical intervals[3]

The Pythagorean Comma: 24c. can be considered a systematic excess.

The Syntonic Comma: 22c. can be thought of as an internal excess.

The Wolf: Unpleasantly sized, one fifth that is altered in size to account for the discrepancy created by the commas.

Figure 9 – Terminology

Depending on what tonal areas are desired, one can choose where to place the Wolf. I chose the common placement between G# and Eb. Please consider the circle of fifths; the placement of the Wolf would be as follows:

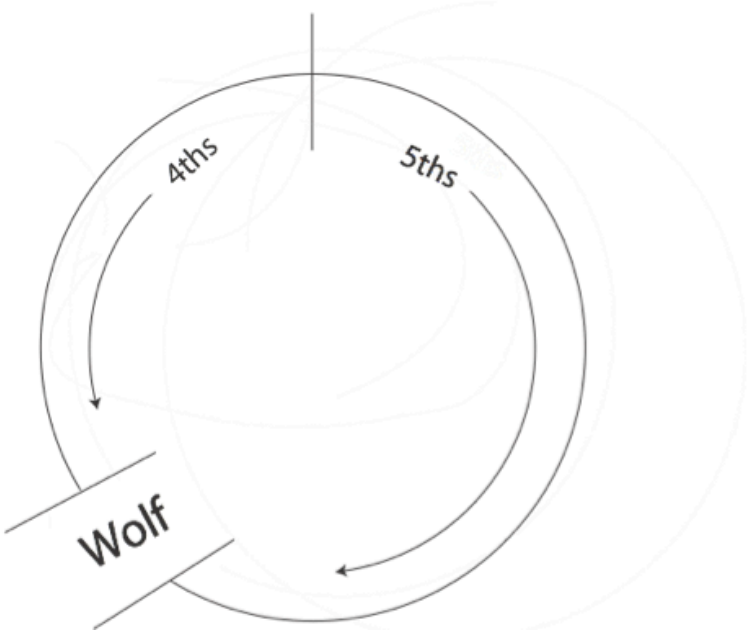


Figure 10 – Placement of Wolf

[3] Clive Greated. "Cent." *Grove Music Online*. *Oxford Music Online*. Oxford University Press, accessed October 17, 2013,http://www.oxfordmusiconline.com/subscriber/article/grove/music/05277.

To calculate the 1/6-comma meantone interval sizes, one must start by determining the size of the fifths and the size of the Wolf, as shown in Figure 11 below.

22c. (Syntonic comma) (1/6) = 22c. ÷ 6 = 3.66666667 (some musicologists and theorists round it to 3.7c.)
702c. (Value of pure fifth in cents) – 3.66c. = 698.3c.
698.34c. = Size of fifth in cents for 1/6-comma meantone temperament.
Wolf: 8400c. – (11x 1/6 comma fifths (698.3c.)) = 718.26c.

Figure 11 – Size of fifth in 1/6 Comma Meantone Temperament

The fifths (698.3c.) are not quite as narrow as in ¼-comma meantone temperament, and the 393.2 c. thirds are not quite as pure. Now that the size of our fifth has been determined, we calculate the cents chart for the temperament and, most importantly, the equal temperament offset chart shown here in Figure 12:

A	Bb	B	C	C#	D	Eb	E	F	F#	G	G#	A
	108.5	196.6	305.1	393.2	501.7	610.2	698.3	806.8	894.9	1003.4	1091.5	1200
0	8.5	-3.4	5.1	-6.8	1.7	10.2	-1.7	6.8	-5.1	3.4	-8.5	

Figure 12 – 1/6 comma meantone cents chart and Equal Temperament offset chart.

To calculate the cent values above, add consecutive fifth values (698.3c.) and compensate for any octaves by subtracting the octave (1200c.) to get the smaller value. Add consecutives fifths following the circle of fifths until the Wolf (G#) is reached, then start back at the top of the circle subtract consecutive fourths (1200c-968.3c=501.7c) to find the remaining values. The equal temperament offset chart is comprised of the values calculated by subtracting or adding the difference of the 1/6-comma meantone interval

cents from the equal temperament interval cents value, for example, an equal-tempered semitone has a value of 100c., the semitone in 1/6-comma meantone is 108.5, 8.5 cents larger. The advent of modern technology has provided the ability to input these offset values into a computer application such as Cleartune, which allows the player to tune to the temperament and listen to it. In the case of *Sonic Peace*, one must also adjust the standard tuning pitch to A=432Hz.

Numerology and Symbolism

The number nine holds significance for numerous cultures, but its importance in *Sonic Peace* stems from the *Solfeggio* frequencies. As I alluded to earlier, the last three frequencies that came to be considered as part of the *Solfeggio* frequencies were adopted because of their numerical qualities. Figure 13 shows the frequency values again, but in a slightly different order:

396 Hz
639 Hz
963Hz

417 Hz
741 Hz
174Hz

528 Hz
852 Hz
285Hz

Figure 13 – Solfeggio Frequencies

When considered in sets of three, they are "inversions" of each other. The calculations shown in Figure 14, often practiced in *Feng Shui,* the Chinese philosophical system of harmonizing the human existence with the surrounding environment, exemplify the numerical finesse of the *Solfeggio* frequencies:

3+9+6= 18

1+8=**9**

4+1+7=12

1+2=**3**

5+2+8= 15

1+5=**6**

9+3+6= 18, 1+8=**9**

Figure 14 – Solfeggio Numerology

While there are mathematicians, philosophers, and musicians who would deem this number play interesting and numerically elegant, there are musicians and acousticians, as well as supporters of A=342 (which also adds up to nine), who doubt that these qualities translate into equally elegant musical forms. I based some aspects of the piece around this number. For example, there are nine *solfeggio* frequencies; I wrote the text based on the six frequencies associated with healing properties. To obtain the numerological value of nine for the lines of text, I also make use of a Japanese Shinto chant comprised of three lines.

Different cultural mythologies refer to the number nine. *Feng Shui,* an approach to organizing aspects in ones life symbolically, divides life into nine "life areas" or *Baguas*, (see, for example, Hale 2003). The ninth area itself, usually illustrated at the center and associated with the color yellow, is said to represent health and balance, as exemplified by the yin-yang symbol at the center of the design in Figure 15 below:

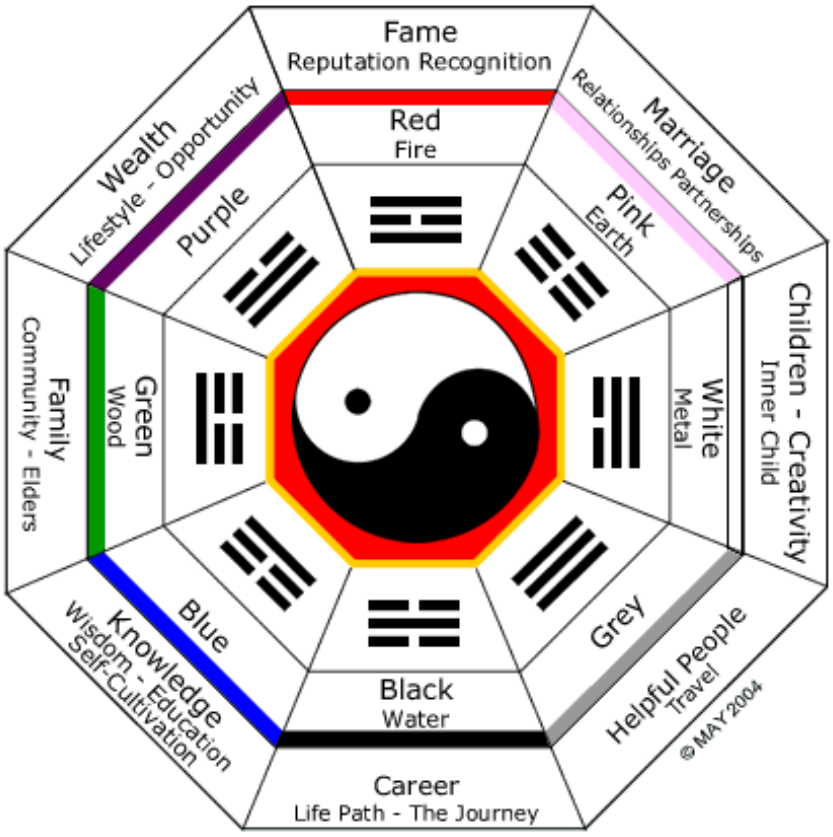


Figure 15 – Yin-Yang Feng Shui Chart

VI. Text and Texture

Sonic Peace features two different texts. My original English text is reproduced in its entirety in the Appendix (Text 1). The second is an ancient Japanese Shinto chant that likewise can be found in the Appendix (Texts 2–-4). This chapter will interpret each text and discuss its role in *Sonic Peace*. Each stanza of the English text correlates to a section in the piece, specifically, sections two through seven, as shown in Chapter IV, page 6. The text has a unifying tone, but each stanza was inspired by one of the *Solfeggio* frequencies and the related healing quality associated with it.

English Text

The first stanza is connected to the idea of "Liberating Guilt and Fear" and is reprinted in Figure 16 to facilitate its analysis:

Anger is coursing through humanity's veins
Fear seeps through delicate skins
Pathos' uproars desire freedom
Release beckons,
Relief waits,
When inner harmony is embraced, liberation nears.

Figure 16 – Text of Stanza One

The semantically salient words in the stanza are *anger*, *fear*, *freedom*, *waits*, *harmony*, and *liberation*. *Freedom*, *fear*, and *liberation* are key words because of their allusion to the healing quality. The word *anger* is often associated with fear. The last statement of the word *relief* in mm. 78–79 is followed by twelve measures of rest in the vocal parts, until a resolution with the word *waits* arrives in m. 93, presented by the sopranos.

The delay of the word *waits* is further accentuated with a *ritardando* in m. 89. The treatment of the word *harmony* in m. 97 is colorful, as it is the first and only moment in the section where more than one pitch is presented simultaneously, as shown in Figure 17 below.

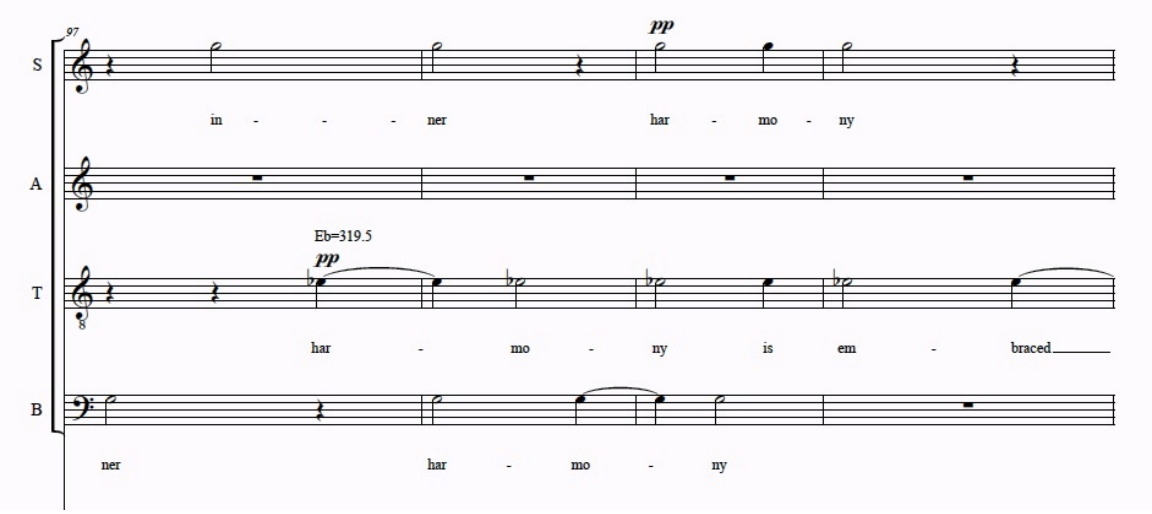


Figure 17 – Mm. 97–100

The second stanza is associated with the idea of "Undoing Situations and Facilitating Change" and is reprinted in Figure 18**:**

Powerful minds
Momentous thoughts provoked
Silent utterances are the strongest:
Thoughts elicit change,
Thoughts, directed, command.

Figure 18 – Text of Stanza Two

A key point of the stanza is that people have the power to effect change on an individual level and during interactions with others. This concept or ideology has been popularized recently, especially in more liberal and spiritual circles, as exemplified in the media by inspirational fiction novels such as James Redfield's *The Celestine Prophecy.* The *Solfeggio* frequency theory, or myth, does not imply this idea exactly, but promotes the

possibility that meditative yet aware listening to the precise frequencies could effect change on both personal and social levels.

The third stanza is linked to the idea of "Transformation and Miracles" and is reprinted in Figure 19:

Dreams are imagination's domain
The mind's creations acted out
Haunting imagery or Wonders
Achievable when personal power is recognized.

Figure 19 – Text of Stanza Three

The previous train of thought continues in this stanza. "Dreams" as a notion is introduced at m. 195 in the alto line over five beats with a *forte* dynamic marking. The setting of the word *dreams* is suspended over the decaying rhythmic texture in the accompaniment, as shown in Figure 20:

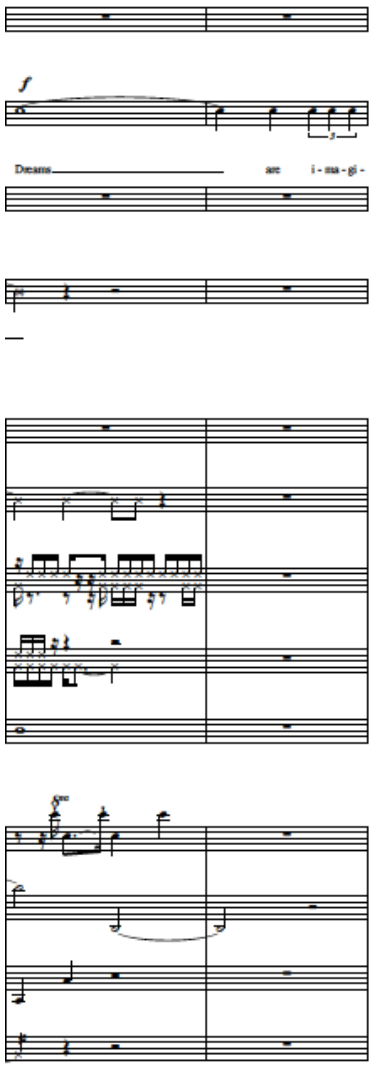


Figure 20 – Mm. 195, 196

The concept of dreams becomes the focal point of the text, each phrase describing and elaborating upon what constitutes dreams. While dreams, like music, have been an object of scientific scrutiny, they are still considered somewhat of an enigma.

The setting of this text is fairly short at eighteen measures; in comparison, the first stanza takes place over sixty-two measures. Note, however, that the third stanza is interwoven with the second line of the Shinto chant, whereas the first stanza stands alone.

Stanza four, reproduced in Figure 21, is associated with the idea of connecting with others and forming relationships**:**

Aloneness is always welcome, somewhere
Loneliness permeates, quietly
Saturated bones crumble,
People need people
True bonds are unassailable.

Figure 21 – Text of Stanza Four

Other than the *clichéd* yet true statement "people need people," the rest of the text and its relationship to the *Solfeggio* frequency is more elusive, or at least it is approached differently than those preceding it. From a textual perspective, we are dealing with a negative image, comparable to the concept of "negative space" in photography. Sometimes, when one looks at the shadows, the light is more noticeable. The text can probably be read in several ways, but I meant it to address loneliness and how people relate to it. Musically, the section opens with canonic imitation in the vocal parts starting at m. 218 (see Figure 22); the performers sing simultaneously alone and together, as it were.

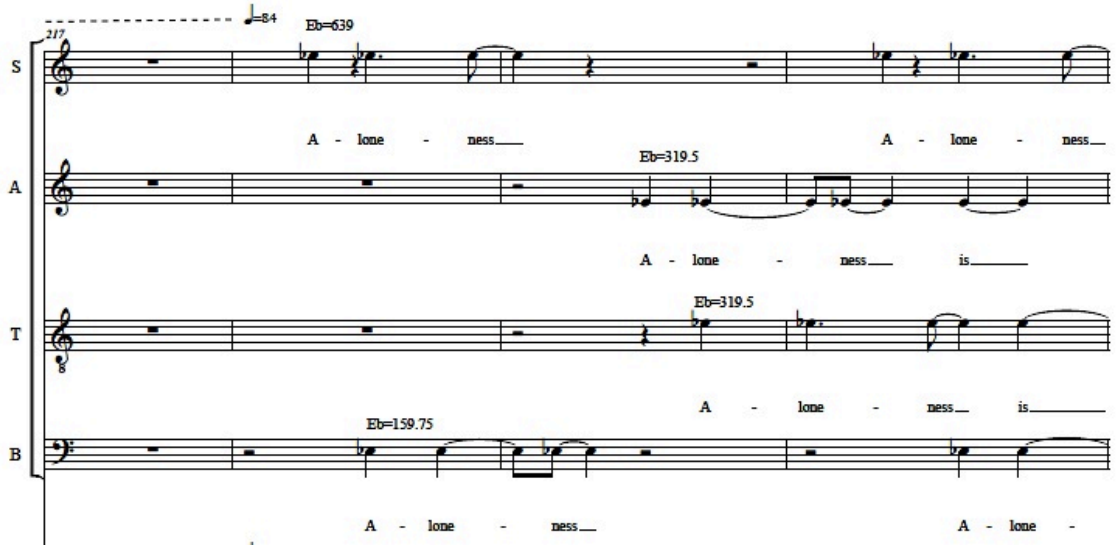


Figure 22 – Mm. 217-220

The fifth stanza is connected to the idea of "Awaking Intuition"; see Figure 23 for my vision of this concept:

Unseeing eyes are looking everywhere
Searching through fog covered lenses
The third eye sleeps
Contemplating meditation
We must learn to trust instinct
Awareness is our sway.

Figure 23 – Text of Stanza Five

Beginning at rehearsal letter **E** with the expressive marking "pensive," the section starts with a soli line sung by the altos, with the rest of the voices following in close imitation. Refer to Figure 24 below:

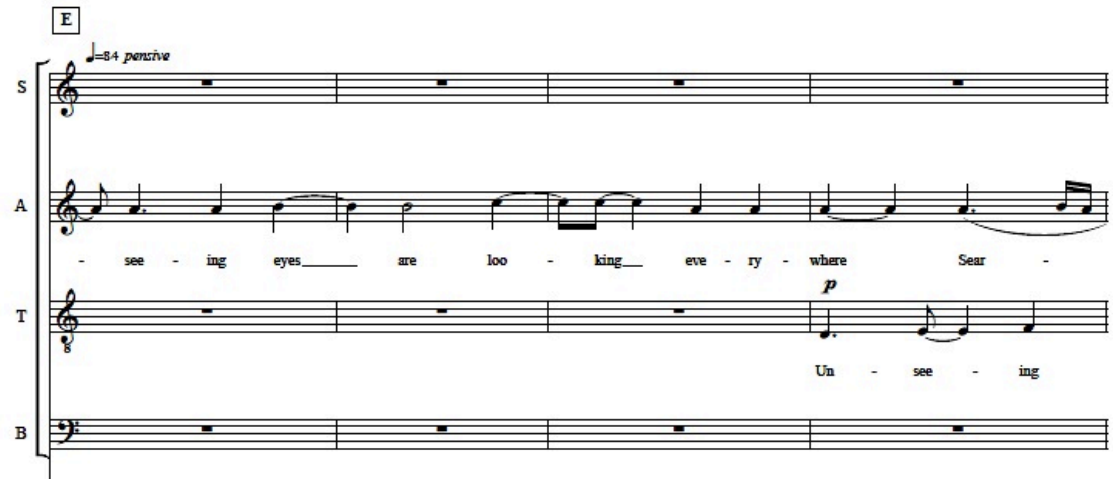


Figure 24 – Mm. 241-244

The initial setting of the word *fog*, sung by the altos in m. 245, is colored with a chromatically altered passing tone, as shown in Figure 25 below. The viola II later presents the same motive in m. 279.

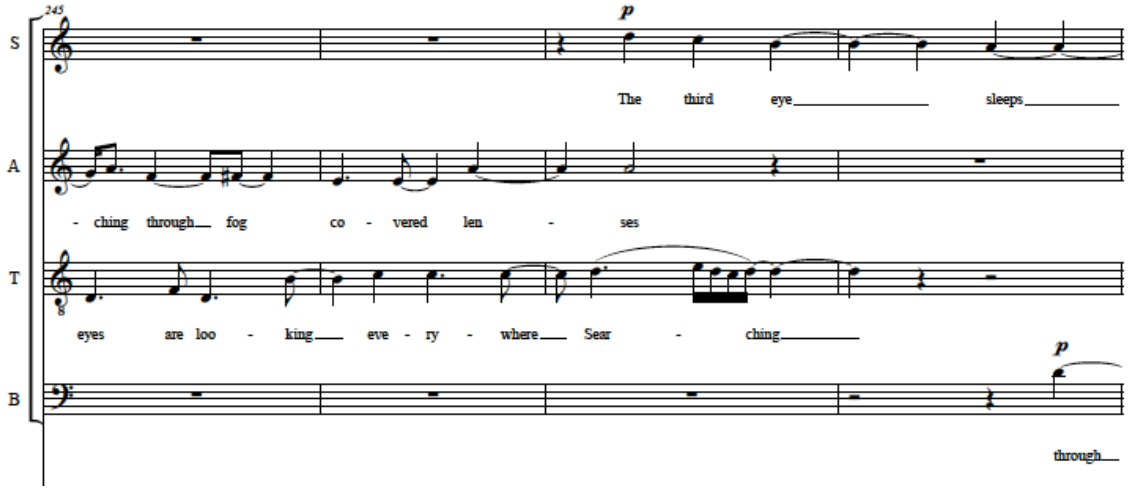


Figure 25 – Mm. 245-248

Here the text is meant to address the current human condition as most sociologists might describe it and as I have observed it. In most bustling cities one often does not have the time to breath, metaphorically speaking, let alone explore or question one's sense of, or quest for spirituality. This stanza highlights this idea with phrases such as *the third eye sleeps*. The third eye is, of course, referring to the spiritual concept associated with enlightenment and direct communication with a higher plane of existence.

A synthesis of Greek and Egyptian mythologies provides the character of "Isis-Sophia" in the text. As far as we know there was no goddess named "Isis-Sophia." Scholars have discussed the relationship between Isis, the Egyptian goddess of many things including wisdom, and Sophia, the Greek goddess of wisdom. Some believe that Sophia was modeled after Isis and that perhaps they were one and the same (see, for example, Forrest 2010). I chose to unite them, inspired by the possibility that Isis and Sophia may have been the same goddess. As a unified symbol, what both goddesses stood for would no longer be divided by time and culture.

The last stanza (Figure 26) is inspired by the wisdom and feminine energies of "Isis-Sophia", as well as Hildegard:.

Isis-Sophia
Your sacred
Ancient wisdom
Is Lost to time
Forgotten by many
But you are still there
Like the Phoenix
We can rise and re-member our spirituality
Open the veil and see through Maya
From the molten ashes
We return to
Om

Figure 26 – Text of Stanza Six

Isis was married to Osiris but her story is often lost in the midst of his. She was humane, an inspiring mother figure, and a patron of nature. Information recently unearthed suggests that Isis, Osiris, and their child may have been the original trinity (see, for example Forrest 2010). Sophia is thought of as the female part of God. This notion is supported by an interesting point Forrest (2010) makes: "Hebrew word *Chokmah* is a feminine word, and thus wisdom, when personified is a Divine She."

This final stanza is related to the *Solfeggio* healing state of "Returning to Spiritual Order." The inclusion of Isis-Sophia, the phoenix as the familiar symbol of renewal or of rebirth, and finally Maya, represents a union of spiritual forces. The piece ends the same way it begins: with a mind-body experience. The end establishes a mind-body connection through the humming and chanting of the word *Om*.

Shinto Chant

The culture of Shinto is venerable. It is not easy to gain an intimate knowledge of the practice. As instrumentalist Mitch Iimori confirmed, most Japanese people cannot

read the chants, for they are written in an old Japanese. Like the *Solfeggio* frequencies, I chose the chant for its mass media appeal. Shinto Priest Hideo Izumoto in particular has popularized this chant. He travels the world teaching Shinto healing techniques. The translation of the chant used in *Sonic Peace* is reprinted in Figure 27:

> We are gods and creators. We create everything with consciousness and it is for our use forever.
>
> We practice actualization of the God Self through Freedom, Truth, Love, Beauty, Happiness, and Advancement.
>
> We live together forever for our happiness, our advancement. Thank you, God, as we open our mind to the Light of God within us, all healing happens.

Figure 27 – Shinto chants, English translation

The translation of the chant fits the concept behind *Sonic Peace* perfectly. From what I have been able to confirm through Japanese contacts, the translation seems to be accurate, but in any case it is the translation that is in circulation, which is the reason I chose it. Many people have been captivated by Hideo Izumoto, his positive spirit, and with his teaching of this chant. As outlined in the next chapter, I treat the chant from a rhythmical standpoint.

VII. Rhythmic patterns in *Sonic Peace*

Sonic Peace is based on simple rhythms. The main reason for using simple rhythms was to allow the sound world, i.e., the non-standard temperament, to play the dominant role. As it stands, the extended techniques employed in the vocal parts throughout *Sonic Peace* make the simple rhythms harder to execute than one might think. The rhythm in *Sonic Peace* can be examined on two levels: the first, and perhaps more esoteric, of the two is as an allusion to the trinity of heart, body, and mind, a concept at the epicenter of the piece—this allusion is most audible during the vocal sections involving body percussion, such as the introduction, excerpted in Figure 28**,** when all four voices are present. The second, more dominant level involves the inclusion of rhythmic ciphers.

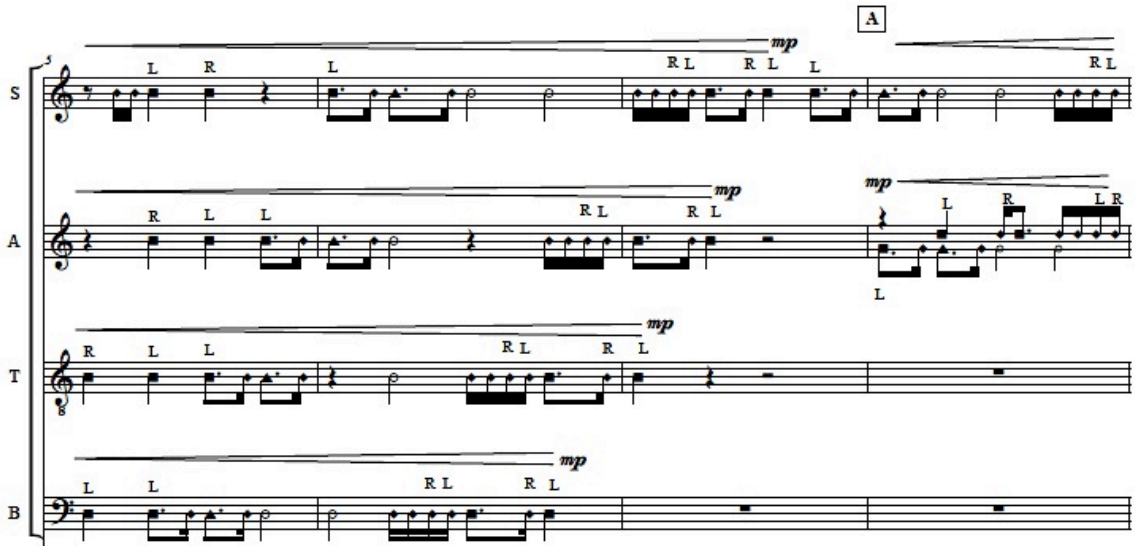


Figure 28 – Body Percussion, Mm. 5-8

Past Uses of Ciphers in Music, and Morse code

There is a definite precedent for using ciphers in music. Composers such as Bach and Schumann used note ciphers to embed the names of colleagues, musical inspirations, or even the titles of compositions in their music. With note ciphers, the letter names of pitches represent letters that are then used to form words. Note ciphers provide complete freedom rhythmically, since they correspond to pitch and are therefore limited by the number of note names. Conversely, rhythmic ciphers dictate rhythmic patterns but allow for versatility when it comes to pitch.

Morse code is a system of dots, dashes, and spaces, or sounds used to represent letters and numerals. The international code differs slightly, the objective being to avoid the "space letters" of the Morse code. *Sonic Peace* employs the now standard international code. The reader may wish to refer to Table 1 in the Appendix to see the series of dots and dashes attributed to each letter and number of the Latin alphabet; *Sonic Peace* only makes use of the letters.

Some contemporary composers have used Morse code to generate rhythmic material. Consider Figure 29, from Boulez's 1976 *Messegesquisse* for seven celli.
The solo cello line at the beginning of rehearsal number 3 exemplifies the linear presentation of a cypher.

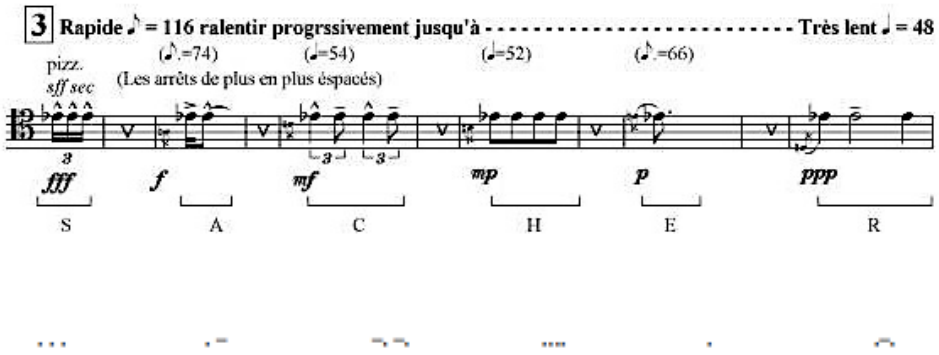


Figure 29 – Pierre Boulez. *Messegesquisse* for seven celli (1976), m. 13

I provide letter identification for analytical purposes only; they are not found in the score. In the episode before the cadenza, the same idea returns, but this time the cypher is presented vertically (see Figure 30 below).

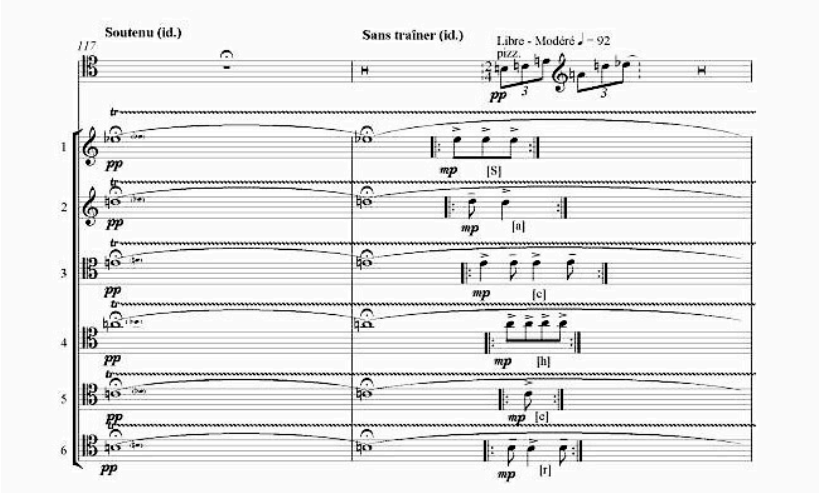


Figure 30 – Pierre Boulez. *Messegesquisse* for seven celli (1976), mm. 117-118

Composer Dmitri N. Smirnov notes that when he uses Morse code, he does so with the intent of being "more clear[ly discerned]"; consider his piano solo dedicated to pianist Sharon Anderson:

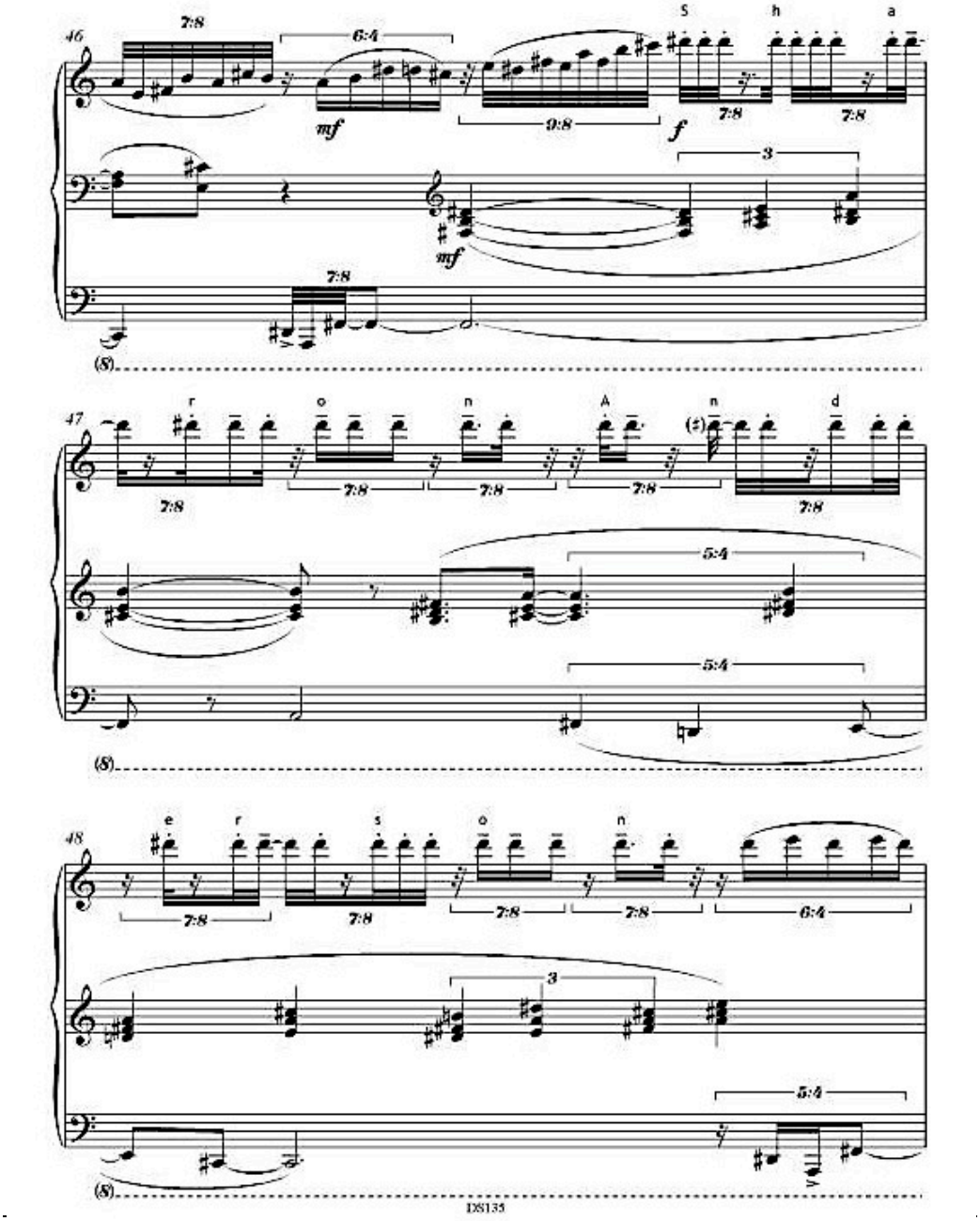


Figure 31 – Dmitri N. Smirnov. Metaplasm 1 Op. 135 for piano (2002) mm.46-48

He uses both articulation and rhythmic values to draw a further distinction between the short and long pulses that comprise each letter; he also uses rests between each of them.

Uses of Ciphers in *Sonic Peace*

Music has received a lot of recent attention from the scientific community. I wanted to incorporate ciphers to juxtapose the concepts of conscious communication and understanding with subconscious communication and understanding. I do this by presenting the text in two ways, the first being an example of conscious communication as the text is spoken or sung, and the second is the embedding of the text throughout the composition.

In *Sonic Peace*, the ciphers used are rhythm-based. I used both the International Morse code alphabet and the *Wabun* code. *Wabun* is a Japanese version of Morse code in which each symbol represents an individual syllable from *hiragana* or *katakana,* the two Japanese phonetic alphabets. *Hiragana* is used to write traditionally Japanese words, whereas *katakana* is used to adapt foreign words or concepts into Japanese. The reader may consult **Table 2** for a guide to *Wabun* code. I used these systems to generate rhythmic cells based on both the original text and the Japanese Shinto Chant featured in *Sonic Peace.* These rhythmic cells are present throughout the composition and varied through augmentation, diminution, and other rhythmic variations (e.g., substituting a triplet figure for a duple figure). Figure 32 and Figure 33 showcase the introduction of the second line of the Shinto chant starting in m. 178; below the musical example is the Morse code representation of the line.

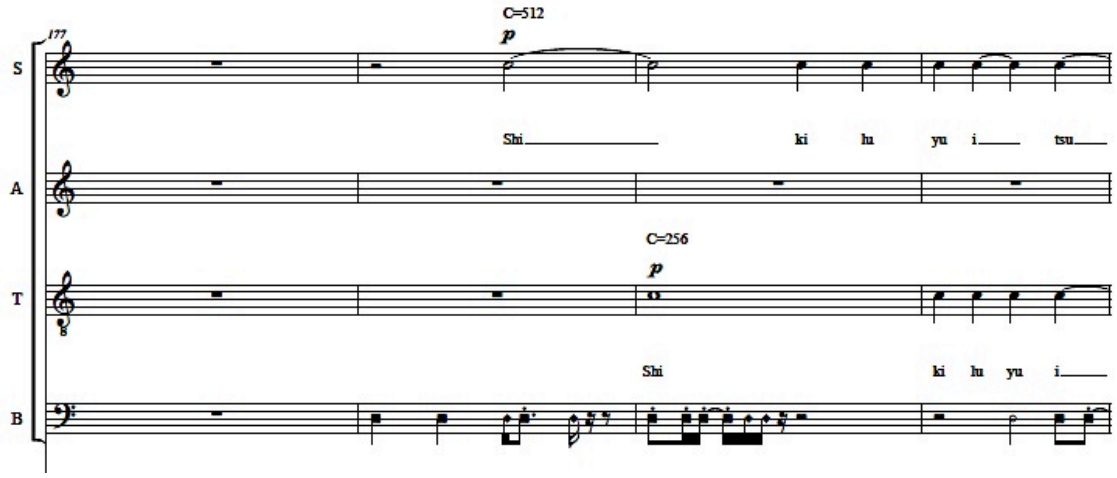


Figure 32 – Mm. 177-180

2nd line

--.-./-.-../-.--./-..--/.-/.--./-.-/..../---./.---/-./-.../...-...-/.-..

Figure 33 – Morse code representation

In this case, the cypher is presented through body percussion by the bass voice, which has the whole sequence, but here, in mm. 178–179, one can only see the first two kana's worth. The rhythms in the string parts also include ciphers. The string parts feature the same cypher, but the rhythmic sequence is either augmented or diminished in value, as heard in mm. 177–180:

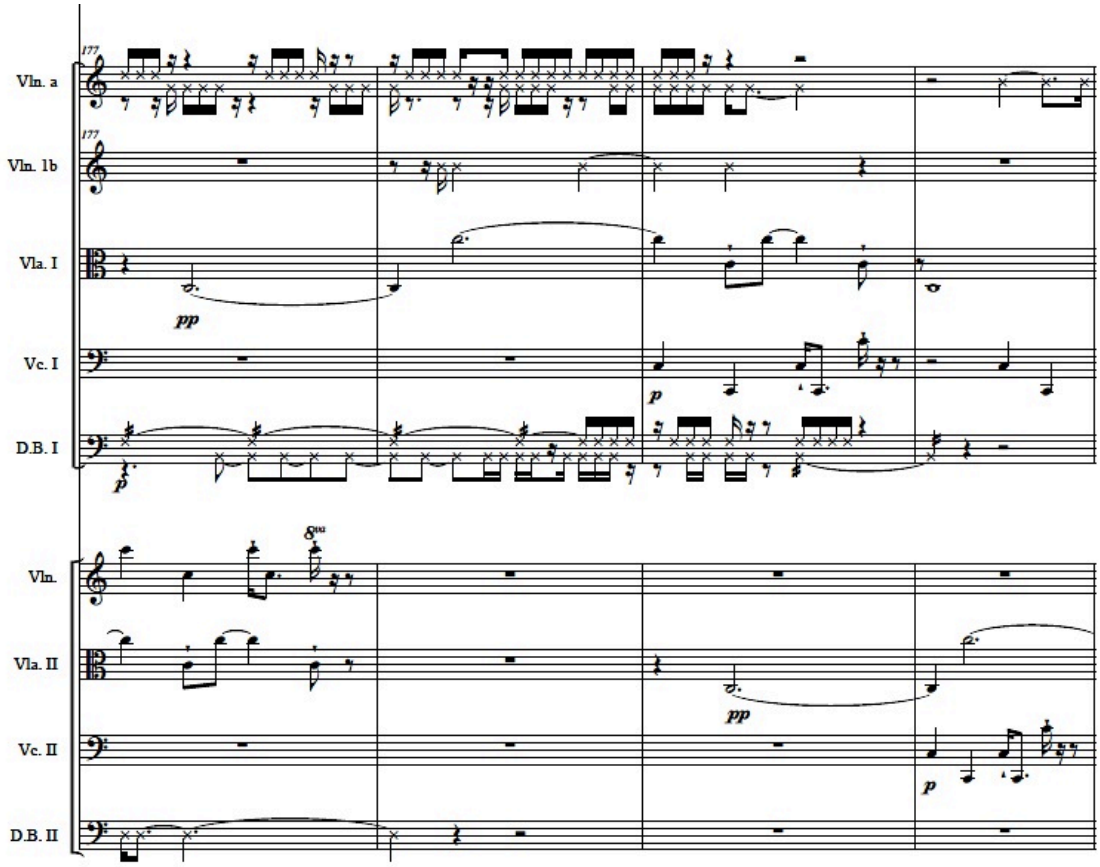


Figure 34 – Mm. 177-180

Compare the Viola I and Cello I lines with the bass voice line from Figure 32 above: they have the same relationship between long and short note values, corresponding to the long and short Morse code pulses shown in Figure 33. Viola II and Cello II follow the same sequence starting two measures later, mm. 179–182, also shown in Figure 34. There are many other such examples throughout the piece.

VIII. Orchestration

Instrumentation

Sonic Peace: An Antithesis to Sonic Warfare is scored for two string orchestras and four-part chamber choir. The piece does not call for woodwinds, brass, or pitched percussion, since most modern woodwind and pitched percussion instruments are constructed as fixed pitch instruments. It would be very difficult, if not impossible, for them to play other than in equal temperament. Brass instruments, such as the trombone, could have been incorporated since they can bend their pitch more readily, but I ultimately excluded them.

Notation and Extended techniques

Sonic Peace is a transposed score, meaning it does not sound as written. There are several notional features to discuss. I use *Scordatura* and other extended techniques to create the desired sound world. *Scordatura* emerges only in the *Solfeggio* orchestra; see Figure 35 below to see the adjustments in tuning required.

Violins:

Vln. a
G (196) >>>>>>>>>>> G (198)
D (293.7)>>>>>>>>>> D (285)
A (440) >>>>>>>>>>> A (426)
E (659.3)>>>>>>>>>> Eb (639)

Vln. b
G (196) >>>>>>>>>>> A (213)
D (293.7)>>>>>>>>>> Eb(319.5)
A (440) >>>>>>>>>>> B (481)
E (659.3)>>>>>>>>>> F (696)

Viola:
C (130.8)>>>>>>>>>C (132)
G (196) >>>>>>>>>>G (198)
D (293.7)>>>>>>>>>D (285)
A (440) >>>>>>>>>>A (426)

Cello:
C (65.41)>>>>>>>>>C (66)
G (98) >>>>>>>>>>>G (99)
D (146.8)>>>>>>>>>D (142.5)
A (220) >>>>>>>>>>A (213)

Contra Bass:
E (41.20)>>>>>>>>>Eb (39.94)
A (55) >>>>>>>>>>>A (53.25)
D (73.4)>>>>>>>>>>D (41.25)
G (98) >>>>>>>>>>>G (99)

Figure 35 – Values measured in Hertz

The *Solfeggio* orchestra only plays open strings and octaves. As the reader may notice, some of the tuning adjustments are minute if considered individually, but they are best contemplated in relationship to each other, where the differences become apparent. Using *Scordatura* implies that the notated pitches are the standard equal-tempered pitches for fingering purposes, but the sounding pitches are the desired *Solfeggio* frequencies, the values listed on the right hand side of Figure 35. Please refer back to Chapter IV on temperament for my reasons behind this specific tuning.

I use different noteheads to denote certain aural effects. For the choir, the different noteheads and their descriptions are shown below in Figure 36.

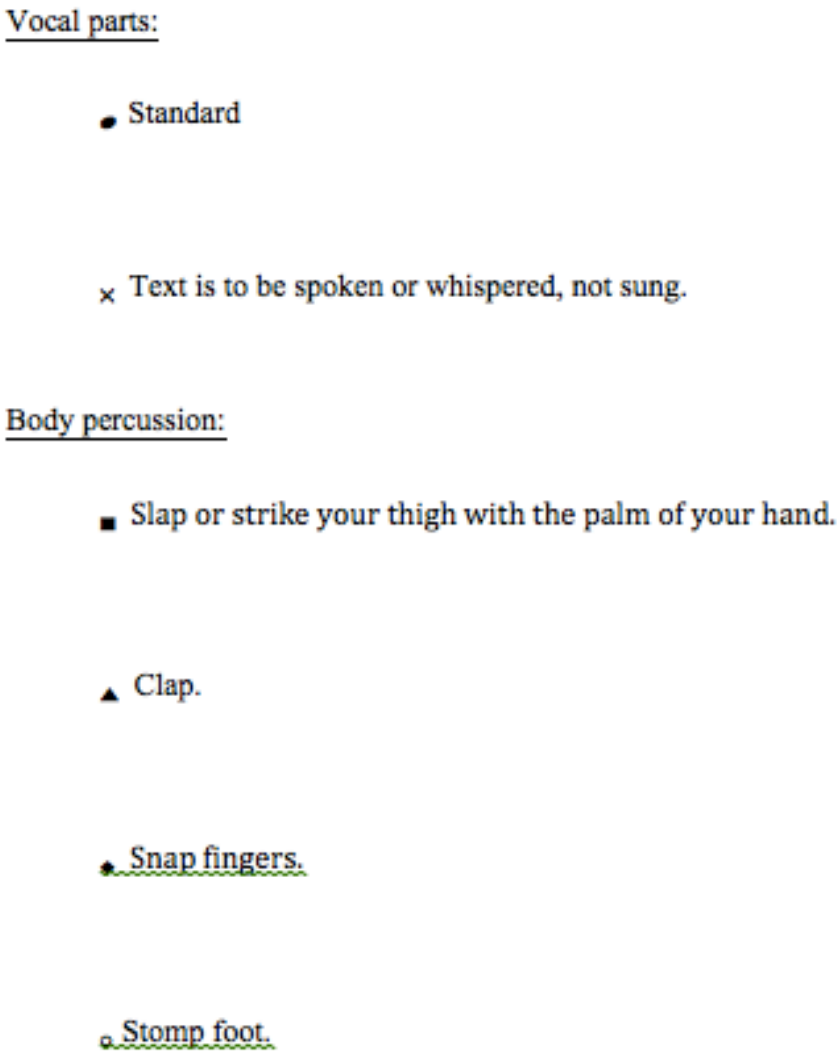


Figure 36 – Noteheads used in vocal parts

Regarding body percussion, the default is for the performers to use their dominant hand or foot, which allows for some visual variety, and gives the performer a modicum of control. When a specific sequence is desired, however, the letters L or R, for left and right are used; for an example please see Figure 37.

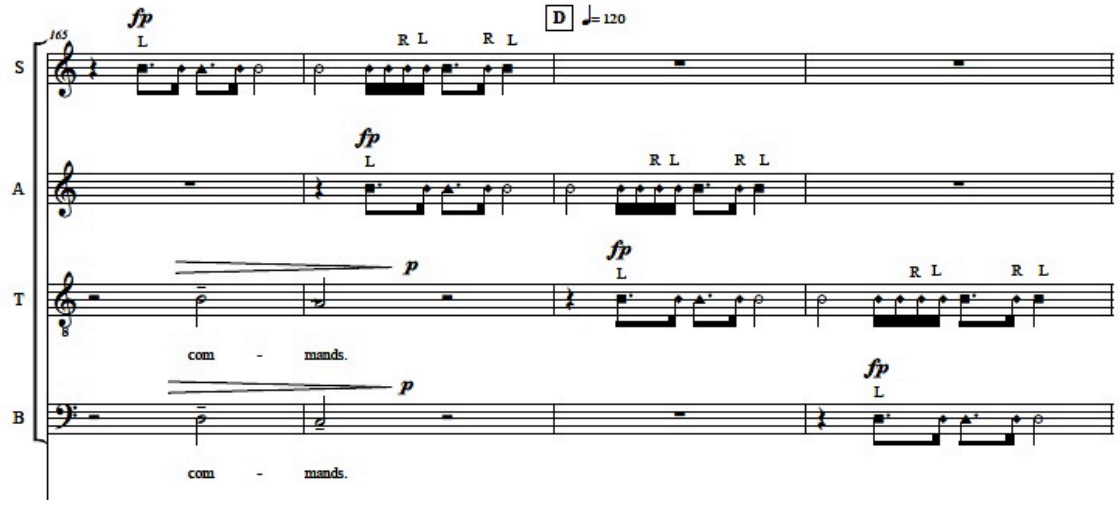


Figure 37 – Mm. 165-168

For the orchestra there are only two notehead variations, listed in Figure 38:

- Standard

- × Tap out the notated rhythms on the body of the instrument.

Figure 38 – Noteheads used by the orchestra

Where exactly on the instrument performers tap is left to their discretion or the conductor's, but it should be uniform among the individual sections and as sonorous as possible.

Staging

There are three different stage set-ups. For the exact seating charts, please refer to the Appendix, Charts 1 through 3. During the opening stage set-up, the chorus members surround the orchestra and the audience to create a *cori spezzati* effect. The second stage set-up should take effect by m. 39, giving all chorus members three full measures to travel to their places. The sopranos, who will need to travel the farthest, have six measures in which to do so. The final set-up only affects two singers, one soprano and one alto, as they are asked to move downstage for the last section, in preparation for their duet, which ends the piece *a cappella*.

IX. Conclusion

In *Music and Ethics* Marcel Cobussen and Nanette Nielson assert that , "music is able to demand the responsive and responsible engagement of its listeners" (2012, 164). If any listener could be expected to react responsibly to music by "engaging" in "active listening," then composers, who are "professional listeners," should be held to the same, if not a higher, standard.

I am not a medical professional, and I am not suggesting that this piece will heal anyone. But I do believe that if the listeners are listening actively and are intent on experiencing the piece, it may arouse in them a variety of emotional responses. Some may feel calm and excited, just as some of the singers may join their bodies, metaphorically, with Mother Nature. Michael H. Thaut states, "The brain has neural circuitry that is dedicated to music, [and that] music is associated with a specific yet complex brain architecture" (2005, viii). Eventually, I would like to explore how *Sonic Peace* affects this brain architecture. When the piece receives its premiere, I plan to draft a survey that will ask the audience to describe their experiences throughout the piece and evaluate their emotional responses. Once there is a recording of the piece, it would be ideal to conduct an experiment that would analyze the differences in perception between performers and audiences of the piece, by comparing two renditions of the piece, as written versus having it be realized in equal temperament. Call the piece an experiment, a sound world, or a spiritual work for non-conformists; in the end its intention is the same: to promote positive thoughts and stimulate healing energy.

"O form of woman, sister of Wisdom, how great is your glory!"
-- Hildegard von Bingen, Epilogue, Life of St. Rupert

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Appendices

Text 1

Anger is coursing through humanity's veins
Fear seeps through delicate skins
Pathos' uproars desire freedom
Release beckons,
Relief waits,
When inner harmony is embraced, liberation nears.

Powerful minds
Momentous thoughts provoked
Silent utterances are the strongest:
Thoughts elicit change,
Thoughts, directed, command.

Dreams are imagination's domain
The mind's creations acted out
Haunting imagery or Wonders
Achievable when personal power is recognized.

Aloneness is always welcome, somewhere
Loneliness permeates, quietly
Saturated bones crumble,
People need people
True bonds are unassailable.

Unseeing eyes are looking everywhere
Searching through fog covered lenses
The third eye sleeps
Contemplating meditation
We must learn to trust instinct
Awareness is our sway.

Isis-Sophia
Your sacred
Ancient wisdom
Is Lost to time
Forgotten by many
But you are still there
Like the Phoenix
We can rise and re-member our spirituality
Open the veil and see through Maya
From the molten ashes
We return to
Om

Text 2: Latin representation of the Hiragana

Hi fumi, yo i mu na ya kotomo chi lo lane
Shi ki lu, yu i tsu wanu so wo ta ha kumeka
U o e, nisali hete nomasu a se e holeke

Text 3: English translation

We are gods and creators. We create everything with consciousness and it is for our use forever.

We practice actualization of the God Self through Freedom, Truth, Love, Beauty, Happiness, and Advancement.

We live together forever for our happiness, our advancement. Thank you, God, as we open our mind to the Light of God within us, all healing happens.

Table 2: International Morse Code

A	.-	M	--	Y	-.--	6	-....
B	-...	N	-.	Z	--..	7	--...
C	-.-.	O	---	Ä	.-.-	8	---..
D	-..	P	.--.	Ö	---.	9	----.
E	.	Q	--.-	Ü	..--	.	.-.-.-
F	..-.	R	.-.	Ch	----	,	--..--
G	--.	S	...	0	-----	?	..--..
H	....	T	-	1	.----	!	..--.
I	..	U	..-	2	..---	:	---...
J	.---	V	...-	3	...--	“	.-..-.
K	-.-	W	.--	4	....-	‘	.----.
L	.-..	X	-..-	5	.....	=	-...-

Table 3: Wabun Code

Mora	Code	Mora	Code	Mora	Code	Mora	Code	Mora	Code	Mora	Code	Mora	Code	Mora	Code	Mora	Code	Punctuation	Code
a ア	--•--	ka カ	•-••	sa サ	-•-•-	ta タ	-•	na ナ	•-•	ha ハ	-•••	ma マ	-••-	ya ヤ	•--	ra ラ	•••	wa ワ	-•-	Dakuten ゛	••
i イ	•-	ki キ	-•-••	shi シ	--•-•	chi チ	••-•	ni ニ	-•-•	hi ヒ	--••-	mi ミ	••-•-			ri リ	--•	(wi ヰ)	•-••-	Handakuten ゜	••--•
u ウ	••-	ku ク	•••-	su ス	---•-	tsu ツ	•--•	nu ヌ	••••	fu フ	--••	mu ム	-•	yu ユ	-••--	ru ル	-•--•	n ン	•-•-•	Long vowel ー	•--•-
e エ	-•---	ke ケ	-•--	se セ	•---•	te テ	•-•--	ne ネ	--•-	he ヘ	•	me メ	-•••-			re レ	---	(we ヱ)	•--••	Comma 、	•-•-•-
o オ	•-•••	ko コ	----	so ソ	---•	to ト	••-••	no ノ	••--	ho ホ	-••	mo モ	-••-•	yo ヨ	--	ro	•-•-	wo ヲ	•---	Full stop 。	•-•-••

Chart 1- Opening Stage Set-up

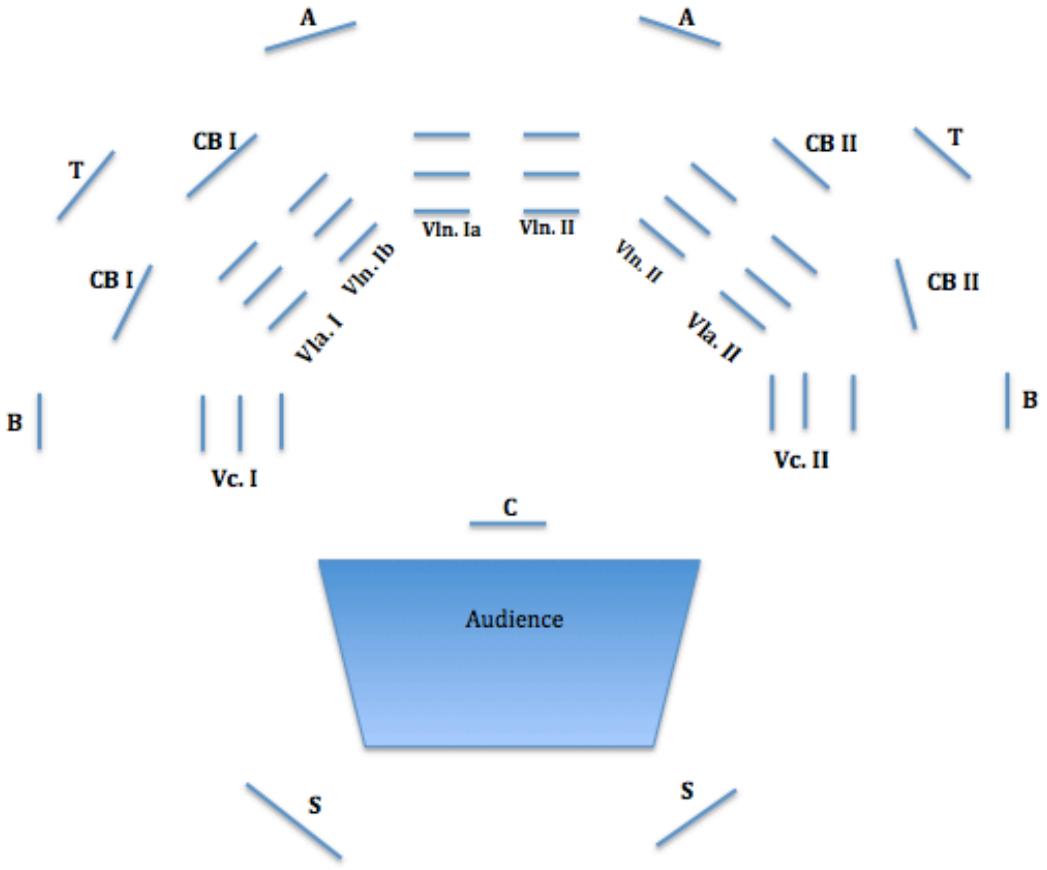

Chart 2- Middle Stage Set-up

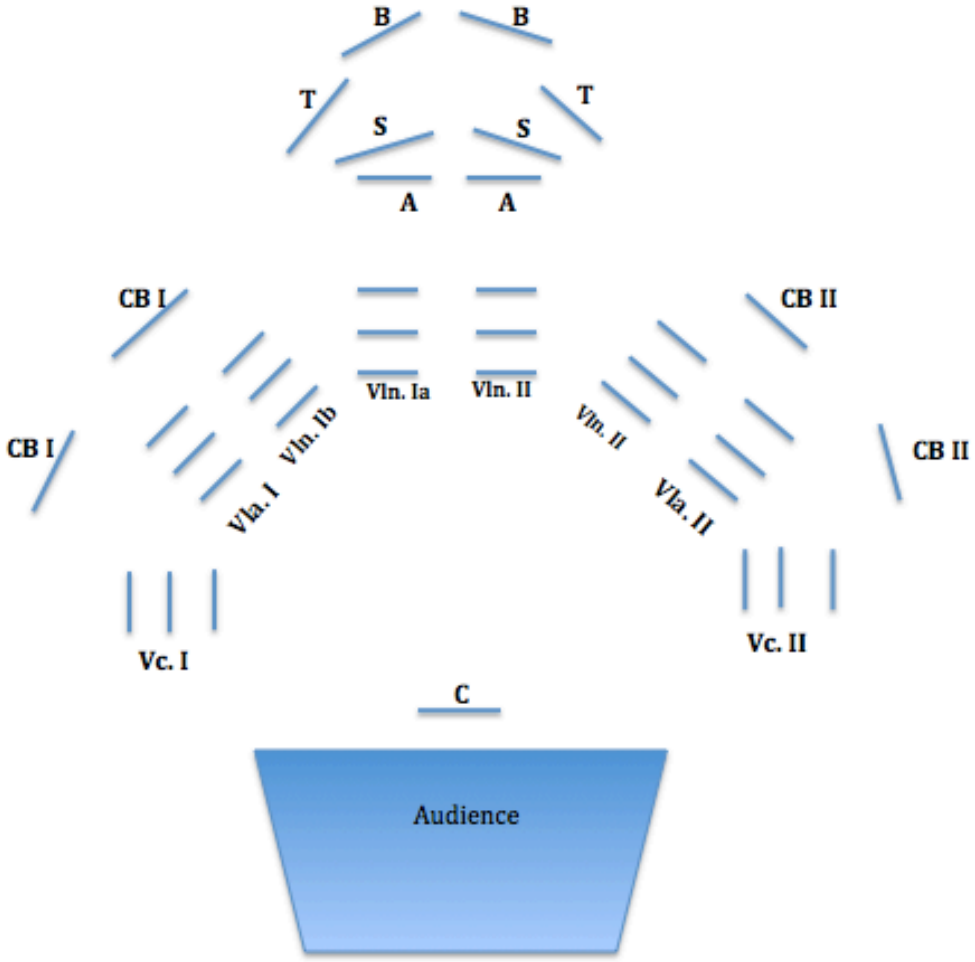

Chart 3- Final Stage Set-Up