Pangenesis for Piano and Orchestra

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UNIVERSITY OF MIAMI

PANGENESIS FOR PIANO AND ORCHESTRA

By
Daniel Manoiu

A DOCTORAL ESSAY

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

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UNIVERSITY OF MIAMI

A doctoral essay submitted in partial fulfillment of the requirements for the degree of Doctor of Musical Arts

PANGENESIS FOR PIANO AND ORCHESTRA

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_Pangenesis_ is a composition for piano and orchestra in two movements that was created using several conceptual ideas: multi-layered horizontal pitch organization, additive and subtractive rhythmic processes, expanding and contracting formal structures and the piano as a solo instrument as opposed to the piano as part of the ensemble. The two movements of the work, named _Part I_ and _Part II_ are both composed using these ideas, but the manner in which they are presented and applied is distinctive for each movement. Some of the development processes used in the piece are related to Gregor Johann Mendel's genetic inheritance model, that resulted from experimental hybridization in plants. Using this model as a reference, a compositional process is used to develop horizontal pitch distribution using pitch class sets, along with aspects of the rhythm and form. Stylistically, _Pangenesis_ incorporates both Western and Eastern 20th century musical traditions and philosophies, which are meant to affect the audience’s perception of time through static and active musical discourse.
ACKNOWLEDGEMENTS

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CHAPTER 1

COMPOSITIONAL DIRECTION

The idea to write *Pangenesis* started after performing my *Sonata* for Piano (Opus 1, 2003) in 2012. I realized that throughout the first decade as a composer, even though certain stylistic traits have remained consistent, most aspects of music composition and performance have greatly evolved. While compiling a list of works, it appears that while my composition portfolio is that of a relatively prolific composer, most of my music involves the piano (Table 1.1). The only works that do not have the piano present are: *Dutchkovitch* for solo trumpet, *Fretful* for symphonic orchestra and the *String Quartet*. Realizing this, I felt that rather than avoiding the piano for this piece, I should concentrate on perfecting my piano writing and give more consideration to the performance practice, along with the compositional processes.

The audience’s response to my music has generally been mixed, and when performing the piece *Vitreous* for piano and orchestra in 2007 in Romania at the National University of Music of Bucharest to great public acclaim, the positive feedback received inspired me to compose a new work in the genre. *Pangenesis* is an attempt to improve on every single aspect of that composition and add a new piano and orchestra work to my repertoire as a performer, as well as a composer, representing a fitting culmination to my graduate school career.
Table 1.1: Compositions involving piano

<table>
<thead>
<tr>
<th>Solo Piano music</th>
<th>Chamber music involving piano</th>
</tr>
</thead>
<tbody>
<tr>
<td>-two <em>Sonatas</em></td>
<td>-three <em>Piano Trios</em> (including <em>Riot</em> for the Cleveland Orchestra workshop)</td>
</tr>
<tr>
<td>-two sets of <em>Variations</em></td>
<td>- <em>Sarcasm</em> for piano and trombone</td>
</tr>
<tr>
<td>-three Suites <em>(5 Pieces, Mizerii, Evenimente)</em></td>
<td>- <em>Cell Phone Duo</em> for piano and flute</td>
</tr>
<tr>
<td>-four Etudes: 3 <em>Etudes of Rhythm and Synchronization</em></td>
<td>- <em>That Nettlesome Enlightening Clock</em> for piano and viola</td>
</tr>
<tr>
<td>and <em>Vasile cel Napraznique</em></td>
<td>- <em>XPercussions</em> for piano and percussion</td>
</tr>
<tr>
<td></td>
<td>- <em>Varademaine</em> for piano quintet</td>
</tr>
<tr>
<td></td>
<td>- <em>Sarmisegetuza</em> for chamber octet</td>
</tr>
<tr>
<td></td>
<td>- <em>MacAttire</em> for chamber orchestra</td>
</tr>
</tbody>
</table>

Although interest in pitch and rhythmic cell development through additive and subtracting processes is evident through most of my undergraduate and graduate works, its inclusion in *Pangenesis* is complemented by more detailed performance indications and subtle developments in the orchestration, thus making it a much more mature and interesting piece to listen to, as well as to perform. The adaptation of extra musical sources, such as Mendel's genetic inheritance laws, and their relation to music development has been a personal interest interest for the last two years, and I believe that a musically satisfactory result is finally achieved from its use in *Pangenesis*. The variety of compound timbres, orchestral textures and interactions between the soloist and the ensemble are the main features of my work, which will hopefully signify an important contribution to the piano and orchestra new music repertoire.
CHAPTER 2

INFLUENCES AND CONCEPTS

Stylistic Influences

Stylistically, *Pangenesis* is mainly inspired by the music of György Ligeti, Charles Ives and Joji Yuasa. Each composer has a style that is significantly different from the other; however, their collective influence is present in my own compositional style.

**György Ligeti** is one of the composers that influenced my work during most of my undergraduate and graduate career. It is perhaps a consequence of the fact Ligeti was born in Transylvania, a region of my country with a significant Hungarian minority. Ligeti began his music studies in Cluj, the largest and most important cultural city in the region and the city where I had my orchestra debut, performing Bartok’s *Rhapsody* Op.1 with the Transylvania Philharmonic. He then moved to Budapest, and ultimately to Vienna. His contribution to music, especially his use of texturalism, sound mass and development based on various mathematical processes\(^1\) has helped me develop a personal system of writing music during the last six years. This system is based on several composition tools:

1. expanding and contracting processes and textures

2. minimal interval content determining the harmonic and melodic elements

3. several layers of different pulse-based rhythm or polyrhythms

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In the majority of my recent works the focus has been on using a limited selection of
interval classes to create the harmonic and melodic systems (usually IC 1 and 3 – minor
second and minor third respectively). I was struck by the quality of music Ligeti achieved
in his Musica Ricercatta for piano, while limiting himself to just an interval per
movement. In Panggenesis a similar approach of limited interval content is followed.
While recently involved in a film scoring project, I was also influenced by director
Stanley Kubrik's use of Ligeti's Musica Ricercata in the film Eyes Wide Shut, and some
rhythmic and melodic material from my own film music is used and developed in
Panggenesis. Furthermore, upon studying Ligeti's chamber music and performing one of
his piano etudes, I developed an interest in mechanistic rhythmic processes in both
diatonic and chromatic contexts. Ligeti's sources for musical material, such as African
polyrhythms, gamelan, western Romantic piano music, Eastern European folklore, Bela
Bartok and even some popular music all blend together in a style that relates to my own
approach as a composer. Ligeti’s concept of pulse as a "musical atom", an indivisible
unit, is present throughout sections of both movements of Panggenesis, and the additive
rhythmic processes inspired by Romanian folk music are similar to minimalist music
techniques such as phase-shifting (Example 2.1).

Example 2.1 Minimalist elements in Ligeti’s Continuum (left) and Panggenesis (right)

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The music of Charles Ives has always been interesting to me as it is distinctively "American", yet it includes many 20th century experimental techniques such as clusters, indeterminacy and quarter tones. When writing the piece Trei as a commission for the New World Symphony - Charles Ives Festival in 2009, research revealed that Ives not only uses polytonality/polymodality and polyrhythms, but takes it a step further into polytextures mixed with musical quotes. For example, Ives might write a faint choral hymn in the background that is to be heard simultaneously with a rhythmically independent, contrasting foreground texture. Inspired by these juxtapositions, polychords and polyrhythms are used in the first movement of Pangenesis, as well as groups of chamber instruments independent from each other that interact to create a compound orchestral sound. Diatonic and chromatic quartal harmonies evolve to clusters, and there are two layers spanning large registers, as in Ives' Concord Sonata (Example 2.2). The performer indeterminacy featured in the second movement of Pangenesis is influenced by Ives' free phrasings and improvised portions of his piano sonata³.

Example 2.2 Pangenesis piano part influenced by Ives’ music

³ B. Hermann, Charles Ives (Trend, 1932)
Joji Yuasa is a Japanese composer that currently resides in San Diego, California. Along with Japanese folklore, his work is also based on the idea of a different perception of time, specific to the philosophies of the Far East. Joji Yuasa described his approach to space and time in his works during one of his lectures:

I've been composing music in between two polarities - namely, universality and individuality. The work based on the former – universality - expresses my interest in spatial temporal structure. Such a point of view holds that music is an entity of transition of sonic energy on a time axis.\(^4\)

From Yuasa’s statements and his music, it appears that his approach to the temporal aspect of his works is based on creating a “time axis” that obscures clock time. As a result, his music is based on a unique time flow that corresponds to the events in the music itself. Far Eastern inspired philosophy of the perception of time in music is also a strong influence on the meditative sections of my music. In contrast to the mechanistic rhythmic sections, in both first and second movements of *Pangenesis*, I aim to deviate from the linear perception of a time line to a spherical interpretation of time, where the unfolding of musical events is perceived differently by each individual listener, rather than as a collective.

The composition that has greatly inspired the pianistic writing in my compositions is *Cosmos Haptic II: Transfiguration*, where Yuasa explores predominantly static material, while featuring sudden explosions of sound across wide registers to great dramatic

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effect. It is one of the few works that has challenged me to think beyond the mechanics occurring as the music is developed, and rather on the auditory experience itself. The audience's perception of time was the main topic of my Master's Thesis composition *3 Ticks 200 Times and Capriccio* at the Florida International University, and in *Pangenesis* this concept is used to develop timbral elements within the space-time dimension of the work.

### Musical Interpretation of Mendel’s Laws

A future project that I would like to pursue consists in documenting a music development system, using patterns and proportions from current genetic inheritance models, and as a preliminary experiment, some aspects of my work *Pangenesis* are related to Gregor Johann Mendel's initial results from his published work in 1866.

The first law of genetic inheritance, as documented by Mendel after his experiments, is the Law of Segregation. Each parent possesses a pair of forms of each transmittable trait (called alleles), of which only one is passed on to the offspring. However, the offspring will have their own pairs of alleles for that trait. Which one is dominant and which one is recessive will determine how the inherited trait will be expressed. Using color as the observed transmittable trait, Mendel's achieved significant results while observing generations of plants that are both self-pollinating, as well as cross-pollinating. In the example below (Figure 1), P represents the parent generation, and F1-4 represent

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6 G. Mendel, *Experiments in Plant Hybridization*, 1866
each consecutive generation of offspring. In the P generation, the lavender flower has AA dominant alleles, while the white flower has aa recessive alleles. All the F1 generation offspring will inherit Aa (one allele from each parent), but since the A is dominant, they will all be lavender. In the F2 generation, there will be four permutations of the alleles: Aa, AA, aA (all lavender because of the dominant A), and aa (which will be white, as the dominant A is missing).

Figure 2.1 Mendel's Law of Segregation

Mendel's second law, the Law of Independent Assortment states that different traits are inherited independently from parents to offspring, while each individual trait follows the first Law of Segregation. More recently, it has been discovered that certain

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traits are actually connected through the generations (Laird, Lange: 2011), so this law is not always true.

In my interpretation of the inheritance laws as they relate to music, the "traits" would be associated with the various parameters of sound. Example 2.3 shows a preliminary plan for the evolution of the primary two motives throughout two consecutive generations in the second movement of *Pangenesis*. The parameters considered are: horizontal pitch distribution (intervals) and rhythmic cells (Example 2.3).

Example 2.3 Preliminary motivic development plan related to Mendel’s law

The initial two motives of the P (parent) generation appear in the string section, performed by the first and second violins, respectively. As the musical parameters observed here are melody and rhythm, we can identify the following characteristics:
Motive 1 is built using interval classes 1 and 3 (with corresponding inversions), and the rhythmic idea is based on 16\textsuperscript{th} notes in groups of four and five; Motive 2 is built using interval class 6 and 1, and the rhythmic idea is based on a half note and two quarter notes. Motive 1 can be considered as the "parent" that possesses the dominant alleles of melody and rhythm – therefore, in the F\textsubscript{1} generation, both Motives are more directly related to it rather than to Motive 2. However, the recessive interval class 6 does make subtle appearances in both Motives 3 and 4 (red), while the eighth note in Motive 4 disrupts the 16\textsuperscript{th} note pulse as a throwback to the longer durations of Motive 2. In the four motives of generation F\textsubscript{2}, the recessive alleles make a stronger comeback – In Motive 8 the same half note from Motive 2 returns on the same pitch (green), and interval classes 1 (blue), 3 and 6 are all represented based on the ratios of Mendel's the Law of Segregation. Similar processes are used throughout the work.

**Orchestra as a Unit and Chamber Ensembles Within**

*Pangenesis* is written for piano and full symphonic orchestra, and the ensemble includes the following sections:

<table>
<thead>
<tr>
<th>Woodwinds</th>
<th>Brass</th>
<th>Percussion</th>
<th>Strings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Piccolo</td>
<td>4 Horns in F</td>
<td>Cymbal</td>
<td>Violin 1</td>
</tr>
<tr>
<td>2 Flutes</td>
<td>2 Trumpets in C</td>
<td>Glockenspiel</td>
<td>Violin 2</td>
</tr>
<tr>
<td>2 Oboes</td>
<td>2 Trombones</td>
<td>Vibraphone</td>
<td>Viola</td>
</tr>
<tr>
<td>2 Clarinets</td>
<td>1 Tuba</td>
<td>Triangle</td>
<td>Cello</td>
</tr>
<tr>
<td>1 Bassoon</td>
<td></td>
<td>Bass Drum</td>
<td>Contrabass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Timpani</td>
<td></td>
</tr>
</tbody>
</table>
As an ensemble, the orchestra can produce many timbres. Not only the different sections of the orchestra—winds, percussion and strings—have different timbres from each other, but also each instrument is capable of many variations on the sounds it can produce. An example of this would be the string instruments: individually, each instrument can bowed, plucked, played on the bridge, etc. As a group, the strings can provide background for other instruments and can be the leading voice of the orchestra. Studying orchestration techniques used by composers from all eras of music history has taught me about many ways of using creative instrument pairings to generate unique timbral effects. By experimenting with orchestras during reading sessions or performances of my works, an affinity for certain compound timbres created by very specific instrument pairings developed. I interpret these compound timbres on two levels: basic (groups of two or three instrument classes) and advanced (groups of four or more instrument groups).

The work is not intended to be a concerto per se, but rather a piece where the pianist can have a soloist role, as well as being a part of compound timbres within the orchestra. As with several of my previous large ensemble works, a principal interest is in how smaller chamber groups can interact within a larger context. For example, [2 flutes, 1 bassoon and cellos] performing a similar melodic line and interacting with [Violin1 divisi, Contrabass, Vibraphone] performing a counterpoint line (Figure 2.2). I use a similar type of development based on Mendel's inheritance laws to determine how these smaller ensembles react to each other within the large orchestral work:
The orchestration progression from Figure 2 represents my design for the first section of the second movement of *Pangenesis*. In the section based on the **P** generation, melodic line 1 and its counterpoint are performed by the instrument groups on the left, while the second melodic line and its counterpoint are performed by the instrument groups on the right. In the **F1** section, all three groups are largely based on the left group of the **P** section, with the exception of the introduction of the glockenspiel, piccolo and 2\textsuperscript{nd} Violins. In section **F2**, the additive process in the melodic, harmonic and rhythmic material is also reflected in the orchestration, and the instruments from the right group of **P** are re-introduced and expanded.
Perception of Time in Music

Through the study of time in music, cognitive psychologists have concluded that each individual listener perceives the passage of time differently. This individual perception or subjective time is distinguished from absolute or clock time. The duration of a piece in retrospect is usually not perceived in the same way as the duration of the piece in real time, which means that often the subjective time is more important than the absolute time when listening to music. The way time is interpreted by the listener can be influenced by many factors, of which boredom or high level of excitement are two. When a piece seems longer than its clock duration, the listener is often bored and he/she expects an ending. Since the ending does not arrive soon enough, the perception of the listener is that time passes slowly and tediously. A high level of interest in the piece or in the performer’s virtuosity, on the other hand, can make it seem that the music ended sooner than the listener expected.

Even if two pieces have the same clock duration, or even if two listeners are hearing the same piece, the perception of subjective time for the bored listener will be different than that of the excited listener. Cognitive psychologists have accumulated evidence that filled intervals are perceived longer by some individuals than empty intervals of the same absolute time duration. This also relates to the division of musical meter. A series of experiments have provided evidence that metric subdivision results in a slower perception of subjective time, which can also be interpreted as an illusion of a slower

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tempo. This is a psychological technique that is explored in *Pangenesis* through techniques such as expanding and contrasting of orchestral textures and static vs. active layers in the instrumentation and the rhythm. Extreme register changes within sections of the orchestra may also have an effect on the audience’s perception of time. Although subjective time has been part of music listening during all eras of music history, many composers in the twentieth and twenty first centuries have explored these psychological effects, and *Pangenesis* represents my latest contribution to this endeavor.
CHAPTER 3

ANALYSIS

Formal Structures and Design

Both movements of Pangenesis have their own distinctive overall form, but they share some aspects of their structural development at a micro level. The first movement, Part I can be summarized as shown in the diagram in Figure 3.1:

Figure 3.1: First movement diagram

\[
\text{Introduction}\ldots\text{A}\ldots\text{B}\ldots\text{cadenza}\ldots\text{Coda}
\]
\[
i_1 \quad i_2 \quad a_1 \quad a_2 \quad b_1 \quad b_2 \quad c_1 \quad c_2
\]
\[
\text{mm.1-49} \quad \text{mm.50-91} \quad \text{mm.92-160} \quad \text{mm.161-190} \quad \text{mm.191-213}
\]

The Introduction can be divided into two subsections: \(i_1\) (measure 1 – measure 31) and \(i_2\) (measure 31-measure 49), which are structurally reminiscent of the Antecedent/Consequent classical period form. Subsection \(i_1\) begins with a piccolo solo that triggers an additive process of the woodwind and string sections, from measure 1 to measure 22 (Example 3.1.1). The triangle note following this unfolding texture prepares the piano entrance in measure 23. Accompanied by the strings and woodwinds, the piano completes its initial, “antecedent” statement in measure 31, marking the end of the \(i_1\) section.
Example 3.1 Additive process in the Introduction (i1) to Part 1 (mm. 1)

Example 3.2 Varied retrograde additive process in i2 (mm. 34)

Subsection i2 is a response and a variation on section i1. While the strings maintain the mid-register texture, the woodwinds engage in a second additive process that is both more rhythmically active and a retrograde of the process in section i1 (Example 3.2).
Percussion instruments are introduced in measure 32 (glockenspiel and vibraphone), to further increase the scope of the texture-based orchestral timbre. The second, “consequent” statement of the piano begins in measure 41 and ends in measure 49, concluding the introductory section of Part I.

In contrast to the Introduction, section A predominantly features mechanistic rhythmic patterns performed by the piano and accentuated by brass and timpani (Example 3.2.3). A can be divided into two subsections: a1 from measure 50 to measure 76, and a2 from measure 77 to measure 91. Subsection a1 begins in the very low register of the piano and gradually expands. While strings are not present at the beginning of a1, with the exception of a brief double bass tone, when they are introduced in measure 64, they add support to the accelerating rhythmic figuration of the piano part. The a2 subsection represents the first dynamic culmination of the piece, marked by a tutti in measure 76. A subtractive process concludes the A section, the only instruments remaining being the first and second violins in measure 88-91 (Example 3.3).

Example 3.3 Subtractive process at the end of section A (mm. 85)
Section B is organized in a similar way as the Antecedent/Consequent form of the Introduction, but also has some parallels with the climax in section A. It can be divided into two subsections: b1 from measure 92 to measure 123, and b2 from measure 124 to measure 160. Subsection b1 is predominantly set in the highest register between the flutes and the violins, until measure 112 when the piano enters with its “antecedent” statement in the extreme high and low registers (Example 3.4).

Example 3.4 Extreme registers in the piano part in b1 (mm. 112)

Subsection b2 represents the largest additive process of Part I, and it leads to the climax of the entire movement in measure 151. The “consequent” statement of the piano increases in rhythmic density and culminates at the tutti (Example 3.5). As a throwback to the Classical Concerto first movement, section B is followed by a piano Cadenza.
The Cadenza can also be divided into two subsections: c1 from measure 161 to measure 174, and c2 from measure 175 to measure 191. Subsection c1 is a piano solo, and material from the Introduction and B sections is developed. Subsection c2 is based on material from the A section, and the timpani accompanies the piano part.
The **Coda** is a synthesis of the material from all previous sections. It begins with an ascending process in the woodwinds and strings from the low to the high registers, leading to the conclusion of the movement (Example 3.6). Although *Part I* is not based on any one pitch center, there are rhythmic and melodic resemblances to cadences in the final measures.

Example 3.6 Ascending processes in the Coda: a) woodwinds; b) strings (mm. 194)

---

Important events within the formal structure of *Part I* are related to the Golden Ratio, as both climactic sections – at the end of A and the end of B - approximate the proportion
(Figure 3.2). The first movement is 213 measures long, and the initial climax ends in measure 82, while the additive process leading to the main climax begins in measure 133.

![Figure 3.2 Golden Ratio proportions in Part I](image)

Figure 3.2 Golden Ratio proportions in Part I

Although achieving these Golden Ratio relations was not a preliminary compositional goal, it represents a relevant post-analysis aspect of the formal structure of the movement.

An important observation is that there are some similarities to the classical Sonata form, used in traditional Concertos, such as two contrasting thematic groups, antecedent/consequent structures and the Cadenza, yet the lack of proportional Development and Recapitulation sections distance the formal structure of Part I from such a comparison.

The second movement of Pangenesis is organized as a set of three variations. This could also be compared to the classical Theme and Variations form, but in Part II there is no actual “Theme”. It more closely resembles Webern’s interpretation of the variation form as a suite of parts that are all based on similar ideas.\(^\text{10}\)

The overall form of Part II can be summarized using the following diagram (Figure 3.3):

Figure 3.3: Second movement diagram

Variation I ……………..Variation II……………..Variation III
A  interlude 1  A’                B  interlude 2  B’            cadenza   A’

mm. 214-265                   mm. 266-293                       mm.294-331

Variation I can be divided into three subsections: A from measure 214 to measure 236, Interlude 1 from measure 237 to measure 248, and A’ from measure 249 to measure 265. Subsection A begins with an additive process applied to dynamic levels and instrumentation until measure 229, which is followed by a subtractive process ending in measure 236. An important feature of the formal structure of the variation is the focus on the pitch A (or PC 9). There is a cyclical aspect to the A subsection, as the beginning and the end are both based on PC 9 (Example 3.7). There is also a strong pedal tone on the same pitch A that is present throughout most of the section.

Example 3.7 Beginning and ending of subsection a1 (mm. 214 and mm.236)
The **Interlude 1** subsection begins with the same additive process as in section **A**, but there are contrasting rhythmical ideas that differentiate it, such as in measure 243 where there is a chorale-style cadence reminiscent of Renaissance era madrigals. The pedal tone on A from the previous subsection is replaced by a different pedal tone on the pitch B (or PC 11). The transition to the **A’** section is done through a sudden *crescendo* in measures 247 and 248 that leads to the climax on the pitch A center in measure 249.

Subsection **A’** is strongly related to subsection **A** via the melodic and rhythmic material, though it also acts as a conclusion to Variation I. A subtractive process applied to pitch, rhythm and instrumentation is used to end the section predominantly on pitch A.

**Variation II** is distinctive, as it features aspects of performer indeterminacy in its structure. Certain sections of the orchestra are instructed to freely improvise on the pitches given, while there is still a strict meter present in the background (Example 3.8).

Example 3.8 Performer indeterminacy in Variation II (m.266)

The variation can be divided into three subsections: **B** from measure 266 to measure 274, **Interlude 2** from measure 275 to measure 284, and **B’** from measure 285 to measure 293. The entire second variation develops the material presented in the first variation in a
less restrictive setting. There is a static aspect to this section from a melodic, harmonic and instrumentation point of view that also greatly contrasts with the very active and dense first variation.

Similar to the conclusion of Part I of Pangenesis, Variation III – Finale is a synthesis of all the material presented in the composition. It can be divided into two subsections: Cadenza from measure 294 to measure 305 and A’ from measure 306 to measure 331. Initially, the Cadenza is shorter and more frantic than its counterpart in the first movement of the piece, but in measure 300, the pianist has the option to direct how the additive process leading to the last subsection will unfold (Example 3.9) If the pianist chooses to perform the main line, the conductor is instructed to cue in the brass section, while if the pianist chooses to perform the ossia line, the conductor is instructed to cue in the woodwinds. Once the repeat sign is reached in measure 305, the pianist repeats the initial choice, and the conductor cues in the missing parts.

Example 3.9 End of the piano Cadenza (mm. 300)
The final A” section is a varied return of the A’ in Variation I, that concludes the piece on PC 9, the absolute pitch center of Part II.

By analyzing the overall form of the two movements of Pangenesis, the conclusion is that although it is inspired by classical forms and idioms, there are modern features in the structural and the material development design.

**Horizontal pitch and Rhythm Distribution**

The pitch material in Pangenesis is mainly organized on a horizontal layer. Melodic lines have been prioritized in composing the work instead of harmonic structures. Intervallic content is limited throughout the entire piece to predominantly Interval Class 1 and 3 (IC1 and IC3), minor second and minor third, with their corresponding inversions. Other interval classes are present throughout the work, but with less frequency. In the **Introduction** section of Part I the predominant interval is IC1, used in a descending line as part of the additive process that creates the orchestral texture (Example 3.10).

![Example 3.10 Descending chromatic line in the first violin part (mm. 7)](image)

The same IC1 is used in ascending non-linear motion, along with IC3 in the first entrance of the piano in mm. 23 (Example 3.11)
The trill is a consistent feature of the entire Part I of Pangenesis, and it is also related to the IC1 melodic element, as all performers are required to perform the ornament with a half step. In measure 41, in the second part of the Introduction, IC1 is expanded through the use of the major seventh along with the minor second and ninth (Example 3.12).

The Introduction to Part I is set predominantly in the higher register of the piano and the orchestra, but there is a gradual descending motion that leads into the next section.

Below is a chart with the ranges of the entire ensemble in the Introduction, with the overall highest and lowest pitches in this section underlined.
Table 3.1: Instrumental range in Introduction (mm. 1-49)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Highest</th>
<th>Lowest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piccolo</td>
<td>a-flat6</td>
<td>f5</td>
</tr>
<tr>
<td>Flute1</td>
<td>e-flat6</td>
<td>f#4</td>
</tr>
<tr>
<td>Flute2</td>
<td>d6</td>
<td>f#4</td>
</tr>
<tr>
<td>Oboe</td>
<td>d6</td>
<td>g4</td>
</tr>
<tr>
<td>Clarinet</td>
<td>a-flat5</td>
<td>c#4</td>
</tr>
<tr>
<td>Bassoon</td>
<td>b3</td>
<td>g2</td>
</tr>
<tr>
<td>Horns in F</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Trumpet</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Trombone</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tuba</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Percussion</td>
<td>a-flat6</td>
<td>d-flat4</td>
</tr>
<tr>
<td>Piano</td>
<td>a-flat8</td>
<td>c#1</td>
</tr>
<tr>
<td>Violin1</td>
<td>b6</td>
<td>b3</td>
</tr>
<tr>
<td>Violin2</td>
<td>c6</td>
<td>g3</td>
</tr>
<tr>
<td>Viola</td>
<td>a4</td>
<td>c3</td>
</tr>
<tr>
<td>Cello</td>
<td>c#4</td>
<td>g2</td>
</tr>
<tr>
<td>Contrabass</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Rhythmically, the orchestral texture in the Introduction unfolds slowly in a steady ¾ meter, which does not change throughout Part I. The piano has melismatic ornaments on asymmetric divisions of the beat, but the underlying basic rhythm strictly adheres to the ¾ meter. Downbeats, with or without a pick-up are frequently emphasized with accents.

In the A section, the new rhythmic unison generates vertical harmonic sonorities, but the predominant horizontal lines are still based on IC1 and IC3. The section starts in the very low register of the piano, accompanied by brass and timpani, but as it reaches its
climactic point in measure 76 the range of the ensemble greatly expands. Observing the range of the orchestra in the A section, the result is that the piano is once again present in both extreme registers:

Table 3.2: Instrumental range in section A (mm. 50-91)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Highest</th>
<th>Lowest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piccolo</td>
<td>b5</td>
<td>e5</td>
</tr>
<tr>
<td>Flute1</td>
<td>f#5</td>
<td>b4</td>
</tr>
<tr>
<td>Flute2</td>
<td>b4</td>
<td>e4</td>
</tr>
<tr>
<td>Oboe</td>
<td>f#5</td>
<td>b4</td>
</tr>
<tr>
<td>Clarinet</td>
<td>b4</td>
<td>e4</td>
</tr>
<tr>
<td>Bassoon</td>
<td>b1</td>
<td>b1</td>
</tr>
<tr>
<td>Horns in F</td>
<td>b4</td>
<td>f3</td>
</tr>
<tr>
<td>Trumpet</td>
<td>b5</td>
<td>g4</td>
</tr>
<tr>
<td>Trombone</td>
<td>g#3</td>
<td>g#2</td>
</tr>
<tr>
<td>Tuba</td>
<td>f#2</td>
<td>b1</td>
</tr>
<tr>
<td>Percussion</td>
<td>g2</td>
<td>no pitch BD</td>
</tr>
<tr>
<td>Piano</td>
<td>b6</td>
<td>a0</td>
</tr>
<tr>
<td>Violin1</td>
<td>b6</td>
<td>b3</td>
</tr>
<tr>
<td>Violin2</td>
<td>c6</td>
<td>g3</td>
</tr>
<tr>
<td>Viola</td>
<td>a4</td>
<td>c3</td>
</tr>
<tr>
<td>Cello</td>
<td>c#4</td>
<td>g2</td>
</tr>
<tr>
<td>Contrabass</td>
<td>d2</td>
<td>e1</td>
</tr>
</tbody>
</table>

Section A is mechanistic and very precise. Like in the Introduction, downbeats are emphasized even stronger with accents and \textit{sfz} markings. The dotted rhythm motive first played in the piece by the timpani in measure 50 becomes prevalent throughout the rest of the work, including in the three Variations of Part II (Example 3.13)
Example 3.13 Rhythmic timpani motive (mm. 56)

In section B, melodic material is still based on IC 1 and IC3, and there is a reference to the flute’s high register passage from the beginning of the Introduction. The piano enters in great contrast to the rest of the orchestral ensemble; as opposed to the previous two sections, where it spanned the entire range of the keyboard through descending and ascending processes, it now has dense, dynamically intense chords simultaneously in both extreme registers:

Table 3.3: Instrumental range in section B (mm. 92-160)

<table>
<thead>
<tr>
<th></th>
<th>Highest</th>
<th>Lowest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piccolo</td>
<td>c#7</td>
<td>d6</td>
</tr>
<tr>
<td>Flute1</td>
<td>g6</td>
<td>b4</td>
</tr>
<tr>
<td>Flute2</td>
<td>e-flat5</td>
<td>g4</td>
</tr>
<tr>
<td>Oboe</td>
<td>a5</td>
<td>g4</td>
</tr>
<tr>
<td>Clarinet</td>
<td>c5</td>
<td>f2</td>
</tr>
<tr>
<td>Bassoon</td>
<td>g3</td>
<td>b1</td>
</tr>
<tr>
<td>Horns in F</td>
<td>b4</td>
<td>b3</td>
</tr>
<tr>
<td>Trumpet</td>
<td>c#5</td>
<td>c#5</td>
</tr>
<tr>
<td>Trombone</td>
<td>f3</td>
<td>e2</td>
</tr>
<tr>
<td>Tuba</td>
<td>g2</td>
<td>b1</td>
</tr>
<tr>
<td>Percussion</td>
<td>g2</td>
<td>d2</td>
</tr>
<tr>
<td>Piano</td>
<td>a-flat8</td>
<td>a0</td>
</tr>
<tr>
<td>Violin1</td>
<td>c7</td>
<td>d#6</td>
</tr>
<tr>
<td>Violin2</td>
<td>b6</td>
<td>f#5</td>
</tr>
<tr>
<td>Viola</td>
<td>e5</td>
<td>d4</td>
</tr>
<tr>
<td>Cello</td>
<td>c3</td>
<td>c2</td>
</tr>
<tr>
<td>Contrabass</td>
<td>c4</td>
<td>e1</td>
</tr>
</tbody>
</table>
Although charts show the piano playing in the extreme registers through the entire work, a linear melodic contour approximation of the entire first movement demonstrates a much more versatile role (Figure 3.3).

![Figure 3.3: Approximate Melodic contour of the piano in Part I (mm.1-160)](image)

In Part II, although IC1 and IC3 are still dominant, IC6 (tritone) also has a significant presence. All three variations are based on the initial pitch collection in the violin in measures 214-217 (Example 3.14)

![Example 3.14 Main melodic idea in Part II (mm. 214)](image)
The pitch class set that results from the collection is (01256); some of its subsets include (01) and (014), both appearing frequently in Part I. Another subset is (015), which is not as frequent in the first movement, but through probability approximation of Mendel’s genetic inheritance models, is identifiable in Part II. The initial (01256) motive is developed through augmentation, diminution and fragmentation throughout the entire second movement. In Variation II, most of the improvisation sections are also based on subsets of this pentachord (Example 3.15)

Example 3.15 Improvisation sections in Variation II

In measure 243, there is a cadence inspired by Renaissance era madrigals, which is meant to briefly interrupt the (01256) collection and provide a recognizable harmonic figure (Example 3.16). After the cadence, the consistent pitch material is resumed until the end of the piece.
Example 3.16 four part reduction of mm 243

The rhythm in *Part II* is consistent throughout and it’s mostly based on binary division, whereas the triplets that are featured in the piano part act as ornaments. The rhythmic unpredictability in Variation II and to some extent Variation III generates contrast with the strictly notated sections.

**Harmonic Consequences**

Because the horizontal layer of pitch and rhythm distribution was the main concern in composing *Pangenesis*, the harmonic aspect became an intuitive process. This being said, there are consistent chordal structures in the piece that result from the melodic organization, of which the most common are quartal and quintal harmonies (Example 3.17 a).

Example 3.17 a) Passage featuring quartal and quintal chord structures (mm.65)
As seen in the reduction from Example 3.17 b, these quartal chords are consequences of voice exchange that accommodates the transition from one (0,1,5) position to another. They are generated quite frequently during Part I, and are also used in Part II of the piece. A more complex type of harmonic structure that is generated is the chromatic cluster type, as seen in the climactic sections of the first movement (Example 3.18a)

Example 3.18 Cluster in first climactic section (m. 75-76)

Upon analyzing the intervalllic content of this cluster in Example 3.18b, the conclusion is that it also features (0,1,3),(0,1,4),(0,2,4) and (0,1,5) trichords. Therefore, the harmonic layer of the piece is consistent in intervalllic content with the melodic layer for the most part. Although this climax is mean to be a chromatic cluster, the pitches C, E
flat and A flat are missing. Some sections of the work have more harmonic presence than others. The best examples are in the piano cadenza in measure 161 of Part I, where there is almost a chorale-style situation.

**Orchestration Techniques**

An important aspect of the choices made in the orchestration is the contrast between static vs. active lines. In Part I, strings are used mainly as part of an expanding or contracting texture, while in Part II, they have a much more active role (Example 3.20)

Example 3.19 a) Strings in Part I (mm.19) b) and in Part II (mm. 220)

Because of the large number of performers, the string section can generate very effective sustained drone sounds, through the use of the staggered bowing technique.

Strings are frequently used together with the woodwinds in additive and subtractive processes, and often provide harmonic support for the piano. In certain sections of the
piece, the strings are instructed to play softly and non-vibrato, to achieve a clean, neutral tone. There are pizzicato sections in Variation II of Part II, where the violins have very precise pulse-based rhythm, as a reference for the instruments with improvised rhythm.

Woodwinds are used both as part of a texture and as soloists. The score requires three flute players and the piccolo part is separated from the flute 1 and flutes 2 parts because of its importance throughout the piece. Measure 1 begins with a piccolo solo that triggers the additive process involving the rest of the woodwinds, strings and the piano. The two bassoon parts are used independently as solos in Part I (Example 3.21), and inspired by my mentor Dr. Dennis Kam’s recent *Concerto for Bassoon*, two additional solos have been added in Part II.

Example 3.20 Bassoon solo in Part I (mm. 188)

The orchestration in *Pangenesis* is based on treating the orchestra as a unit and as a collection of chamber ensembles. Compound timbres are created using doublings of the same melodic line in different registers. Brass and percussion parts are used to create these compound timbres throughout the work. Some examples of doublings are [horn + trombone + piano + timpani] in measure 58, [vibraphone + triangle + piano] in measure 112, and [horn + trumpet + glockenspiel + vibraphone] in measure 205. There are certain sections where the piano is accompanied only by timpani and brass, or where the piano
accompanies the bassoon (Example 3.22). These sections greatly contrast other areas of large orchestral density.

Example 3.21  Piano in a chamber group  a)Part I (mm. 69); b)Part II (mm. 253)

There are two percussionists needed in the work, and a timpanist. The only percussion instruments used in the piece are: glockenspiel, vibraphone, triangle and bass drum. There is an overall metallic orchestral sound that is attempted, and the glockenspiel and vibraphone pairing greatly contributes to the effect. Triangle hits are used to signal the beginnings of certain sections and in events involving overall loud orchestral dynamic levels.
Chapter 4

Performance Considerations

As a pianist, I intended to include a broad range of keyboard techniques and performance practices in *Pangenesis*. In the first movement of the work, the piano part is exclusively "on keys", but there are advanced, subtle indications of how the soloist should perform. For example, some right hand chords require a very specific balance of the voices, with emphasis on the top (5th finger) or one of the middle voices (2\textsuperscript{nd} or 4\textsuperscript{th} fingers). One such example is in measure 112. The pianist is given the choice to perform the trills that are prevalent throughout all of the sections of the first movement as single or double voice ornaments in the preliminary pages of the score. In the high register virtuosic passages, the indication *brilliante* is used to imply the need for clear articulation of fast moving motives. At the same time, the indication *sonore* is used for heavy harmonic structures.

There is broad dynamic and registral range in the first movement of the piece, which allows the pianist to personalize his or her approach to the interpretation. There is a combination of "on keys" and various "on strings" extended techniques, but several parameters of the sound (such as dynamic, articulation, agogic accents) are left to be decided by the soloist, with the condition that they are developed as specified in subsequent sections. The piano part also features strong percussive sounds in the lowest register that interact with the timpani and the brass accents, achieving a compound timbre (Example 4.1)
In the second movement, there is a performer indeterminacy component, as the genetic inheritance models discussed above are applied to the pianist's interpretation of the piece. The idea of having the live performer’s decisions impacting the dynamic shape of the music is inspired by the concept of *pangenesis*, which is Darwin's hypothetical mechanism for heredity that was later replaced by Mendel's inheritance laws\(^{11}\). The theory proposed that certain effects from the environment could be acquired by individuals throughout their life and subsequently transmitted onto their offspring. For example, if the father was physically fit and active, the son would have a chance to inherit those traits. Although the theory has never been proven, it inspired the concept for

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\(^{11}\) Y. Liu and X. Li, *Darwin's Pang enesis and Molecular Medicine* (Henan Institute of Science and Technology, Xianxiang, China)
the piece, and the second movement of *Pangenesis* evolves based on choices that the pianist makes, therefore many aspects of each performance of the piece will be unique.

Some extended techniques such as glissando and pizzicato on the strings are used in the second variation of *Part II* to complement the improvisation elements from the woodwinds and percussion (Example 4.2)

**Example 4.2 Extended techniques on the piano**

After discussing with Professor Tian Ying about several other aspects of keyboard writing and performance, more detailed indications have been added to the score. One such case is in measure 223, where the pianist is instructed to use the middle “sostenuto” pedal to sustain only the bass pedal tone, while not affecting upper register notes. Also, the indication “marcatto, non-legato” is used in *Part II* to suggest a powerful, clear sound. Articulations and pedal markings are written in key parts in the score to help the performer interpret the musical intention, but there are also many sections where the performer is free to have a personal approach. The cadenza in *Part I* has the indication “Freely” so that the pianist can establish both rhythmic and dynamic parameters. In *Part II*, even though it is more rhythmically strict, the cadenza is not conducted, therefore allowing many different performance interpretations.
Conclusion

Throughout my undergraduate and graduate career, there have been immense improvements in my ability to compose, perform and teach. Pangenesis is the cumulative result of several years of using a system based on additive and subtractive processes in my compositions, and a first attempt in relating extra musical inspirations such as genetic inheritance patterns to melodic, rhythmic and structural development. After discussing each of these concepts in detail, and how they relate to my music, sharing it with the audience is the next step. As I am reaching the final stages as a student, my first large project is performing the work. A first step toward this goal will take place in the near future, as a chamber ensemble version of Part II will be rehearsed and performed by the Other Music Ensemble at the University of Miami. As the piece has been written mainly for myself as a pianist, it is expected that it will be part of many future projects. Interest from other pianists will certainly be welcome, and will hopefully be received as a valuable contribution to the piano and orchestra repertoire.

Although there are music styles and genres in my output that I have not yet successfully explored (such as choral music or music using live electronics), writing for piano and orchestra has been a thoroughly fulfilling endeavor. Pangenesis is an important personal achievement, as well as a perfect starting point for a change and an evolution in my approach to music composition in the future.
BIBLIOGRAPHY


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APPENDIX A:

Full Score
Pangogenesis

for piano and orchestra

DANIEL MANOIU

February 2013
Instrumentation:

1 piccolo
2 flutes
2 oboes
2 clarinets in Bflat
2 bassoons

4 horns in F
2 trumpets
2 trombones

percussion 1: glockenspiel, triangle, cymbal
percussion 2: bass drum, vibraphone
2 timpani

Piano (solo)

full strings

Special performance instructions: all ornaments should be performed as half-steps. The pianist has the choice to perform double or single trills freely.

Duration: cca 16’
molto cantabile

p

p

p

p

p

p

p
Pangenesis
part II
Variation 1
Variation II

Più mosso

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

improvise on given pitches

p

repeat measures
improvise on given pitches
If pianist chooses the main line, the conductor should cue in the brass.

If the pianist chooses Ossia, the conductor should cue in the woodwinds.
When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.

When repeating the section, the conductor should cue in the missing instruments.