Polytonal Non-Octave Complexes

DMA Document

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ABSTRACT

Through an exploration of dissonance by means of phenomenologically organized scalar complexes, this document describes an alternative to the octave-based scalar system that has prevailed over the past centuries. These complexes are derived from an adaptation of Ching Fang’s sixty-step division of the octave into systems that use the perfect fourth or the perfect fifth as their interval of periodicity. In this manner scalar complexes are created that span five octaves with the use of the fourth, and seven octaves, with the use of the fifth, and can contain thirty-six or more register dependant pitches. In this document I will explore the origins and methodology for deriving these complexes and, through the analysis of my own musical compositions, I will explain the compositional approaches and techniques that I have developed over the past four years using these complexes, which I have termed “Polytonal Non-Octave Complexes”.

Dedicated to

Ion, Balam and my parents
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INTRODUCTION

The sound, style and emotions that a particular piece of music might transmit are, in part, the direct result of the underlying pitch structure upon which the composition is developed. A minor mode is easily distinguishable from a major mode and the emotion and color characteristic of a piece will inevitably change as soon as the mode changes. Furthermore, the compositional approaches, as well as the techniques and instrumentation used by the composer will all contribute to the aesthetic and emotional qualities of the work. It is the responsibility of composers to propose procedures and solutions to fulfill their creative motivations.

Until the twentieth century, musical styles and trends were somewhat unified in direction; revolutions and evolutions existed within one general approach: common practice tonality. The composer was taught and trained in this craft, and when the composer entered the professional world, he or she turned to common practice tonality. However, since the early twentieth century, as musical styles have diverged and opposing styles have evolved, the composer has a much larger and conflicting world of musical style to sort through before he can decide what direction to take.

Among the conflicts in compositional procedures inherited by the modern composer there is one that revolves the use of scalar order. On one side, scalar order is discarded and new systems and processes of pitch organization are developed. On the
other side, scalar order is kept and the harmonic vocabulary is expanded. Where scalar order provides the composer an ordering of pitches through which he or she can make compositional decisions, without scalar order the decision making process is fundamentally altered as well as the experience of the compositional act itself.

Even though these new theories of pitch organization such as serialism have not had a broad acceptance in the general public, they have been embraced by many institutions and, at one point, were considered the only “serious” compositional technique. Although the pressure exerted from the academic world certainly has diminished, many institutions still only recognize certain stylistic characteristics as “contemporary” trends. Thus composers are usually encouraged, to write with a “contemporary” language. Because the abolition of scalar order started almost a century ago there is now an enormous amount of “experimental” and “forward looking” music that has accumulated, making it even harder for the contemporary composer to be innovative or unique within these compositional trends.

On the other hand, a movement foreign to the complexity embodied by serialism bloomed with the nationalistic movements that turned to jazz and folk music for ideas. Composers such as Claude Debussy, Charles Ives, Aaron Copland and Bela Bartok, among others have been responsible for the survival of melody and tonality in the concert hall. Through a revision of the rules of voice leading, and an expansion of the harmonic palette through quartal and quintal harmonies, as well as with polytonality, this movement was able to expand on the idea of tonality and counterpoint and continue the tradition of scalar order established by common practice. Because there is a great deal of
freedom and diversity in compositional approaches there are many concepts that have not yet been codified and are dispersed throughout the music history and theory books.

Adding complexity to the composer’s stylistic decision-making, the twentieth century brought a whole new world of music: computer music. This addition has not only changed the traditional act of composition itself, but has provided new techniques and methods to creating music. This path, besides requiring a whole new set of knowledge that can amount to a new career, is even a step further away from the traditional act of composition.

As a composer, I believe common practice tonality still has the potential to be developed and that melody and harmony can exist in forms not yet explored. I also believe that the direction taken by serialism and other avant-garde movements, while they provide the composer with alternative tools, they are not always useful in the creation of melodic and harmonic content that my artistic endeavors require.

In creating melodic content, it is sometimes difficult to escape the limitations of a pentatonic scale or the seven-pitches of a scale or mode. One common way to do so is through chromatic embellishment or micro inflection of pitch. This however, still leaves us with five or seven structural pitches upon which the melody moves. These limitations are set by the use of octave equivalence throughout the range of the melody. Thus, in a modern grand piano, there are seven complete sets of the C major pentatonic scale. In creating scales with more than seven or even twelve pitches in a twelve-pitch, equal-tempered system, removing the traditional periodicity of scales at the octave affords the creation of scales with more than seven or even more than twelve pitches within the usual twelve-tone equal-tempered system. Thus, if a set pattern is repeated at the fifth or the
fourth, the result is a scale in which pitch content changes in different registers and that can have up to as many as 48 structural pitches. Furthermore, the verticalization of these scales gives the composer yet another tool for harmonic exploration.

Because I have used these scales in a manner that expands common practice tonality, I have called them Polytonal Non-Octave Complexes, where the set pattern represents a particular tonal region among many distributed throughout the available range. The purpose of this document is to describe the nature of these scalar complexes with which I have written my last five works for the concert hall. Through specific examples of my music throughout my career, I will explore the various methods of deriving these scalar complexes (which in continuation will be referred to as PTNOC), their origin, and how these structures are helpful in creating new harmonies and unheard-of melodies, as well as their ability to incorporate both serialism and the harmonic materials of Nationalism.
CHAPTER 1: EARLY COMPOSITIONS

Two major factors have determined where I have channeled my energy as a composer: First, having studied piano and the classical repertoire and having a close, working relation with tonality and the practice and pleasure of playing piano music; and second, having been born and raised in Mexico has predisposed my ear to an eclectic culture with its unique sound. Since my early compositions, I have worked with tonal structures replacing the interval of the third with the interval of the fourth. This replacement is a simple first step in departing from the Romantic or Classical eras, without necessarily destroying the underlying tonal structures (and was used by composers such as Debussy, Stravinsky, Bartok). The compositional approaches and techniques that I developed in my later years, that ultimately led me to develop PTNOC, are present in an embryonic manner in my “Two Preludes for Violin and Piano” that date back to 1996. The first movement is loosely in the key of C, as it begins and ends with a C in the bass. However, there is not enough evidence to determine the mode. The piano introduction outlines a perfect fifth that through neighboring motion moves to a $V^4_2/V$ sonority, suggesting a Lydian mode. However, the use of $E^b$ and E as well as A and $A^b$ and the context in which they are used suggests an almost simultaneous use of both major and minor modes. It is interesting also to note that, with the exception of the $E^b$ 1, in measure four, the E natural is used in a lower register than the $E^b$, which is directly a
predecessor of the idea that pitch can be tied to a certain register. By measure three, starting at G, a series of fifths outline the opening violin phrase while the piano plays an open fifth ostinato. The contrasting \( b \) section (mm 12-22) is characterized by fourths with neighboring motion.

Example 1.1 *Prelude for Violin and Piano*
Example 1.1 Continued

In further exploiting the use of fourths, I often turned to a well known technique that Brahms used in his fourth symphony: In the first movement of this symphony a series of descending thirds framed in a rhythmic pattern are kept within a certain range through octave displacement:

Example 1.2 Brahms, Symphony no 4 in E minor, Op. 98

Because we are replacing the third with the fourth, it seems plausible that one could use such a technique of phrase construction using the fourth or the fifth. In my setting of “Cancion del dia que se vâ”, I employ this technique for generating a main ostinato figure that oscillates between a tonic and dominant pillar. A series of six ascending fourths is interrupted with a seventh fourth (B♭–or A♯) that arrives one eighth too early and is displaced down an octave. This interruption shifts the tonal pillar to the dominant by reinterpreting the notated fourth (B♭) to its enharmonic A♯ which functions as the leading tone of the dominant and ends the two measure cycle. Upon this two-
measure ostinato, the voice delineates a Phrygian tetra-chord, a quasi lament reminiscent of the cantaor Gitano.

Example 1.3  *Canción del día que se vá*

In the second part of this opening (mm 9-14), the two-octave span gets reduced to an octave and a half, or five fourths, as the first eighth-note of the second beat, is re-struck by the right-hand thumb. The stacked fourth harmony again moves in a parallel motion with chromatic neighboring motion. However, in the final cadential gesture (mm
13-14) only the bottom three voices descend while the upper two remain creating harmonic tension that resolves to the opening gesture.

Another technique I used for exploring quartal harmony is to have two independently moving voices, each one with mostly fourths stacked above. This technique allows for colorful harmonies by introducing pitches outside the key, that is, chromatic pitches that are the result of parallel fourth motion. “Canción del Naranjo Seco” has an underlying tonal structure of C major/minor; however, tonality is blurred with the pitch saturation of the six-pitched chords on the piano. While the right hand always maintains the stacked fourths, the left hand changes intervals. This not only helps accommodate the tonal structure of the movement, but also creates interest by providing diversity and surprise in chord colors.

Example 1.4  *Canción del Naranjo Seco*
Example 1.4 Continued
Another example of this technique is used in the main theme of *Cuauhtli*, where two sets of stacked fourths move in oblique motion:

![Example 1.5 Cuauhtli, Graphic reduction of measures 43-66](image)

Using fourths alone to generate ideas, however, becomes increasingly challenging and can sometimes feel very limiting. The necessity for a scale is evident in certain forms such as the passacaglia, where a repeated harmonic pattern provides a base for adding melodic motions that accumulate pitches as the piece develops. In *Cuauhtli*, I turned to the octatonic scale to create a passacaglia that constitutes the ending. This choice in part was due to the fact that I did not know of any other system that could accommodate fourths at that time. However, the idea of a scale that could accommodate fourths or fifths in a different way, or that could escape the octave barrier had not yet crossed my mind; I was trapped in the axiom that scalar structures repeat at the octave. Although the practicality is undeniable, its limitations are as well. It was evident that I needed to find a new system of scalar order. It was only when I began to study Chinese history of Tuning that I was able to come up with a scalar structure of more than eight pitches.
CHAPTER 2: ORIGINS OF POLYTONAL NON-OCTAVE COMPLEXES

Even though the idea of non-octave scales has existed since ancient times, it has been of little interest to contemporary music. The only scholar that I have found that has specifically written about it is Gordon Wilcox. In his “Fourth as a scalar option” he describes a scale where the fourth is the scalar step, thus covering a span of five octaves (before the starting pitch repeats), within which the composer can freely interpolate pitches between the scalar steps. Through the inclusion of these aggregated pitches, the quartal scale, he explains, can assimilate into its structure the widest variety of intervallic constituents, thus providing composers a scale with a versatility not possible within the octave species (143). However, in his “Macro-Intervals System: Core Repertory”, Wilcox only uses the tertian scale and ultimately applies octave equivalence, hence his goal was mainly to find twelve-tone chord progressions.

Example 2.1 Gordon Wilcox, a chord progression derived from a tertian macro-scale (p. X1)
The complexity of these scales only multiplies the number of approaches that a composer can have on them and any significant examination of these is beyond the scope of this document. I will from now on only focus on how I have derived them and approached them in my compositions, which to my understanding so far, has more differences than similarities than most of the previous scale theories. Before starting a discussion on these approaches, I would like to explain methods and origins of what I call “Polytonal Non-Octave Complexes” (PTNOC).

The system for deriving PTNOC is an adaptation of Chinese philosophies and tuning systems to create scales that go beyond the range of an octave. In the History of China, Music and tuning played an important role in religion and politics. Precisely tuned bells were cast in China since the 5th century BC as it established a standard in the measurement of grains. For this they used a Chung vessel which was essentially an upright clapper-less bell. The capacity of the bell would then form a measurement of grains. Thus two bells of the same pitch would contain approximately the same number of grains, with sufficient accuracy, to be considered equal. The pitch of a bell in one city could be replicated by using a seven-foot long string tuner (chün). This monochord had a moveable bridge that could then be set to match the pitch of the bell. The length and tension of the string would be measured, and then a bell in another city could be cast to match the exact pitch of the chün. In this manner the empire was able to maintain control over the population; for if there was no standard form of measurement, chaos would make its way in trading, taxation and the stability of the empire (Needham/Robinson, 199).
Another standard was the lülü, the Chinese twelve-pitch system. In this system 11 pitches are derived from the Huang Chung, or starting pitch. The exact pitch or frequency of the Huang Chung was decided by the dynasty in power, and most often it would change from dynasty to dynasty. The lülü was favored as the official pitch system since it had a correlation with the solar calendar.\(^1\)

In the lülü, the term, Qing Huang Chung, is used to denominate the thirteenth pitch that is derived from their fifth-based tuning. This provides evidence of the fact that they were fully aware that the thirteenth pitch is not equivalent to the octave above Huang Chun.\(^2\) However, official and religious music preferred the natural imperfection and regarded it as aesthetically pleasing as it was more connected to the Cosmos.

Furthermore, stringed instruments, which naturally produce perfect octaves, were banned from religious ceremonies as they did not convey the sound of the cosmos. Thus, a mathematical solution was sought by very few scholars as there is a gap of 17 centuries between the first approach to a solution and a refined version.

Even though the octave ratio was not used in religious music, the problems that are derived from the Pythagorean tuning, were dealt with in an entirely different manner. The main problem arises when a pentatonic scale is constructed on any other pitch other than Huang Chung using only the twelve pitches of the lülü. Because the intervals will be different on each key, especially in the latter pitches of the lülü, the difference will be enough to sound out of tune. The most common solution was to derive a specific set

\(^1\)-In the Chinese calendar each month has a corresponding pitch, Huang Chung being November or the starting month.

\(^2\)-Today this difference in pitch is commonly known as the Pythagorean comma, and consists of a twenty-four cent difference between the perfect octave above the starting pitch and the thirteenth operation of the fifth-based tuning. Equal temperament is essentially the distribution of those “extra” 24 cents (23.948 to be exact) among the twelve pitches. Thus, by reducing each fifth by two cents, the thirteenth pitch will result in being exactly one octave above the starting pitch, thus a ratio of 2:1.
of pitches (usually five) for each pitch of the lülı. The earliest example of this approach to tuning can be found in the Zian Zhong Bells. This set of bells, that dates back to the fifth century BC, consists of 45 bells that produce 90 pitches. This is because they have the unique property of producing two different pitches depending on where they are struck, creating an interval of mostly thirds and sixths. The bells are divided into 6 groups of bells, each containing a set of bells in a particular range. As an ensemble, the bells cover a five-octave span. The age of these instruments makes it difficult to know exactly what method of tuning was used. The irregularities in the pitches produced could have different explanations: one, that it could have followed a particular tuning style of the region, or two, that decay due to time could have altered the pitch. However, the disposition of the bells and the way it is organized suggest that the set provided the performers different modes or keys to choose from (Mingyue, p.72).

Using a similar concept, in 45 B.C. Ching Fang devised a sixty-pitched tuning system. His method consisted of deriving 5 pitches to every pitch of the lülı, thus deriving a pentatonic scale starting on any particular pitch of the lülı (12x5 = 60). In his essay “Prince Chu Tsai-Yü’s Life and Work: a Re-evaluation of His Contribution to Equal Temperament Theory”, Kuttner points out, that by choosing 12 pitches from this set, the mean deviation of the lülı is reduced to 4.3 cents. He further explains that Chi’en Lo-chih (fl. 414-455) expanded these calculations to 360, which reduce the mean deviation to 1.845 cents, beyond human perception. It is not the goal of this essay to explore the intentions of Ching Fang or Chi’en Lo-chih (173). Naturally Western scholars will view their theories and contextualize them to their octave-based mind set.
What is being explored, however, is not only how different approaches can lead to similar results, but how different approaches can be combined to create new outcomes.

In instruments such as the piano, avoiding equal temperament is highly impractical and in most cases out of the question. By adapting the different Chinese tuning methods, and specifically Ching Fang’s method of tuning, scales that do not rely on the octave or \( T_{12} \) as a repetition factor can be constructed within an equal-tempered system. A series of twelve perfect fourths will result in a twelve-tone row across the span of 4 octaves. Similarly, twelve fifths will result in a twelve-tone row across the span of seven octaves. If these intervals are taken as points of scalar repetition, and five or six pitches are derived from these using the traditional method of deriving pitches, the results are scales that surpass the span of one octave. A scale based on the fourth as a factor of repetition (\( T_5 \)) will cover a span of four octaves and a scale based on the fifth as a factor of repetition (\( T_7 \)), will occupy a span of seven octaves.

In “Bells of Silk and Wood” this adapted system is used to generate a 36 pitched scale that is used diatonically in its entirety. The following formula is applied starting at Db. Six pitches are derived with a factor of repletion applied to the fifth (\( T_7 \)) of the starting pitch, and instead of deriving only five pitches, as Ching Fang did, I derived six resulting in the following formula:

\[
\begin{align*}
x &= 2:3 \\
y &= 4:3 \\
X &= xyxyx \\
\text{Thus} \\
C4(X) &= \text{[music notation]}
\end{align*}
\]
Applying this formula to the fifth \((T_7)\) we get the following:

\[
T_7(X) = 
\text{Db1}X, \text{Ab1}X, \text{Eb2}X, \text{Bb2}X, \text{F3}X, \text{C4}X, \text{G4}X, \text{D5}X, \text{A5}X, \text{E6}X, \text{B6}X
\]

The formula \(X=xyxyx\) can be found in the ostinato for the second movement of “Bells of Silk and wood”, which was the first piece written for this suite, and my first approach to PTNOC. The closing passage of the second movement follows this formula starting at G4:

\[\text{Example 2.2 Bells of silk and wood, closing passage}\]

In using \(T_7\) as a factor for repetition, 3 of the pitches derived from \(X\) will overlap to both adjacent \(X\) derived pitches. Thus using \(T_7^2\) as a factor of repetition will result in the same pitch collection as using \(T_7\) as a factor of repetition:

\[\text{Example 2.3 Complex derived from } T_7(X), X=xyxyx\]
As the reader may note Ching Fang’s calculations result in sixty distinct frequencies whereas in a well-tempered system these differences are eliminated, thus creating overlapping pitches and reducing the complex to 36 pitches (12x3). In strictly applying Ching’s Fang method of 12x5, we can reduce X by one operation to X=xyxy would again have the same resulting scalar complex as in Example 2.3.

**Example 2.4** Complex derived from T\(_7\) (X), X=xyxy

Using T\(_5\) as a factor of repetition, however, the overlapping pitches do not align as neatly and an additional pitch is added to the scale making this version a significantly more densely pitched scale, and significantly closer to the chromatic scale. However, unlike the chromatic scale, the use of the formula X, empowers it with tonal regions, which is the subject of part III of this document. Furthermore, the formula variants applied using T7 as factor of repetition, can also be applied to the T5 variation, having more varied results.
Example 2.5 Complex derived from $T_5$ (X), $X=xyxyx$

Through a shortening $X$ to only $xyxy$, a simplified scale can be derived:

Example 2.6 Complex derived from $T_5$ (X), $X=xyxy$

In noting that this particular version has a smooth almost major-like quality, a similar version can be derived with $T_7$. In doing this, $X$ must be expanded to $xyxyxy$, which will engender a Lydian mode. This suggests that modal procedures can be applied to these scalar complexes in such a way that any set of the resulting pitches of $X$ can be perceived as a tonic, thus allowing the use of all modes that we know (Aeolian, Dorian, Phrygian etc.) within any kind of PTNOC. In the second movement of “Sonada”, this next scalar complex was used in Aeolian mode:
Example 2.7 Complex derived from $T_7 (X)$, $X=xyxyxy$

In some works such as “Bells of Silk and Wood”, “Uqbar Overture” and “Coatl”, these scales are used almost entirely in a diatonic manner and are limited to one form of the scale. Other works such as “Sonada”, and “Four Aquarelles and an Oil Painting”, incorporate several forms of the scale, moving freely from one version to another, as well as incorporating non-scalar pitches.

Not only do these complexes afford a wider variety of intervallic constituents than the octave-based scale, but through them, I have also been able to apply the basic concepts that I used in my earlier works. Using stacked fourths in the $T_5$ version, for example, is particularly comfortable as each pitch has a perfect fourth above it that belongs to the greater scalar collection. Furthermore these scales have permitted me to use thirds in a more systematic way without necessarily being strapped to the past.

However, PTNOC represents only the departing point to a seemingly infinite number of approaches. The following parts of this document will be devoted to the compositional techniques I have developed through the use of these scalar complexes. I
have structured the following section of this document according to the three basic principles I have found to be unique in PTNOC and which will supply for the titles set forth in the following parts of this document: “Tonal Regions”, “Verticalization of PTNOC as a Harmonic Generator”, and “Tonal Direction as a Source for Musical Form in PTNOC”.
CHAPTER 3: TONAL REGIONS

One of the key principles behind PTNOC is the way pitches are laid out throughout its entire range. Because of this organized simultaneity of keys, the set of pitches used will vary on the register used by the composer. This regional set of pitches is what I refer to as tonal regions as illustrated in the following example:

Example 3.1 Tonal Regions of T7 (X), X=xyxyx

The second movement of “Bells Of Silk and Wood” consists of what can amount to one long phrase group cast in a sentence structure, and includes an “extra” closing phrase. Each phrase consists of three different overlapping voices, which, in dialogue, form each sub phrase. The sentence structure is conformed by the proportions 3:3:9:(9).
There are four basic voices to this movement and each one moves around a specific register. The right hand of the piano has an ostinato based on the above-mentioned formula X as a harmonic background and the other three remaining voices take up the melodic aspects of the piece. First, the left hand of the piano articulates a three-note motive, outlining a tonal region of G minor, which is then answered in G major by the erhu and finally echoed in A major in the upper register of the piano.

Example 3.2 *Bells of Silk and Wood*, second movement

Continued
Example 3.2 Continued

The overlapping of X in $T_7$, even though it might seem redundant and unnecessary, provides the composer with new guides for solving compositional problems. Such is the case for the main theme of the second movement of “Coatl”. This theme is created by using two voices, moving in parallel motion, each of them using a different set of pitches from a particular region; thus, the middle C is used only by the upper voice while middle C# is only used by the lower voice.

Example 3.3 Coatl, second movement
CHAPTER 4: VERTICALIZATION OF PTNOC AS A HARMONIC GENERATOR

PTNOC affords the creation of new harmonic structures that are register dependant. The principle that differentiates this system from modulo twelve is that modulo twelve reduces compound intervals through octave displacement. Thus the interval formed between the pitches A1-B♭5, will be regarded the same as A5-B♭5. However, these two intervals have a completely different character and level of dissonance because the fundamental pitches of A1 and B♭5 are separated by a large gap. The latter pitch behaves almost as a frequency component of the former, while in the second interval, because their fundamental frequencies are in the same range, their pitches do not fuse as well and clash creating a notable agitated beat. While this clash can be debated, there is an undeniable difference between a minor second and a minor 37th.

It could also be argued that in the frequency components of any pitch played on a traditional instrument, the octave will have a strong presence, or that two pitches separated by an octave have a similar color-identity. While indeed I have used octave doublings for orchestration purposes, I will remind the reader that the purpose of these scales is to provide a structural order of pitches that provides the composer with a tool for melodic and harmonic development. This particular behavior of sound invites the composer to harmonies spread out throughout the frequency spectrum.
In the third movement of “Bells of Silk and Wood”, this spreading out of dissonant intervals is evident from the opening phrase. In measure four the pitch collection C-C#-D-Eb-E-F-F# can be heard simultaneously; however, because they are spread out through a five octave range, using PTNOC as a guide, their coexistence is much more harmonious than if they would be played within the same octave.

Example 4.1 Bells of Silk and Wood, third movement

Another example of these register dependant harmonies can be found in the second movement of “Sonada”. In this movement, the minor second B-Bb, Eb-E, F#-G, are all separated by at least two octaves. As mentioned before this movement includes a great deal of non-scalar pitches. However, the scale provides a harmonic foundation that is kept throughout the entire piece.
Example 4.2 *Sonada*, second movement. Pitch collections

A slightly different approach can be found in the fourth movement of "Coatl", where the dissonant intervals are removed and only the pitches contained in an F Lydian scale are used.

However, because certain pitches of this scale are not available in the PTNOC used for this movement, octave displacements are used in order to fulfill the continuity of the scale. In this manner a simple up and down scale using only white notes, acquires a new dimension and with it brings interests (and technical challenge to the performer) to an otherwise uninteresting line.
Example 4.3 *Coatl*, fourth movement

Furthermore, the addition of dissonances in the higher register helps push the movement to its climax.

![Music notation]

Example 4.4 *Coatl*, fourth movement

This use of register opening to bring dissonance to the music can be very useful in the creation of direction in form, and is the subject of the next chapter.
CHAPTER 5: TONAL DIRECTION AS SOURCE FOR MUSICAL FORM IN PTNOC

Because of the multiple tonal regions within a PTNOC, as the music changes register, the pitch content will change. Thus, when two voices are in the same region, their resulting harmony will be that of consonance and as the voices move apart in register the harmonies become more dissonant. This idea involving motion from register to register can become a device for structuring a phrase, a section or an entire movement.

In the third movement of “Bells of Silk and Wood”, this concept is the driving force of the whole movement. This motion can be seen in the graph representing the piano part. The movement starts in the middle range expanding a ninth from G3 to A4. As the movement progresses the range expands in both directions opening to almost three octaves in range. This motion provides direction as the movement progresses from consonance to dissonance, which is also reflected in the dynamics of the piece.

Example 5.1 Bells of Silk and Wood, third movement graphic reduction
A similar and even more pronounced widening of register can be found in “Two Dancing Butterflies” from the suite “Four Aquarelles and an Oil Painting”, where this characteristic becomes the underlying structure for the movement. Upon a repeated D ostinato played by the right hand of the piano, a motive, played by both the flute and the piano is transformed each time with a wider range. The first time, the motive outlines a major second, and is echoed by a minor version of the same. This process continues opening the motive to first a fourth, then a sixth and ultimately a minor seventh. At this point, the range explodes to a span of more than three octaves (mm29-29) as the opening phrase comes to a “cadential” gesture (mm. 33-37).

Example 5.2 “Four Aquarelles and an Oil Painting”, graphic reduction of “Two dancing butterflies”

This motion of register does not necessarily have to be from the center out, but can be from the bottom to the top or vice versa. These kinds of motions can be found in the first and the third movement of “Coatl”. The third movement begins with a two-note motive outlining a major second in the upper register. As the movement develops, pitches in a lower register are interpolated between the two high pitches, again, opening the register and moving towards more dissonant harmonies, but this time from the top to the bottom.
Example 5.3 *Coatl*, graphic reduction of third movement
CONCLUSIONS

Repetition has always been a key component in music composition throughout history. With repetition, the idea of contrast and surprise is embraced and becomes part of the compositional craft of achieving a balance between repetition, variation and conflict. The repetition of an idea or motive along with its balancing elements, create a consistency with which the listener can construct or decipher the meaning or intentions of the composer. In twelve-tone music the repetition or transformation of a series is what drives the underlying logic and ultimately the coherence of a particular piece. Thus finding ways to repeat underlying concepts to make them coherent to the listener is a challenge that every composer faces and ultimately dictates the stylistic traits of the composition itself.

In PTNOC, not only the idea of motivic development can be incorporated, but also, because these scalar complexes rely on repetitions of logical patterns, their intrinsic structures and natural placement of dissonant intervals provide a more accessible setting for complex harmonies to be developed. Furthermore, they emancipate the creation of harmonies and pitch structures from the limitations of octave equivalence, which, although provides a practical understanding of tonality, has governed a music theory that has focused on non-tonal languages over the past century. In this manner, the non-reductive nature of PTNOC offers a more phenomena-oriented backbone to the
compositional problems modern composers face, without necessarily turning its back on the glorious past that music has had.
BIBLIOGRAPHY


Wilcox, Gordon A. Perfect Fourth as a Scalar Option. Perspectives of New Music, Vol 5, No. 2 (Spring-Summer, 1967), pp. 141-145

Wilcox, Gordon A. Macro-Interval System: Core Repertory. Buffalo : Latko Pritning and Copying Centers, c 1977

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APPENDIX A
SCORES CORRESPONDING TO THE GRAPHIC REDUCTIONS
Example A.1 *Cuauhtli*, measures 43-67
Example A.1 Continued
Example A.1 Continued
Example A.2 *Sonada*, second movement

Continued
Example A.2 Continued

Example A.3 *Bells of Silk and Wood*, fourth movement

Continued
Example A.3 Continued
Example A.3 Continued

Example A.4 “Four Aquarelles and an Oil Painting”, “Two Dancing Butterflies”
Example A.4 Continued
Example A.5 *Coatl*, third movement
Example A.5 Continued