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Musical Forces in the Serial Music of Igor Stravinsky

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MUSICAL FORCES IN THE SERIAL MUSIC OF IGOR STRAVINSKY

by

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ABSTRACT

In his 2018 book *A Theory of Virtual Agency*, Robert Hatten briefly describes the potential to analyze atonal music through the lens of musical forces. These musical forces are phenomenological sensations listeners experience, akin to physical forces felt in daily life. Larson (2012) categorizes and explains these forces as gravity, magnetism, and inertia, but his work only applies them to tonal music.

Gravity is a universal force that exerts influence over the music on a global level. In a tonal context, this would be the tonic pitch, however in the absence of tonal hierarchy the locus of gravity comes from continuously emphasizing musical elements. Magnetism is no longer unstable pitches resolving to more stable pitches (as there are no stable pitches), but instead is intentional and gestural voice leading implying the motion of resolution. Inertia's influence remains essentially the same; linear motion and motivic motion are present in both tonal and atonal music.

Analysis of three brief serial Stravinsky compositions shows evidence these forces do exist in serial contexts. Gravity is determined by the combination of the duration of a pitch, the pitch's position in the row (specifically initial and final position), and duplications of that pitch in different voices. Magnetism transforms to a localized influence that ranges from implications of resolutions to pairings of specific pitches. Inertia remains similar. Motivic patterns and linear motion can be precompositionally set in the row, or various combinations of row forms could create sequences.

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DEDICATION

The most important people to thank are my grandparents. This thesis would not have been completed without their physical, emotional, and financial support. I am completely indebted to them and forever grateful.

I also thank my parents and my sister for their constant belief in me and for all the support they provided.

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CHAPTER I - INTRODUCTION

In the early 1950s, the composer Igor Stravinsky underwent a radical change in his compositional style. After completing and debuting *The Rake's Progress* in 1951, his mind turned towards the thorny realm of serialism. Stravinsky ceased to spurn the style of Schönberg and his students and instead began to embrace the serial idiom, slowly at first but with increasing comfort and experimentation. He eventually came into his own style and created his own methods of expression within the serial framework.

Analysis of some of the smaller works composed during this period is lacking, and thus this thesis endeavors to shed light on lesser known works. This thesis will focus on 1952's first of the *Three Shakespeare Songs* "Musick to Heare," 1959's *Double Canon, Raoul Dufy in memoriam,* and 1959's *Epitaphium.*

These pieces have been selected for numerous reasons. Firstly, with the exception of "Musick to Heare," very little research has been done on *Double Canon* and *Epitaphium*. There is a gap in research on these serial compositions, as theorists have tended to deal with the larger works of this period. Secondly, all three pieces are comparatively short chamber works. "Musick to Heare" provides the only example of vocal music of the three, but all are orchestrated for chamber ensembles. The brevity of the works allows for meaningful detail to be included in the scope of this thesis. Thirdly, and as mentioned previously, Stravinsky was something of an outlier in serial circles. His compositional style and methodology differed oftentimes greatly from that of the Second Viennese School or its descendants. Perhaps the uniqueness of Stravinsky's methods could provide a different and new perspective on serial

analysis. Finally, these compositions were selected through personal interest in serial music and the serial Stravinsky.

This analysis will be focused through the lens of musical forces as described by Steve Larson and Robert Hatten. Larson's work synthesized decades of research into the cognition and science of how listeners feel and interpret music, and therefore how those feelings are threaded into the music itself, while Hatten expanded the potential application of these musical forces to an atonal idea. At the time of this writing, no analysis of serial Stravinsky has ever been done with musical forces in mind.

The goal of this thesis is to prove that musical forces exist in serial idioms without the need for tonal hierarchy, and this will be proven using the serial work of Igor Stravinsky. Each chapter will focus on one composition, with analyses of the works themselves along with application of the musical forces discovered therein. Finally, this analysis will examine the place of this research in the context of the broader research into Stravinsky, serial music, and musical forces, before concluding with potential areas and directions research launching from there.

CHAPTER II – "MUSICK TO HEARE"

Three Songs from William Shakespeare is a collection written by Stravinsky and published in 1953. It is one of the earliest compositions in which Stravinsky made use of a serial technique, following only the "Ricerar II" movement of *Cantata* and the theme borrowing and transformation of *Septet* within the previous year.

"Musick to Heare," the first of the three songs, is 50 measures long, and performances last about two and a half minutes. The song is scored for mezzo-soprano, flute, clarinet, and viola. Milton Babbitt, in his 1964 review of recent Stravinsky works, described the song as being a vocal part and a unified instrumental part as "performed on a monophonic instrument with varying timbral characters."[1] The register of the work ranges from C3 (in the viola) and Eb6 (in the flute). The vocal apex is Eb5, which occurs twice on the last page at mm. 42 and 49. There are multiple examples of the vocal nadir of C4, and it occurs multiple times throughout the piece, most notably the concluding vocal pitch at m. 50.

The formal arrangement of "Musick to Heare" aligns itself with the formal construction of the sonnet it adapts for its text. There are 5 formal sections, based on the lines of the sonnet.

[1] Milton Babbitt, "Remarks on the Recent Stravinsky," *Perspectives of New Music* 2, no. 2, (Spring-Summer): 44.

Table 1 *"Musick to Heare" Form*

Introduction	mm. 1-8
Quatrain 1	mm. 9-21
Quatrain 2	mm. 22-34
Quatrain 3	mm. 35-43
Couplet	mm. 44-50

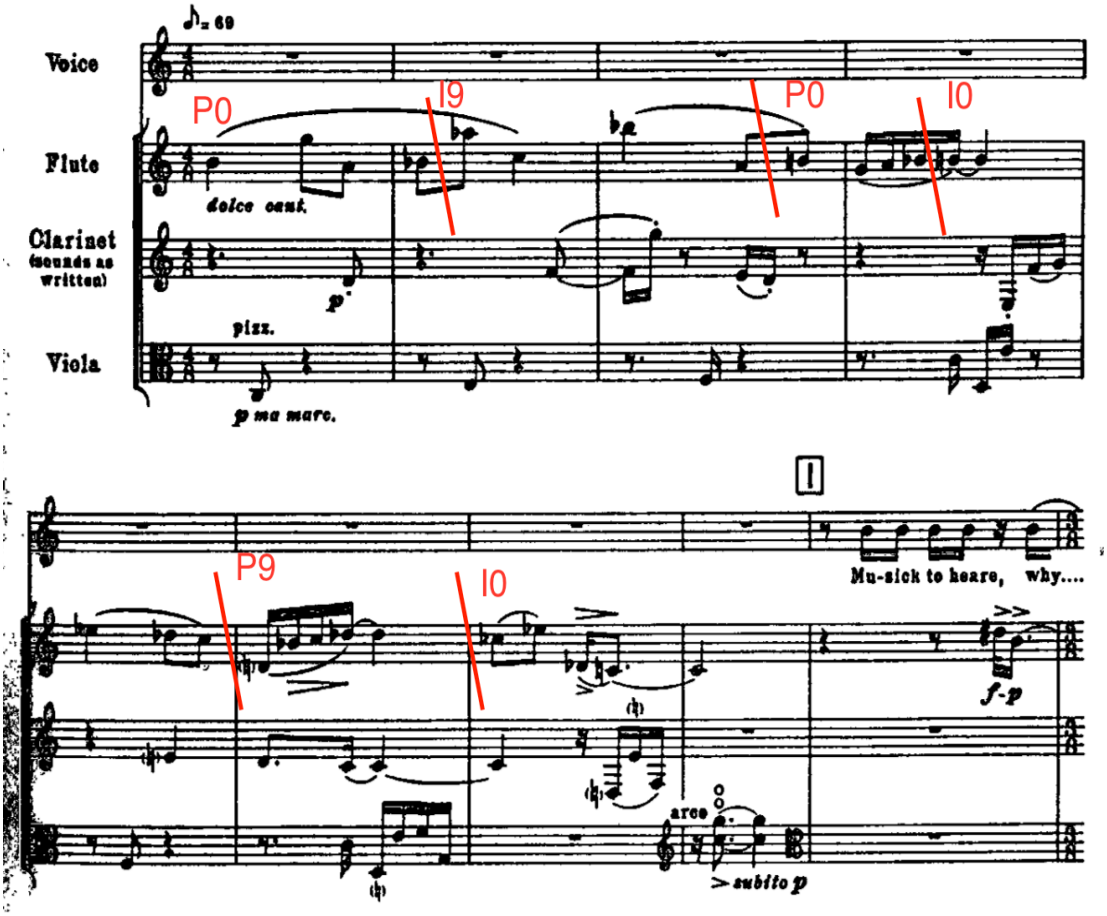
There is no vocal part present during the eight measure introduction; the mezzo-soprano enters in at m. 9 for the first Quatrain. The rhyme scheme of the sonnet is displayed musically through this formal arrangement. Each section is punctuated by the open interval of a perfect fifth as a marker of the lyrical and musical breaks.

The form of the piece also differentiates the rhythmic structure of the song. The introduction is eight measures of 4/8, but Quatrain 1 begins a patterns of 4/8 and 3/8 meters alternating every measure. Quatrain 2 changes this to a sequence of 2 measures of 4/8 and 2 measures of 3/8, but the third Quatrain returns to one measure of each. The couplet blends the two patterns together with a sequence of two measures of 4/8 and only one of 3/8. Since the lyrical content of this sonnet concerns itself with marriage, unity, and singleness vs duality, a case can be made that the rhythmic variation in the piece is an example of the merging of two individual designs. There is a struggle between the 1+1 rhythmic sequence and the 2+2 sequence, but in the conclusion of the piece, a unity is born in the form of the 2+1 rhythmic pattern.

"Musick to Heare" is composed entirely out of two different sets. The primary compositional device is the four-note row that makes up the majority of the music. The pitches of this row are B-G-A-Bb. The inverted, retrograde, and inverted retrograde

forms of this row are also used throughout the piece. The row implies G major tonality before twisting to minor upon the appearance of the Bb. The arrangement of the rows themselves forms a specific pattern that Rokus de Groot calls the "reference sequence" of "Musick to Heare."[2]

Musical Example 1 "Musick to Heare," mm. 1-9

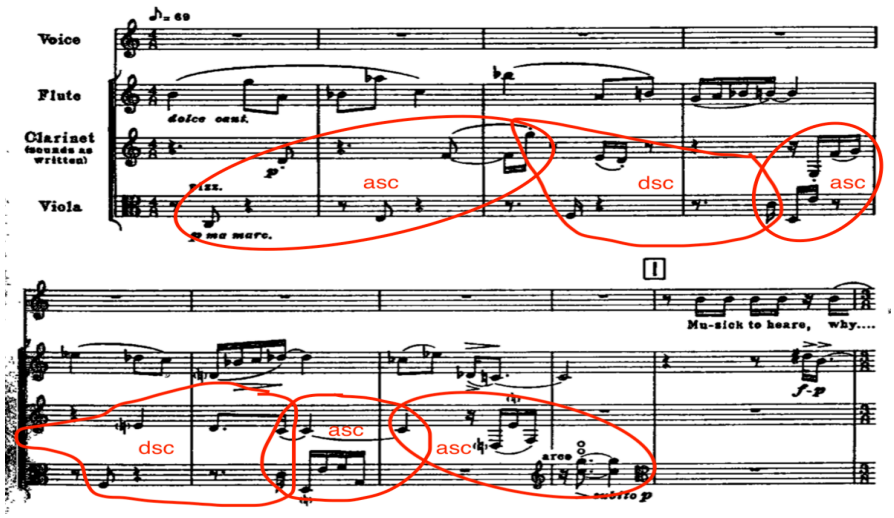


Measures 1-9 with reference sequence marked

[2] Rokus de Groot, "Stravinsky's 'Musick to heare': a study in union and singleness," *Dutch Journal of Music Theory* 16, no. 1 (2011): 30.

This example is the entirety of the introduction section, mm. 1-8, with each row form identified. De Groot identifies P0-I9-P0 as being the aforementioned reference sequence; the motion from prime to inversion and back, as well as the T3 motion, is replicated in many places throughout the rest of the piece.[3] This is immediately evident with the I0-P9-I0 series following the reference sequence. This is the perfect inversion of the original reference sequence (rs), and therefore it will be called the inverted reference sequence (irs). Not only does this provide symmetrical motion as rs and irs rotate back and forth, it also creates a sort of resolution. Emphasis is placed on the pitch class B because it begins four out of six rows in the rs/irs: the two P0s and the two I0s. This B is reinforced all the way to the end of the irs, as a Db steps down to a C and is held for almost a measure and a half. The overall shape of the rs and irs together creates B-C leading tone motion.

Musical Example 2 “Musick to Heare,” mm. 1-9



Measures 1-9 with pentachord marked

[3] de Groot, (30)

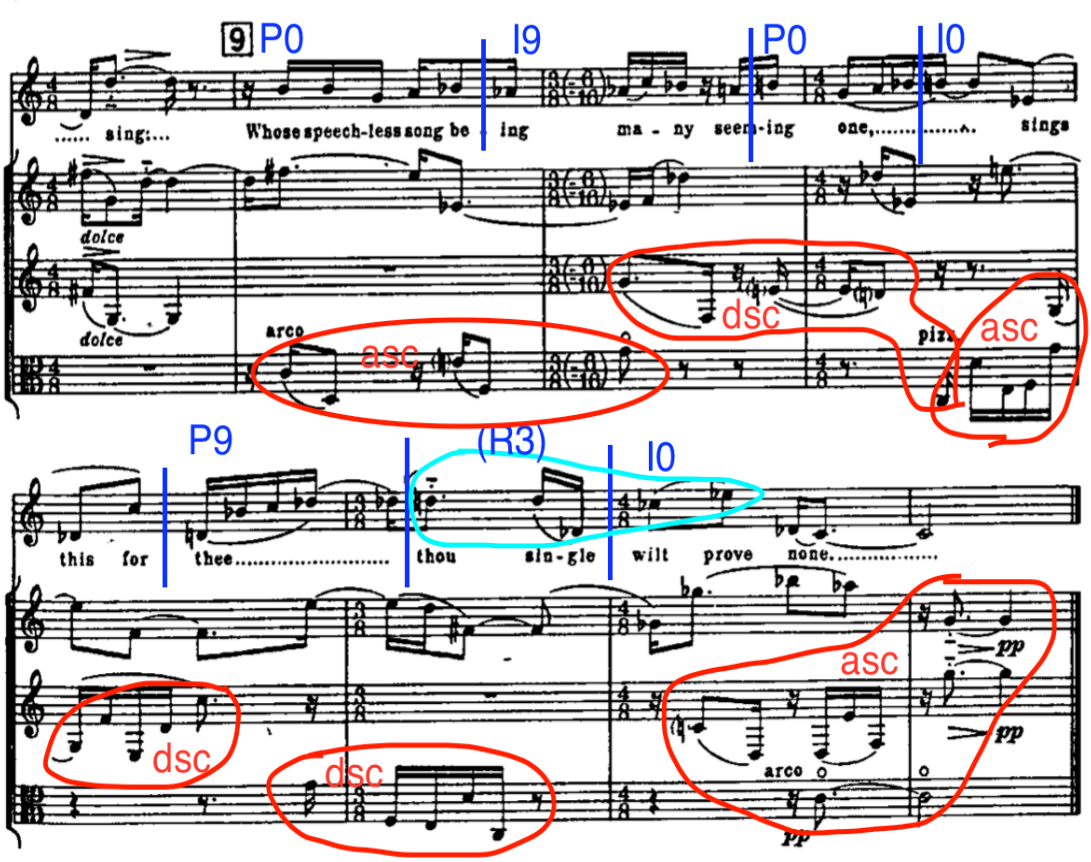
The pentachord set occurs in the introduction and couplet sections of the work. The pentachord is a stepwise diatonic collection of C-D-E-F-G in either ascending or descending orderings. Generally, the collection will alternate ascending and descending, but as can be seen in mm. 1-8 this is not always the case. The sixth and final use of the collection in mm. 7-8 appears to break the pattern specifically so the pentachord will ascend to G and create the open C-G interval in m. 8.

The interval of C-G is not only a pleasant harmony to include with the aforementioned leading tone motion from B-C, but there is a deeper structural reason for this interval. Comparing the rs and the pentachord collection, the only common pitches are C and G. Not only that, but the rs chromatically fills in the interval from G-C, as opposed to the diatonic collection. In "Musick to Heare," Stravinsky combines not only an atonal approach with a tonal one, he increases the contrast by using both diatonicism and chromaticism. However even in the division of these approaches, he ensures that they work together to become greater than the sum of their parts. Together the diatonic and the chromatic cover the entirety of an octave, with special emphasis on the interval of C-G, and they come to together to effectively create a resolution at the end of each section.

After the introduction, the voice carries the original reference sequence while the instruments play variously abbreviated, transposed, or inverted versions of the rs. The first quatrain more or less maps onto a full repetition of the rs and irs, however beginning in Quatrain 2 the voice begins to digress and depart from that pattern. Quatrain 1 ends with a C-G interval, however Quatrain 2 ends with a B-F# interval. Quatrain 3 continues the digression by ending on a G-D interval, before the couplet returns to the both the rs and irs in the voice and the pentachord collection in the clarinet and viola. The only

exception to the rs and irs in this passage is what David Carson Berry calls "as a singular aberration intended to reflect the concurrent text" at the beginning of the R3 row[4]. Besides the inclusion of that note and the presence of the mezzo-soprano, the couplet is functionally equivalent to the introduction in its harmonic construction and form.

Musical Example 3 "Musick to Heare," mm 43-50



Measures 43-50, with row forms and pentachords marked

Stravinsky is once again toying with traditional tonality by referencing a familiar key structure. The introduction and the first Quatrain "resolve" to the structural interval of C-G, but Quatrain 2 goes off the map to B-F#. This is motion to a completely foreign

[4] David Carson Berry, "The Roles of Invariance and Analogy in the Linear Design of Stravinsky's 'Musick to heare'," Gamut 1, no. 1 (2008): 42.

harmonic center, and it continues to modulate in Quatrain 3 to conclude that section with the G-D interval. Finally, C-G returns in the couplet. The transition from G-D to C-G is very obvious dominant motion; Stravinsky departed for a non-closely related center, then used dominant motion to return to the home harmonic center of C-G.

"Musick to Heare" shows Stravinsky embracing the ideals of serial composition while also utilizing compositional techniques from his more traditional fare. He creates centers of harmonic stability in a way that evokes more common key progressions. He also combines diatonic and chromatic collections in a way that allows them to unify and represent the entire octave. His chromatic tone rows are used in a sequence that reinforces a leading tone resolution motive of B-C, and the diatonic set provides familiar musical gesture of diatonic stepwise motion. However, this analysis can be improved with the inclusion of musical forces.

Steve Larson's 2012 book *Musical Forces*[5] is a collection of writings that examine how a listener's perception of motion creates meaning. The book describes different kinds and layers of musical motion and also provides evidence of these perceptions based in cognitive research. Major examples of musical forces Larson describes are the concepts of gravity, magnetism, and inertia. These melodic forces derive from how listeners abstractly visualize the music. Larson's work places music in the context of it "happening" to the listener, and as such, these physical forces can be associated with quasi-physical sensations of the music.[6]

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[5] Steve Larson, *Musical Forces: Motion, Metaphor, and Meaning in Music,* (Bloomington: Indiana University Press, 2012).
[6] Larson (2012), 82.

Gravity is a force that draws all other pitches down to the tonic. No matter where in the scale a pitch may be, the tonic is always exerting some amount of attracting force, seeking to pull a pitch back down to tonic. This force can simply be related to the Schenkerian *Urlinie*, but Larson illustrates this phenomenon by relating the physical force of gravity to the musical force of being drawn down to tonic. Gravitational pull increases with proximity to the tonic pitch: in the key of C, the pitches B or Db would have more "desire" or "pull" to C than perhaps the pitch F#.[7] Gravity is a universal force that exerts influence on the entirety of a piece of music, through melodic and harmonic content.

Magnetism is the force that moves an unstable pitch to the closest stable pitch. Magnetism is weaker than gravity, but they can work together and are harmonically related. A very plain example would be a fourth scale degree descending to the third scale degree. Any descending motion can be explained by the force of gravity, but the pitch stopping on the stable third scale degree is due to the magnetism inherent in the tonic triad. Therefore, in this understanding of musical motion, notes universally descend due to the gravitational pull of tonic (leading tones can be descended down to and "rebound" to the tonic), but they can become magnetized to a stable pitch before they reach the tonic. Once again, the strength of the magnetism varies depending on the proximity to a stable note.[8]

Finally, inertia is the tendency of a pitch or phrase to continue in a certain direction or pattern. A stepwise descending phrase is an example of gravity directing the

[7] Larson (2012), 83-88.
[8] Larson, 88-96.

notes towards tonic, and inertia as the feeling of following that motion. If there were no tonic, it is likely a stepwise descending line would continue indefinitely. For our purposes, however, the inertia would only continue until the greater forces of magnetism or gravity brought the line to a rest at a stable pitch or tonic. Inertia does not have to be simply motion in a single direction; it can be any sort of continuous repetitive or directed motion. The main thrust of this concept is that a musical motive or motion will continue until acted upon by a stronger force.[9]

"Musick to Heare" provides an excellent opportunity for analyzing Stravinsky through the lens of Larson's musical forces. For example, traditional application of musical forces in this piece can be placed on the diatonic pentachord set. Even though it is placed in an atonal setting, the inherent energy of magnetism and inertia are still present. Although the set never pauses or rests upon the pitch E, the tonal quality provides a sense of potential energy to the force of magnetism. The ascending and descending line could become magnetized to the pitch E at any point in the motion and stop there, but inertia in this case is more powerful. Lerdahl's depiction of tonal pitch space is helpful as the force of magnetism a pitch exerts increases for each level.[10] The pitches C and G have more magnetism than E, but all three of them acting analogously to a tonic triad inside the pentachord gives them more magnetism than the pitches of D and F.

[9] Larson, 96-100.
[10] Fred Lerdahl, *Tonal Pitch Space,* New York, Oxford University Press (2001): 47.

Table 2 *Tonal Pitch Space*

0												0
0							7					0
0				4			7					0
0		2		4	5		7		9		11	0
0	1	2	3	4	5	6	7	8	9	10	11	0 (12)

Continued application of musical forces is a topic in Robert Hatten's 2018 book *A Theory of Virtual Agency for Western Art Music.* Hatten uses the aforementioned musical forces as an element of music that could imply agential activity.[11] He notes that he and Larson have only shown examples of musical forces found in tonal works, however he begins to make a case for their continued relevance in atonal music. Hatten's idea of gravity in atonal music adapts to becoming "a locally asserted pitch," rather than a centralizing tonic pitch. Magnetism depends more on proximity than stability as a tonal hierarchy does not exist. Momentary gestures would imply resolution and stability upon concluding the gesture. Out of the three forces, inertia requires the least adjustment; linear forward motion and motivic motion are still present in atonal compositions, therefore inertia functions essentially identically as before. Hatten utilizes an example from Schönberg Op 11, no. 1 to show the voice leading creating a force similar to magnetism through a "familiar gestural pattern" rather than a stable resolution. Linear motion and attraction are still present in atonal motion, but what creates goal tones and resolution is different.[12] Embracing Hatten's expansion of the application of musical forces can allow us to hear atonal music in a new way.

[11] Robert S. Hatten, *A Theory of Virtual Agency for Western Art Music*, (Bloomington: Indiana University Press, 2018), 56.
[12] Hatten (2018), 59.

A distinction to draw on the subject of gravity and magnetism operating in this new musical space is the difference between their effects. With the absence of tonal hierarchy, both forces will derive from linear motion and gesture, however they still function differently. Gravity will continue to be a *universal* constant, like a tonic would be. Music can change keys, and therefore tonics, and as such loci of gravitational pull can also change in atonal textures. Gravity will need to exert a centralizing force over the entire piece, and even if the gravitational pitch changes, the new pitch must be reinforced in similar ways to the original pitch.

Magnetism is a *locally* asserted force. Magnetism may exert influence on a motive or a phrase, but it will not influence the work as a whole. Motives or phrases can be magnetized. To make more tonal analogies, magnetism is equitable to harmonization of non-tonic scale degrees. These harmonies are consonant, but they are still under the *universal* influence of tonic that eventually directs everything back to itself. Gestural phenomena create magnetism on an event by event basis, but gravity is created by continuous, repeated reinforcement of the significance of a pitch.

In the serial music of Stravinsky, there are three ways that a pitch may be reinforced as a gravitational center. First, the duration a pitch receives can inform listeners to how influential it is. Atonality disrupts a normal sense of stability and resists allowing the ear to become comfortable. However, a pitch can be emphasized temporally through its duration, whether that is simply being relatively long in its surroundings, all the way to taking on a dronic characteristic. Pitches that are increased in duration proportionately sound more familiar and comfortable to listeners. Secondly, gravity can be discovered by examining for elisions. In atonal contrapuntal textures, the likelihood

for either consonant harmonies or perfect unisons is decreased by nature of expanding the musical language to all 12 pitches. If two distinct voices result in a unison, this is often a marked event and can be considered significant. Thirdly, the pitches that begin and end rows are often more noticeable than the notes that lie inside on the interior of the row order. (This may be relevant to some serial composers more than others—depending upon how they use the row compositionally.)

To begin finding a pitch with gravitational force, we will examine duration in "Musick to Heare." The longest duration of any pitch class in "Musick to Heare" is C. At mm. 49-50, C is held for two and 3/16th beats, and an even two beats in mm. 8 and 21. All three of these moments are the instances of the C-G interval concluding a formal section. The pitch G comes in second place for duration, often slightly offset to join in the C-G interval just later than the C establishes it. Moving on to unisons, the only pitches to overlap with a second voice for more than an eighth note are once again C and G. C is carried in the voice and viola for the same two and 3/16th beats as noted above in mm. 49-50. Unsurprisingly, all three of the C-G interval junctions were the most notable example of elisions. The pitch B is the most common note to begin a row, with 18 instances of this. Runners-up were Ab/G# with 9 instances, and D with 6 instances. All three of these pitches are the initial pitches of the four rows of the rs and irs pattern. The pitch C concludes 8 rows as well, with 7 of those coming from the rs/irs in the I0 form. The cumulative evidence of the prominent unisons, longest durations, and the position of C in the row show the importance of the pitch C throughout the entirety of the work.

With the addition of Hatten's applications of musical forces in atonal music, the serial elements of "Musick to Heare" can be examined with this framework in mind. As

previously identified, every major formal shift is marked by an open fifth harmony. In the introduction and the couplet, the pentachord becomes a crucial part of his interval: the G of the pentachord becomes the G in the C-G interval. (The C-G at the end of the first quatrain is made up by notes of I0 and P9 without need for the pentachord.)

The reference sequence's design creating a resolution from B-C is also something that functions within, or by at least alluding to, a tonal framework. The B is emphasized throughout the entire reference sequence, and at its conclusion there is stepwise motion from Db to C as well as G acting as a supporting harmony. Based on the relationship to tonal harmony and the emphasis it receives through duration, elision, and initials of rows, the pitch C exerts the force of gravity over the music, drawing everything to itself and its resolution. In this piece, C is a locus of gravity, and G is a locus of magnetism, as it holds secondary importance to C. C is more universal and has more compelling evidence for being analogous to a tonic pitch, while G supports C harmonically and shares significance with C in the pentachord set.

Therefore, there are clear elements of tonality that emerge in "Musick to Heare," and musical forces can be identified and derived from how Stravinsky twisted the atonal setting to produce quasi-tonal results. The goal of this research is to discover how applicable musical forces are to serial Stravinsky, and whether similar methods can be used to identify musical forces in his other serial works. These questions will be answered with what has been gathered in "Musick to Heare," as well as two other Stravinsky chamber works.

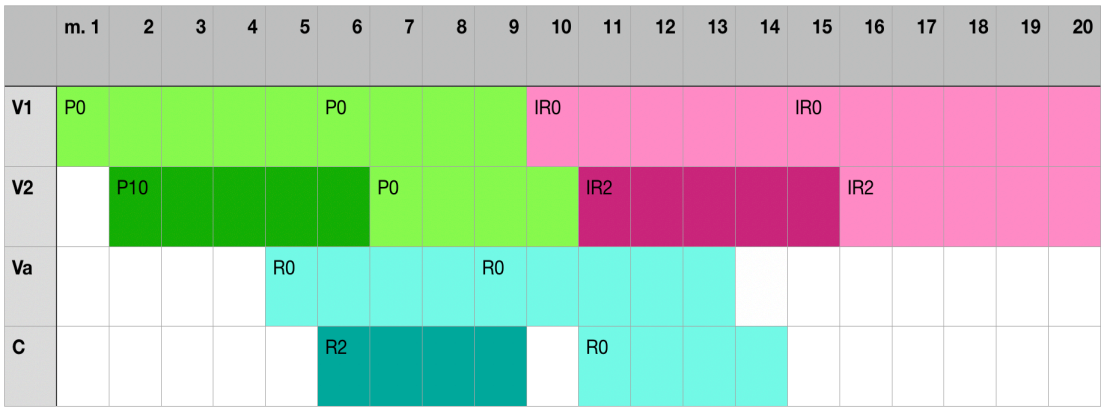
CHAPTER III – DOUBLE CANON

Double Canon, Raoul Dufy in memoriam was composed in 1959 and is unique as it is perhaps the only instance of Stravinsky utilizing both a 12-tone row and transpositions of that row, rather than rotational arrays, rows of various lengths, or foregoing transpositions.

Stravinsky refers to this piece as a double canon. Twelve tone pieces, due to their atonal and strict compositional processes, can appear quite different from traditional canons both melodically and formally. Thus we must ask: what elements of this composition does Stravinsky use to justify calling this piece a double canon?

Firstly, Stravinsky uses specific transformations of his row in specific orderings to reveal a symmetrical design.

Table 3 *Double Canon Row Forms*



In this table, the different transformations of the original row are shown in a graphical depiction. It is possible to separate this piece into 3 distinct sections based on types of transformations that appear, which are shown using differently shaded groups on the graph. The first pair in the canon (violins 1 and 2) appear in prime forms at the

beginning, and the cello and viola utilize retrograde forms upon their entrances. The closing section returns to only the violin pair using retrograde inverted transformations. It may not be immediately clear how one can see these transformations as indicative of a canon, but in referencing both pairs together one can see the symmetry. The first violin begins on P0 and the second violin follows on P10, a movement of T2 down. The viola enters on R0 and the cello on R2, a movement of T2 up. This inverts the motion of each pair, creating a symmetry around P0 and R0 respectively.

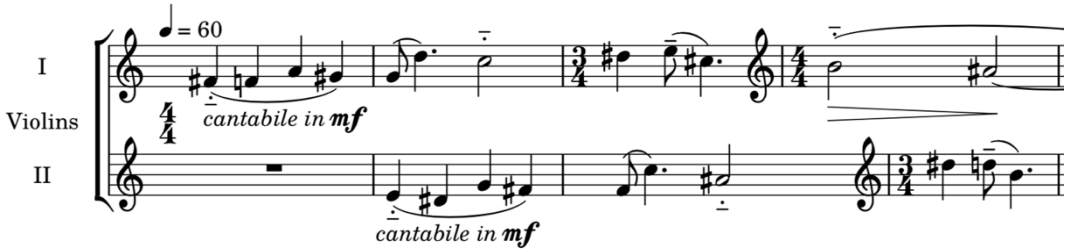
The second section includes entrances on P0, P0, R0, and R0, once again showing imitative qualities not only within each pair but with each other. The motion of T2 in either direction was balanced out on both sides in the first section; this allows both pairs to enter on the same transposition in the second section. Just over the halfway point, the viola and cello fall tacit as the texture returns to violins only (the cello does enter for its final row at m. 11, but this is grouped with the Prime and Retrograde transpositions at 0 rather than the first violin IR0 at m. 10).

The third entrance of the first and second violins mimics their first entrance with IR0 and IR2. IR0 and IR2 are a movement of T2 up, which is an inversion of their first entrance at P0 and P10 (the first time T2 down, now T2 up). The change to inverted retrograde forms creates a unification of sorts of the upper and lower pairs of the double canon. When the cello and viola drop out, they bequeath the retrograde aspect of their transformations to the violins. The inverted form creates a distinction of a new section, and the retrograde aspect maintains a sense of continuity. Finally, the piece concludes with both violins playing IR0, a reference to the series of entrances beginning at m. 6 that were all on the same transposition. Thus, the third and final section is a culmination of all

the ideas in the previous 2 sections of the work: a reference to the symmetry of the entrances at m. 1 and m. 2, a reference to the retrograde transformations of the cello and viola, and a reference to the unison 0 forms of the second section (mm. 6-14).[13] [14]

Stravinsky also uses rhythmic and metrical elements to emphasize symmetry. This short work changes meters many times from 4/4 to 3/4 and back.

Musical Example 4 *Double Canon*, mm. 1-4



This excerpt from mm. 1-4 shows the first entrances of the first and second violin and how Stravinsky's assignment of specific rhythmic values to order positions in the row interacts with the first four meter changes of the work as a whole. Counting along, one can see the first violin has two measures of 4/4, a measure of 3/4, and then back to 4/4 (this contains the entire first row). Now looking at the second violin, one can see two measures of 4/4, one of 3/4, and at the end of the excerpt, a return to 4/4, just as in the first violin. Going deeper, one can see that the order of rhythmic durations for each of these parts is identical: four quarters, an eighth, a dotted quarter, a half note, one quarter,

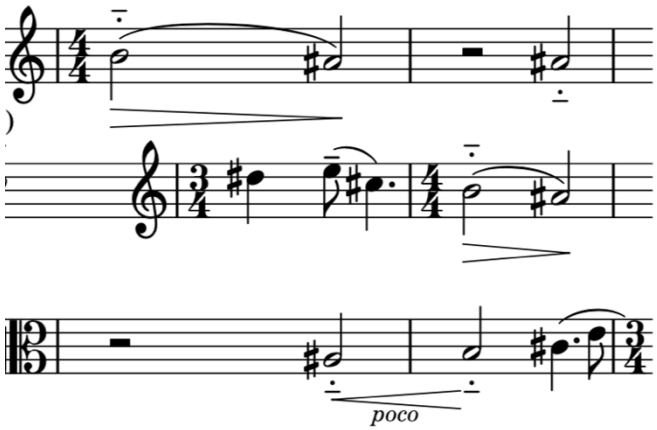
[13] Some sources describe the IR forms as the more traditional RI. Considering Stravinsky's affinity for IR forms in his serial work, I feel it is more appropriate to use that in the naming of these rows. However, IR0 and RI8 are the same row, and IR2 and RI10 are the same, so if RI is preferable to readers, those forms would be acceptable.

[14] Amy Hatch examines the transformational nature of this canon by looking at quadrants, rather than the more vertical approach I have taken.
Amy M. Hatch, "A Transformational-network approach to Stravinsky's Double Canon 'Raoul Dufy in Memoriam' (1959) and Feu D'Artifice (Fireworks), Op. 4 (1908)", (master's thesis, Texas State University, 2013), 17-26.

one eighth, a dotted quarter, and two half notes. Every instance of a prime form has this exact sequence of meter changes and rhythmic patterns. One corollary is that the retrograde forms utilize these exact same rhythmic patterns and metrical changes but in reverse.

This excerpt shows the top 3 lines: violin 1, violin 2, and the viola.

Musical Example 5 *Double Canon,* mm. 9-10



The viola entrance (marked R0) shows the prime rhythm played in reverse (two half notes, dotted quarter, eighth, etc.) and the first meter change to 3/4. Not only do the individual pairs of voices imitate each other rhythmically, the retrograde (and retrograde inversion) transformations imitate those rhythms in retrograde perfectly. The symmetry of design Stravinsky imbues in the formal and rhythmic structure of this piece reveals a considerable amount of compositional intentionality. However, continued analysis of this piece through the lens of musical forces will show further examples of this intentionality.

As in the previous analysis, there are three criteria that will establish gravity in this serial setting. The intricacies of "Double Canon" will help to reveal why these three criteria were selected to begin with.

Duration was the first musical factor examined. Until the final two measures of this piece, half notes are the greatest notated durations. In five out of the six unique rows that appear, A# is given a half note. As noted previously, this piece uses a serialized rhythmic pattern, thus a half note being the longest duration of a note follows logically.

Table 4 *Double Canon Pitch Durations of Rows*

Greyscale decreases with note duration: black = half note, dark grey = dotted quarter, light grey = quarter note, white = eight note

P0	F#	F	A	G#	G	D	C	D#	E	C#	B	A#
P10	E	D#	G	F#	F	C	A#	C#	D	B	A	G#
R0	A#	B	C#	E	D#	C	D	G	G#	A	F	F#
R2	C	C#	D#	F#	F	D	E	A	A#	B	G	G#
RI8	A#	A	G	E	F	G#	F#	C#	C	B	D#	D
RI10	C	B	A	F#	G	A#	G#	D#	D	C#	F	E

Table 5 shows the number of different durations for any given pitch. (The purpose and exception of the dotted half note and whole notes on D will be discussed in greater length later; suffice to say they do contribute to placing significance on the pitch D.)

Table 5 *Double Canon, Durations per Pitch*

	A	A#	B	C	C#	D	D#	E	F	F#	G	G#
Eighth	1	0	0	0	1	1	1	3	1	2	2	0
Quarter	2	1	2	1	2	2	4	2	5	3	3	3
Dotted	1	0	1	1	2	2	1	1	0	1	1	1
Half	2	5	3	4	1	1	0	0	0	0	0	2
D.Half	0	0	0	0	0	1	0	0	0	0	0	0
Whole	0	0	0	0	0	2	0	0	0	0	0	0

Table 6 is an altered version of Table 5. In this variation, the numbers represent a normalized total of eighth note values. For example, if a pitch was represented with 2

quarter notes, its eighth note value would be 4. The sum row adds together the eighth note value of a pitch across the entirety of the work

Table 6 *Double Canon, Eighth Note Values per Pitch*

	A	A#	B	C	C#	D	D#	E	F	F#	G	G#
Eighth	1	0	0	0	1	1	1	3	1	2	2	0
Quarter	4	2	4	2	4	4	8	4	10	6	6	6
Dotted	3		3	3	6	6	3	3	0	3	3	3
Half	8	20	15	16	4	4	0	0	0	0	0	8
D.Half	0	0	0	0	0	6	0	0	0	0	0	0
Whole	0	0	0	0	0	16	0	0	0	0	0	0
Sum	16	22	22	21	15	37	12	10	11	11	11	17

This graph shows the pitch D has the longest overall duration with the equivalent of 37 eighth notes cumulatively. There is an obvious explanation for this in the score which will be discussed later. Tied for second are the pitches A# and B. The pitch C is only one eighth note below A# and B, but the rest of the pitches have a noticeable gap between the longest four pitches. Other methods or ranking reveal the significance of A# and D, while the B and C are coincidental due to their placement in the rhythmic pattern. In the prime row, A#, B, and C all are represented by a half note. This row repeats three times at P0 and twice more in retrograde. Therefore, the row structure guarantees that these pitches will have equal temporal significance. However, of these three only A# takes on further gravitational factors.

The next factor identified was unisons throughout the piece. There are 11 total examples of unisons, as shown in Table 7. The pitches A# and D both feature unisons a total of 3 times. Of these, the A# unisons are the most significant: all three unisons last the longest possible duration (as per the rhythmic serialization), and they are perfectly

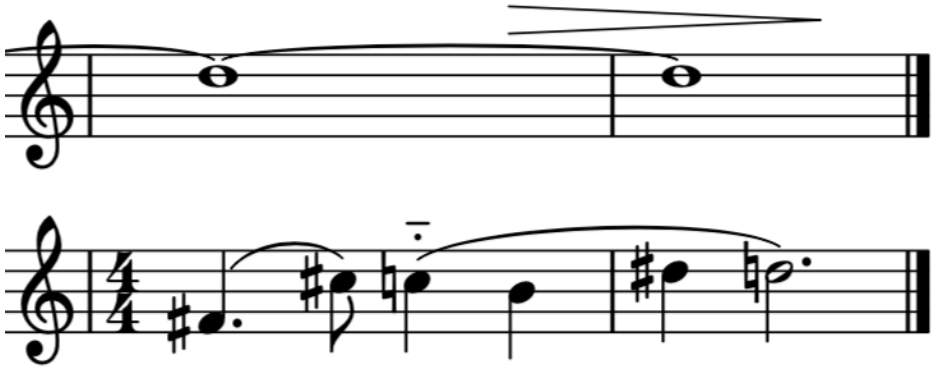
Table 7 *Unisons in Double Canon*

	Pitch	Duration	Voices	Overlap
m. 5	A#	Half note	Vn 1, Va	Congruent half notes
m. 7	D	Quarter note	Vn 2, Vc	Unequally overlapping dotted quarters
m. 7	G#	Quarter note	Vn 2, Va	Congruent quarter notes
m. 8	D	Quarter note	Vn 2, Vc	Unequally overlapping dotted quarter and half notes
m. 9	A#	Half note/quarter note	Vn 1, Va, Vc	Congruent half notes in Violin 1 and Viola, congruent quarter note in Cello
m. 10	B	Half note	Vn 2, Va	Congruent half notes
m. 10	A#	Half note	Vn 1, Vn 2	Congruent half notes
m. 12	G#	Quarter note	Vn 1, Va	Congruent quarter notes
m. 13	F#	Eighth note	Vn 1, Va	Unequally overlapping dotted quarter and quarter notes
m. 13	G	Eighth note	Vn 2, Vn	Unequally overlapping quarter and eighth notes
m. 20	D	Dotted half note	Vn 1, Vn 2	Unequally overlapping whole and dotted half notes

congruent, unlike many of the others. Compared to the pitches A#, B, and C identified as potentially significant previously based on their duration, C is not ever represented with a unison. B does have a congruent half note unison, but only one compared to A#'s three unisons. The pitch D is represented three times on this chart, but only the final unison at

m. 20 appears to have any significance as the final pitch of the entire work. The first violin completes its row and sustains a long D as a drone, breaking the established rhythmic pattern, while the second violin concludes its row. The half-step motion from D# to D in both voices, along with the drone in the upper voice, establishes D as a point of resolution. Therefore, the pitches A# and D are the most important as shown by unisons.

Musical Example 6 *Double Canon,* mm. 19-20

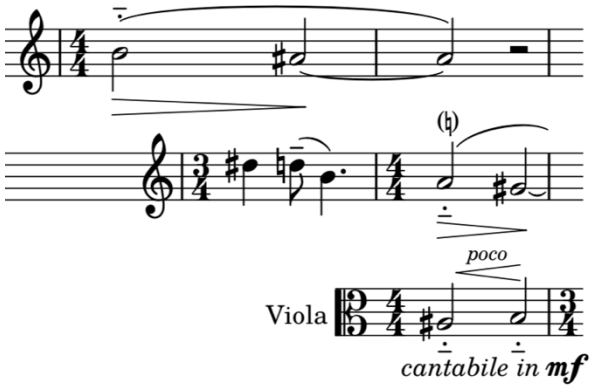


The majority of the other unisons occur within inner voices, are not congruent, and/or last for a very short duration, such as the G unison at m. 13. It lasts for a mere eighth note in the viola and cello. It's hard to point to this unison as having salience for establishing gravity. The A# and D pitches do far more in this regard.

The third and final factor used to find gravity was locating the beginnings and endings of rows. Having discovered points of unison, suddenly three specific row transitions become interesting to examine. The A# unisons all share the same function of elision between the rows, akin to a handoff in a relay race. In m. 5, the first violin concludes its P0 row exactly where the viola enters for the first time with R0, therefore one row ends and another begins on A# simultaneously. The most fascinating thing about

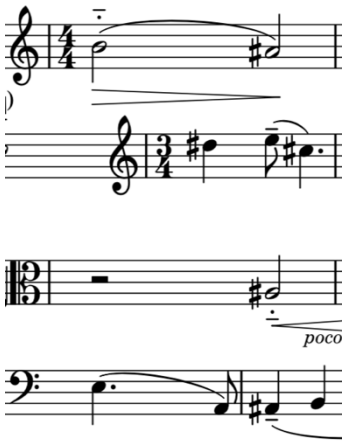
the elision is that Stravinsky breaks his rhythmic pattern to achieve it. Strictly speaking, the P0 row should have ended on the last beat of m. 4, but Stravinsky ties the final half note to another half note to create the moment of elision at m. 5.

Musical Example 7 *Double Canon,* mm. 4-5



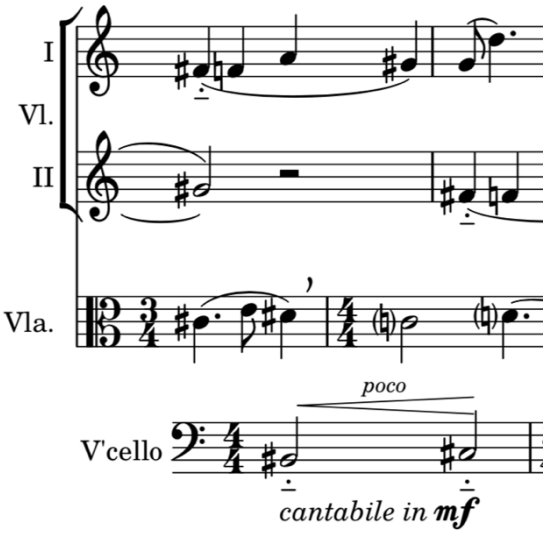
This elision appears again at m. 9 also with violin 1 and the viola. The first violin's repetition of P0 concludes and the viola's second R0 begins. The cello has a quarter note of A# for good measure as well.

Musical Example 8 *Double Canon,* m. 9



Stravinsky utilized a cutaway score to give himself greater freedom despite the strict rhythmic pattern. The barlines are not aligned in this work, as the meter changes in each voice along the established pattern, and steady quarter notes must be depended for counting on rather than bar lines; all measure markings here are based upon the first violin with vertical visual approximation for the lower parts. The cello has considerable freedom compared to the other three parts as it is written on a cutaway score. The viola enters in m. 5 on the same downbeat as the violins, but the cello enters on the third beat of m. 6.

Musical Example 9 *Double Canon,* m. 6



If Stravinsky had wanted to keep the entrances consistent, he certainly could have and entered the cello on the downbeat of m. 6. Obviously, he did not, and the goal can be surmised to facilitate the A# unison at m. 9 (refer back to Musical Example 8.)

At m. 10, the second violin concludes a row on A# and the first violin begins its final row transformation to IR0 which begins on an A#. Once again, there is a moment of perfect elision as the A#s hand off to each other. Using A# as a way to signal and anchor

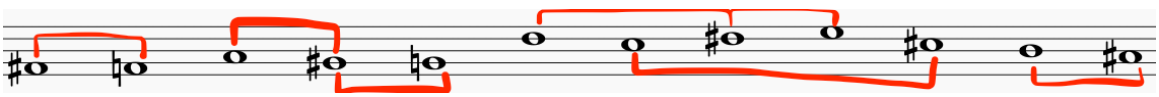
transformations and transitions solidifies its presence as a pitch that exerts a gravitational force over the first half of the work.

The row IR0 is an incredibly important row for this analysis as it begins with A# and ends on D, the two pitches identified as exerting the most gravitational weight. The conclusion to the piece in mm. 19-20 has the upper voice on a drone D while the second violin concludes the IR0 row with pitches of F#, C#, and B before following the first violin and resolving D# to D and sustaining (see Example 6).

The sustained unison and the half step motion implies a clear resolution. Stravinsky could have composed the final two measures to include more dissonance or without resolving to the same pitch, but he didn't. If this half step motion is indicative of a resolution figure and it comes at the end of a row, then IR0 acts to transfer the gravitational force from A# to D. If D and A# are analogous to being gravitational pitches, then the motion of B to A# found in mm. 4, 9, and 10 is also a resolution figure at the ending of those rows (as well as those points of elision). Therefore, A# and D can be established as pitches of gravitational pull. Voices resolve to them, they maintain the longest and most influential durations, and they anchor the piece at pivotal transitions between rows.

A second musical force besides gravity is also featured in "Double Canon." This figure reveals a series of half steps permeating the tone row used in this piece.

Musical Example 10 *Double Canon* Tone Row



Prime row with half step motion marked

The opening of the row establishes a descending half step motive that also concludes the row, as shown previously to be a resolution motive. In this analytical interpretation, inertia as represented in this piece is not a melodic force but rather a motivic one. Motion of a half step, especially that of a descending half step, becomes a driving and continuous feature of the row.

In the center of the row (D-C-D#-E-C#), it appears the half step motion is discontinued, but another interpretation disproves this. At the pitch D, the row splits into a compound melody where the D-D#-E and C-C# become upper and lower voices. Looking at the row in this way maintains the half step motion throughout the entirety of the row, although the direction of motion is now ascending.

I have come to this interpretation for a number of reasons. Firstly, the row is segmented into three sections. The opening five pitches initiate the half step motion with emphasis on the descending half step. The center of the row continues the half step motion but inverting to ascending motion in addition to splitting into two distinct voices. The end of the row is only the final two pitches, but the voices re-unite and the descending half step returns in a resolution figure. Secondly, thinking of the center of the row as two voices is consistent with Hatten's theory of virtual agents in the text of his book. Deviations from an established order can be explained by and thought of as musical elements enacting their own agency over the music, in this case, splitting into two voices to preserve the motive and inertia of a half step motive. A second voice, or agent, enters into the row to maintain the half step motion.

Double Canon provides a contrast to the application of musical forces as heard in "Musick to Heare." First, the canon uses a complete 12-tone row without any additional

material, and secondly the piece was composed during a later, more secure period of Stravinsky's serial composing. Both compositions feature gravity as a primary force prominently, however *Double Canon* accomplishes something "Musick to Heare" did not: a locus of gravity is established through entirely atonal means. The Shakespeare song made use of tonal elements and allusions, and those contributed to identifying C as the gravitational note. *Double Canon* has no tonal elements, and by using the same three criteria as "Musick to Heare," analysis was still able to discover which pitches were more influential over the entire composition.

"Musick to Heare" also featured the force of magnetism, whereas the canon featured inertia as a precompositional device within the row itself. *Double Canon* does not contain any examples of magnetism as defined by this analysis. The reasons for this relate to the nature of its highly serialized nature. Because the pitches of the row and the rhythms of the row were all serialized, little room was left for variation in between different instances and settings of the row form. Considering that magnetism is a local, passing gesture or emphasis and gravity is a universal, longer lasting emphasis, anything in this piece that would have been considered magnetic ends up being indicative of gravity. All the same moments of potential magnetism added up to reinforcing the same 2 pitches (at different points), and thus developed into gravity.

The distinctions between magnetism and gravity, their interplay, and how Stravinsky liberates himself from gravity will be illuminated more in the third and final analysis.

CHAPTER IV – EPITAPHIUM

Epitaphium is potentially the shortest work composed by Igor Stravinsky. It was published just a few months after *Double Canon*, however Douw (1998) states "we may speculate that *Epitaphium* is a transitional work that antedates *Double Canon*" as it is also a 12-tone work with no major differences in his serial style.[15]

It a mere seven measures long, and it features alternating voices in each measure consisting of either solo harp or a clarinet and flute duo. It begins with a measure of harp, and the wind duet follows in the next measure. This pattern continues three times and the harp performs the seventh and final measure. The sixth measure can be considered an outlier, as it is twice as long as every other measure. In this way, it appears the fourth repetition of the timbral pattern is inverted; the harp occurs after the wind duet in mm. 6-7. (See Figure 3.1 on next page.)

Registrally, the two voices are distinct. The wind duet never descends below C4, and while the harp occasionally peeks over C4 (D5 in m. 1, D#5 in m. 3, E4 and Eb4 in m. 7) it primarily resides in the bass clef. Therefore, it is unsurprising that the apex (B5) occurs in the flute and the nadir (C#1) occurs in the harp. To sharpen the contrast between registers the final note of every harp measure is extremely low. The distance from the last pitch of the first measure to the first pitch of the second measure is a leap of over two octaves, measures 3 to 4 is a leap of just over three octaves, and measures 5 to 6 is approximately three and half octaves. This creates a very fragmented experience for the

[15] André Douw, "Sounds of Silence: Stravinsky's 'Double Canon'," *Music Analysis* 17, no. 3 (1998): 316.

listener as the timbre, ranges, and musical content of the two voices are very different from each other.

The piece lacks time signatures, and the measures consist of varying lengths ranging from 3 quarter notes to 11 quarter notes. I cannot identify a pattern for the lengths of measures, and the individual quarter-note pulses are divided into about twenty different rhythmic arrangements of durations. Grace notes feature prominently throughout the melodic lines, and since their pitches are members of the tone row, the grace notes are perhaps more structurally important here than in tonal music. The combination of the grace notes interrupting the flow of the melody and the constantly shifting pattern of the rhythms contributes to a highly disorienting and unpredictable rhythmic quality to the piece.

Epitaphium is made up of 4 transformations of a twelve tone row. Stravinsky often eschewed the use of transposition in his serial compositions, and thus the transformations in this piece remain at the same pitch level. The four forms used in this piece are prime, retrograde, inverted, and inverted retrograde. Each measure contains exactly one example of a row (with the exception of m. 6 which contains two rows elided in the center) that occurs in a somewhat cyclical pattern through the composition.

Table 8 *Row Structure in Epitaphium*

	M. 1	M. 2	M. 3	M. 4	M. 5	M. 6	M. 7
Harp	P	~	I	~	R	~	IR
Winds	~	P	~	IR	~	R, I	~

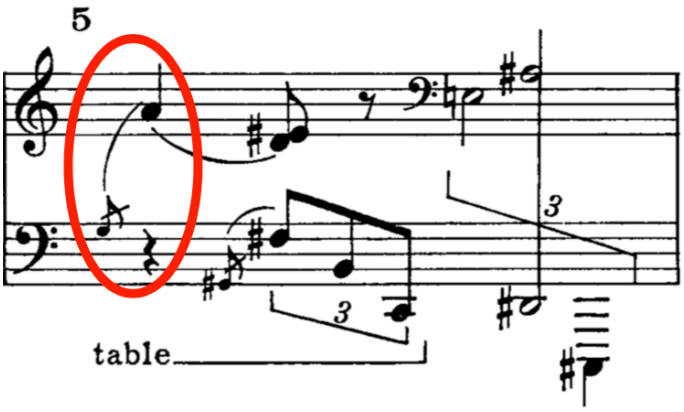
Inversion and inverted retrograde appear to signify the closing of a loop, while the retrograde forms could be a replacement or variation on the prime forms that appear in mm. 1-2. In this way, the row structure can be considered antecedent and consequent phrases: prime initiates, retrograde responds, and inversion is a conclusion to both phrases.

Table 9 *Tone Rows of Epitaphium*

Prime	C#	A#	D#	E	C	B	F#	F	D	G	G#	A
Inversion	C#	E	B	A#	D	D#	G#	A	C	G	F#	F
Retrograde	A	G#	G	D	F	F#	B	C	E	D#	A#	C#
Inverted Retrograde	A	A#	B	E	C#	C	G	F#	D	D#	G#	F

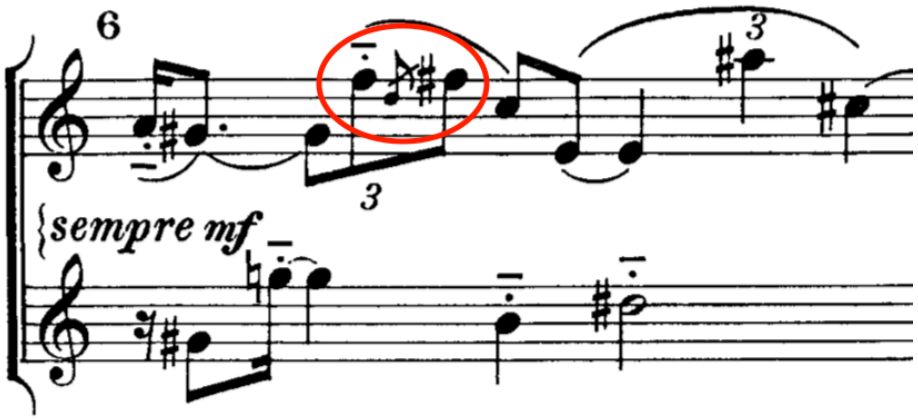
The pitches of all four rows are listed in Table 9. The accuracy of the rows may come into question upon close inspection as there are two occasions in which the ordering of the row is technically incorrect. In m. 5, Stravinsky places the third pitch G of the retrograde form at the beginning of the row, preceding the pitches A and G#.

Musical Example 11 *Epitaphium,* m. 5



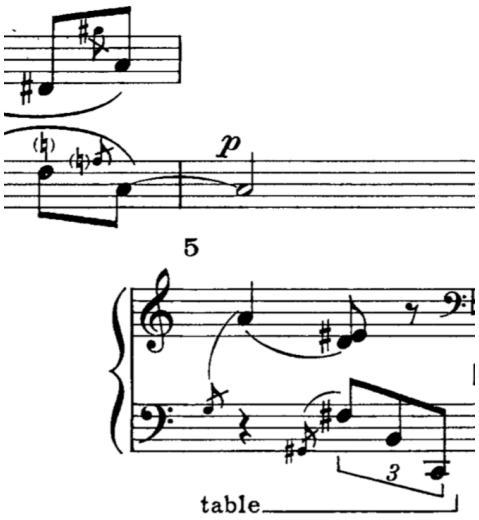
The second example occurs in the following measure, also in the retrograde form, where pc D is delayed to occur in between F and F# rather than before.

Musical Example 12 *Epitaphium,* m. 6



The change in the ordering of the row is just one factor in a list of unusual events that begin to occur at the halfway point of the piece. The first four measures of *Epitaphium* can be considered the unmarked (normative) section of the piece. The harp and winds alternate twice in the pattern established from the beginning, the voice parts do not overlap or elide in any way, and they are constrained to the registers as described earlier. At exactly the junction between measures 4 and 5 however, things begin to change. Firstly, both examples of misorderings of the row occur after m. 4. Secondly, the transition from m. 4 to m. 5 has the only example of elision between the harp and winds. The final eighth note of m. 3 is actually not a part of the inverted form of the row; there is an additional A4 tacked onto the measure that is tied to a half note so that the A4 in the harp is now the only unison between voices in the entire composition. The addition of the A4 at the end of m. 3 is solely there to provide the elision. This moment is also the only time the harp moves into the treble clef, another example of atypicality after measure 4.

Musical Example 13 *Epitaphium,* mm. 4-5



The extra-long measure 6 breaks the cycle of the alternating voices by including 2 forms of the row back to back in the winds. Lastly, retrograde forms do not appear until m. 5. All of these things contribute to *Epitaphium* having an arch-like structure: atypicality, or markedness, increases rapidly at m. 5 and then decreases as utilizing those elements normalizes, or unmarks, them.

Application of elements utilized in previous analyses can once again be used to discover structural pitches, often gravitational pitches, in *Epitaphium;* these elements are the beginning and endings of rows, duration of pitches, and unisons between voices. In this work, rows exclusively begin and end on the three pitches C#, F, and A. In fact, the pitch F never begins a row, however all three can end a row. In Straus' book on late Stravinsky, he argues that the pitch F carries musical meaning of death and finality in much of Stravinsky's work. *Epitaphium* is titularly an epitaph, and notably, only the rows

that end measures 6 and 7 conclude with an F, tonally signifying the ending of the piece itself[16].

The second element used to identify structural pitches is duration. In this piece, G and D are both sustained for 2 and two thirds beats in m. 1. The second longest duration is 2 and a half beats in m. 5 for A and in m. 2 for C#. The maximum any other pitch is sustained for is two beats. Due to the small range in variation of longest sustain for each pitch class, duration does not imply as much structural importance as it has in other pieces using this analysis.

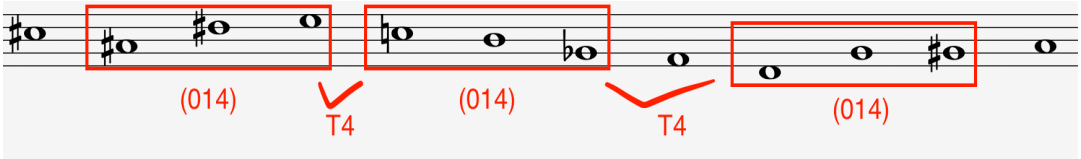
The third element is elision. Incredibly, *Epitaphium* has exactly one point of elision. This point of elision has already been described in depth above as it is the unison A4 between mm. 4 and 5. This moment is triply significant as it is the only source of elision, an alteration of the row, and the beginning and ending of the rows. These three elements, while duration is not as useful, make clear that A and C# are structurally important pitches to this work.

However, through different lenses of analysis, it becomes clear that the pitch F belongs with C# and A as structural pitches. Each pitch is T4 away from the other two, creating an augmented chord if stacked vertically or simply a symmetrical division of the octave. Furthermore, Straus' analysis of the row shows a series of 3 trichords (all of which are set [016]) that are themselves each T4 away from each other, and C#, F, and A are excluded from these trichords[17]. Therefore, by the distinction placed on these three notes in the deriving of the row itself and the fact that these pitches are the only ones to

[16] Joseph N. Straus, *Stravinsky's Late Music*, (Cambridge, Cambridge University, 2004) 202-208.
[17] Straus, 102.

begin or end row forms, the conclusion can be drawn that C#, F, and A are the key structural pitches to *Epitaphium*.

Musical Example 14 *Epitaphium* row with (014) marked



A unique element to keep in mind when analyzing this piece is that Stravinsky's original sketches show *Epitaphium* originated with only the four woodwind measures written sequentially. Stravinsky discovered the piece could easily be turned into a 12 tone duet, so he inserted the harp part to create the interchange of treble and bass as well as the two strophes of the row pattern. A unified structure of these measures is still present if the harp passages are removed, in fact more elision emerges. Measure 2 (now measure 1) ends on A4, where the first grace note of m. 4 is also an A4 in both voices. Measure 4 also ends on A4, and m. 6 begins on an A4 sixteenth note. The final measure of the woodwind sketches is m. 6, which concludes on F4. These specific design elements present A and F as structural even without the harp parts (C# loses some evidence in the sketches: it now begins the work as a whole, but the only other C# even somewhat notable is the elided C# that hands off the row forms in the extended m. 6).

However, Stravinsky did not simply slot in the harp measures without concern for their overall effect. As has been shown previously, the organization of the rows in this piece support the piece being a unified and complete work; the research of Andre Douw references a rhythmic quality present in the completed work and not the sketches. If one

were to re-meter Epitaphium so that every C# became a downbeat, the piece would be in a consistent 5/4 time until the final measure[18]. Rather than the constantly shifting tempo in the score, C# would serve as a marker of metric significance (this does not work for any of the other structural pitches). Obviously, this not borne out by the division of the instrumentation and row forms, but this internal structure only holds when the harp parts are included. These examples show us how the original woodwind sketch maintains the identical structural focus as the final version, as well as how Stravinsky possibly integrated the later composed harp measures.

David Carson Berry's dissertation reveals a specific element of invariance in the rows of Epitaphium, specifically the pairings of the pitches F/F# and G#/A (hereon described as [5,6] and [8,9] respectively to account for various enharmonic spellings in the score). Berry notes "these dyads may be emphasized more or less in the actual setting, but there is the potential to bring them out" in every measure except the IR rows (although an exception to this rule will be addressed).[19] Further analysis of the instances of these dyads revealed they often occurred nearby (016) verticals, creating a harmonic association[20].

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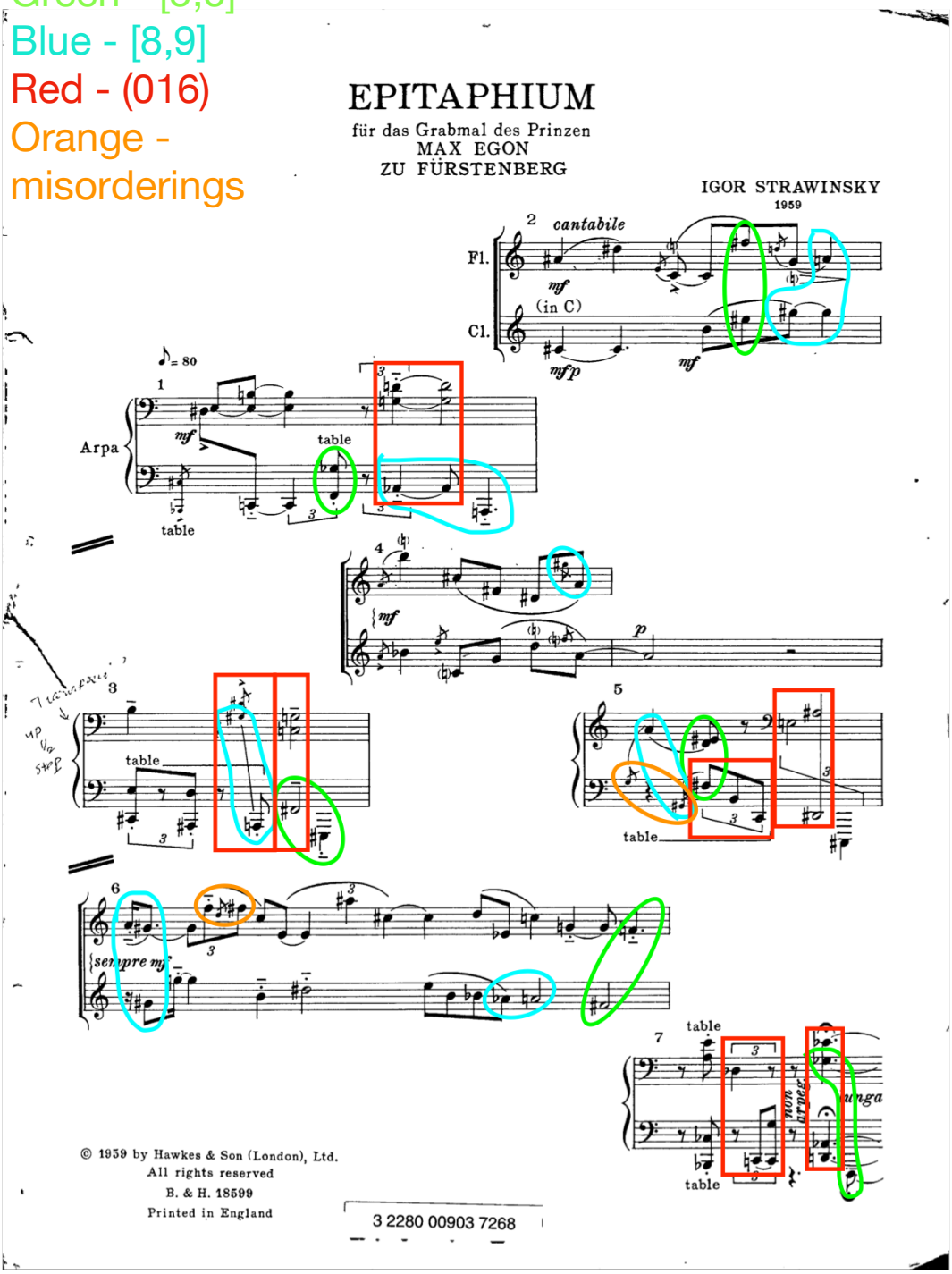
[18] André Douw, "Closing the Circle: Stravinsky's Epitaphium," *Muziek and Wetenschap* 5, no. 1-2 (January 1995), 118.

[19] David Carson Berry, "Stravinsky's 'Skeletons': Reconnoitering the Evolutionary Paths from Variation Sets to Serialism," (PhD diss., Yale University, 2002), 250.

[20] David Smyth notes in an article that the row for Double Canon also features the [5,6] dyad as well as an ordered tetrachord at opposite ends of the row. Considering their proximity in composition, it's interesting to think of them as being related.
David Smyth, "Stravinsky's Second Crisis: Reading the Early Serial Sketches," *Perspectives of New Music* 37, no. 2 (Summer 1999): 138.

Musical Example 15 *Epitaphium* Marked Score



The previous page is an edited version of the Epitaphium score highlighting specific elements. The red boxes are verticals of set class (016) in the harp part. The blue circles are dyads of [8,9], the green circles are dyads of [5,6], and the orange circles show the misorderings of the row. The uniqueness of these dyads is they conclude 6 out of 7 of the measures of this piece. However, what is most intriguing about them is that they seem to be either responsible for, or a result of, the markedness of the second half outlined previously.

The first three measures occur without any incident; both dyads are present in the prime and the inverted row forms. Neither dyad is present in the IR row form, however, the addition of the A4 at the end of that row in both wind voices creates the [8,9] dyad. This is the same A4 Stravinsky appended to create the single instance of elision, except remarkably, only the A in the bottom wind staff is sustained to create the elision. However, both wind voices include the appended A4 which leads to m.4 concluding with the [8,9] dyad that previously did not exist in the row.

The very next measure is the first example of a retrograde form, which does contain both pairs of dyads; the alteration to the order of the row threatens the sounding of the [9,8] dyad, however it merely delays that perception until the G# arrives as a grace note. Unlike m. 5, the misordering in m. 6 (also retrograde) does break up the forthcoming [5,6] by inserting D in between the dyad as a grace note.

The sixth measure has two row forms combined and follows the opening retrograde row with an inverted row, ending consecutively on both dyads. Finally in m. 7, one final adjustment is made. Being an IR form, no natural [5,6] or [8,9] dyad exists in the row. In a singular exception, Stravinsky constructs a vertical of 4 pitches for the harp

rather than the previous maximum of three pitch verticals. Due to all 4 pitches being played simultaneously, the final pitch F immediately follows the F# hidden in the chord, creating the final [6,5] dyad.

To sum up, there are 5 unusual adjustments that impact these dyads. One adjustment (m. 5) merely prolongs the dyad, one breaks up a dyad (m. 6), and the other three allow measures to end in dyads that previously wouldn't have (mm. 4, 6, 7). Two of those three measures end on F (mm. 6, 7), which as previously noted is a topically significant pitch for Stravinsky.

All of the adjustments just mentioned fit with what was identified as being marked and unmarked. Every example of a marked moment relates to the presence of the dyads in the second half of the work. Stravinsky places a great deal of importance upon these dyads, using the composition to force them into existence even when it is against the row's will. The [8,9] dyad pair relates to unmarked statements in the first half: the row forms exhibited here are the prime forms with the inverted conclusions to that grouping, and [8,9] ends three out of the four measures of mm. 1-4. Although the piece shifts to the retrograde statements in mm. 5-6, inversion still seems to be the conclusion to both statements, a sort of cadence perhaps. Both measures 6 and 7 conclude with the [5,6] dyad; the [8,9] dyad does not end a measure after m. 4. Considering the narrative importance Stravinsky places on the pitch F in this epitaph, it becomes clear why suddenly the [5,6] becomes marked.

Through examining the pattern of row form structure, noting the series of marked changes that occur halfway through the piece, and the use of the [5,6] and [8,9] dyads, it

becomes clear that Epitaphium utilizes an antecedent/consequent structure to its formal arrangement.

So far in analyzing these works with musical forces, the force of gravity has been a present and significant force, functioning essentially as an "atonal tonic". Epitaphium is distinct in this respect, as Stravinsky subverts the markings of gravity to create a truly center-less piece.

First, how do the three identifying features of gravity play out in Epitaphium? The beginnings and endings of rows are C#, F, and A, and as previously mentioned these are precompositional structural pitches. F never begins a row/measure; it only concludes, but all three pitches conclude rows. This is a great start for establishing gravity. Next, the only example of elision in the entirety of this short piece is the A tying mm. 4-5 together, once again a structural pitch. Finally, although the pitches G and D receive the longest duration (they are tied with 2 and 2/3 beats), the second longest pitches are C# and A with 2 and 1/2 beats. (8 pitches are tied with 2 beats, and F comes in short with only 1 and 1/2 beats). The pitches G and D do not receive any other gravitational support through significant elision or initials or finals in the row, so they may be disregarded.

Therefore, all the markers used to find the pitch of gravity identify C#, F, and A as all meeting the standards of gravity, especially C# and A. However, upon listening to Epitaphium, this is not supported phenomenally or aurally. There are a number of reasons for this. The primary reason is dividing the locus of gravity across three distinct pitches destroys the key idea of a note of gravity or an "atonal tonic". None of the pitches ever receive enough significance to become more important than the others. The register and the instrumentation is so fragmented that any relationships between the beginnings and

endings of rows does not become clear. On a formal level, the tone row pattern influences the form more than the structural pitches can. The notes C#, F, and A are not aurally established, they are too varied to centralize anything, and none of them individually act like a tonic pitch. These pitches are precompositionally made structural, but do not exert enough force on the music to be the loci of gravity.

Now, if the structural pitches are not gravitational because they do not exert enough influence on the piece as a whole, what musical force is the primary force in Epitaphium? Looking back on the analysis, it becomes clear the musical events that most influenced and affected the composition were the the dyads of [5,6] and [8,9]. Magnetism, while the most abstract force when applied to an atonal context, is clearly the force at work due to the way in which these dyads act upon the music.

This analysis already has shown how the presence of the [5,6] and [8,9] dyads created and influenced change in the composition (the only elision, misorderings in the row, the only treble harp part), so it is clear they are exerting some kind of force. One of the markers of magnetism is the brevity of the influence. Each measure of this composition is exactly one instance of the tone row; in this way the influence of the dyads is limited to a single measure at a time, if they are even present. The dyads do not feature all the markers for gravity (even though the structural pitches do): they are not always of a long duration, and they are not always the beginnings and endings of rows. [8,9] is part of the elided pitch, but that is the only gravitational marker that clearly applies to the dyads. The dyads are also affected differently each time they appear. In one instance the elision creates a dyad, another time a misordering of the creates a pair, or perhaps a vertical is extended to four pitches rather than 3 to bring together the pitches F

and F#. Therefore, unlike in Double Canon, the musical force is not emphasized in the same way repeatedly. Gravity is a universal force that becomes universal through continuous and repetitive reinforcement, but magnetism is local force that exerts influence on small sections of the work at a time. In Epitaphium, it is clear that the dyads themselves are the loci of magnetic force and they are influencing the work with that force.

In the *Double Canon*, A# was made to be more significant through the precompositional design of the row. It was at the end of the row, and it was a note of intentional duration. The precompositional emphasis it received all but guaranteed its gravitational role, without even mentioning the formal structure of the rows. In "Musick to Heare", C and G are both pitches of influence, gravity and magnetism respectively, and once again this is a precompositional feature. C and G are the only shared pitches between the two sets that intertwine to make up the texture of "Musick to Heare". Epitaphium stands in contrast to this. There are prominent structural pitches that were designed to be that way precompositionally. However, the way in which Stravinsky utilizes these pitches in the actual composition does not allow them to exert influence over the music as the structural pitches of Double Canon and "Musicke to Heare" did. Stravinsky found a way to shift the primary force over to a small-scale events rather than a single centralizing pitch. It is no coincidence that two of the structural pitches of Epitaphium, F and A, are also featured in the dyad pairs. F and A are more than just precompositional artifacts; they become stronger as forces in the presence of their allies. If gravity in atonal and serial works represents itself as simply an "atonal tonic", like in

“Musick to Heare” and Double Canon, in Epitaphium Stravinsky found a way to divest the power of the musical forces across more notes and to truly escape a centralizing force.

CHAPTER V – RESEARCH AND CONCLUSIONS

Research on serial Stravinsky is not in short supply, yet regarding the short chamber pieces referenced in this thesis, not much is available. There is very little written about *Epitaphium* and *Double Canon* in particular. This is likely due to the modest length of each composition. The only research I found written about both pieces were the articles Douw (1995)[21] and Douw (1998)[22]. Douw's research is concerned with a prototypical row that he suggests Stravinsky utilized in the design of many of his serial works of this period. His work also concerns itself with structure and symmetry as it relates to meter and the interaction with real world time, but does not deal with gestural or harmonic elements of those pieces as this analysis does.

Hatch (2013) provides a transformational analysis of *Double Canon* in the tradition of David Lewin. Her analysis centers around the groupings of rows, and it shows how two axes of symmetry explain the transformations within each grouping and in their relation to each other.[23] This analysis shows another way to consider the canonic nature of the work through transformations connected to each other by symmetrical motion. This analysis, however, does not concern itself with the pitches or the contents of the rows themselves.

Perhaps the most useful book in studying serial Stravinsky is Joseph Straus's *Stravinsky's Late Music*. This book provides an excellent description of Stravinsky's turn to serialism, his relationship with other serialists, and most importantly descriptions of the methods Stravinsky used in this period of his career. As this book is an overview, it

[21] Douw 1995, 104-105.
[22] Douw 1998, 315-316.
[23] Hatch, 17-26.

focused on interesting or pertinent elements of most of the serial works, but doesn't bog down into deep detail on any of them. Apart from a chapter establishing topical ideas utilized by the composer during this time, there is no narrative analysis, and certainly nothing about musical forces.

Of the three pieces analyzed in this thesis, "Musick to Heare" has by far the most published academic writing. Many of these works discuss the interplay between diatonic and chromatic, tonal and atonal, and stepwise and serial. Neidhofer 1999 discusses the relationship between the text and the music and how a key feature of the vocal work is text painting.[24] However for all the works that acknowledge C and G being important elements of the piece, I have found none that offer an analysis based on musical forces.

Something that should be noted in regards to the analysis of "Musick to Heare" is a disagreement in how to approach the arrangement/structure of the rows themselves. In Berry 2008, examination is given towards grouping elements in the reference sequence (P0-I9-P0, I0-P9-I0) in varying arrangements: 12 element segments, 8 element segments, 4 element segments, 3 element segments, and 6 element segments.[25] Richards 2003 posits for a transformational analysis which the 4 note set is overtaken in importance to the combined 12 note set of P0-I9-P0, and furthermore is twisted to a 24-note "object theme" when combined with the inverted reference sequence.[26] Analysis of "Musick to Heare" in this thesis has remained consistent in analyzing the work as developed through the basic

[24] Christoph Neidhofer, "An Approach to Interrelating Counterpoint and Serialism in the Music of Igor Stravinsky, Focusing on the Principal Diatonic Works of his Transitional Period," (Ph.D. diss., Harvard University, 1999) 168-170.
[25] David Carson Berry, "The Roles of Invariance and Analogy in the Linear Design of Stravinsky's 'Musick to heare'," *Gamut* 1, no. 1 (2008): 11-14.
[26] William H Richards, "Transformation and Generic Interaction in the Early Serial Music of Igor Stravinsky," (Ph.D. diss., University of Western Ontario, 2003) 187-201.

4 note set described in that chapter. Considering this analysis was not a transformational analysis and that specific mention was made of the combined weight the 4 note set creates through the reference sequence and inverted sequence, it did not seem necessary to describe the structure as Richards does. The evidence and function of the musical forces is not lessened by whether the structure is at its base a 4 note set, or two 12 note sets, or one long 24 note set.

This thesis contributes to filling a research gap found in the chamber works of serial Stravinsky by performing analysis on the three brief compositions. However extant research in this area does not dwell at all in realm of narrative theory, and specifically none of it is based on the concept of Larson's musical forces as applied by Hatten. Hopefully my research can help further work on these ideas as well as fit valuably into the canon of theory that already exists.

There are a number of routes further research with these ideas could develop towards. Numerous jumping off points are available to researches and theorists to pursue, either in similar content or related applications and ideas.

First and most obviously, more application of musical forces can be done on the works of Igor Stravinsky. The selection of pieces for this thesis were limited to brief chamber pieces, one from his earliest serial compositions and two from near the middle of that period. This leaves large spans of time out of the scope of the thesis. Analysis could be done on the latest serial Stravinsky, or on the earliest of it all. Particularly fascinating research could derive from comparing musical forces as they appear in early and late serial Stravinsky in greater detail. Do the exact applications of musical forces, as presented in this analysis, hold up or do they transform over time?

Larger scope compositions also were not addressed in these analyses. Longer forms could potentially expand the role of gravity in the work. *Agon, Movements,* and *The Flood* are all distinct in serial construction to the compositions analyzed here, and their longer forms would reveal even more about the applications of musical forces to Stravinksy's work.

A second path for further research would be atonal music beyond that of Stravinsky. Stravinsky was selected due to personal interest as well as hope that his distinctive contrapuntal style would prove fruitful, however the initial example used to launch this project was Hatten's application to Schönberg. Any of the notable atonal composers would be useful to analyze in this way to discover if this is an entirely new way to think about musical forces. Another qualifier to note is that all three of the pieces analyzed were serial in nature, not just atonal. Due to the restrictive and prescriptive nature of serialized music, there is a comparatively incredible amount of freedom in atonal music. Presumably, one could find an immense number of examples of magnetism that derive from the voice leading of merely atonal music. Again, Hatten's example comes from Schönberg's pre-dodecaphonic period. There are many opportunities in atonal music itself.

Thirdly, musical forces is an area of study adjacent to the burgeoning field of narrative theory. This present analysis has leaned away from direct connections to narrative theory, rather focusing on more tangible relations to tonality and voice leading, however it would not be difficult to apply these ideas to that field. Hatten references musical forces early in his book on agency to use them for the motivations and energies

that either create the forces or resist them. Musical forces can provide evidence of agential influence.

Musical forces have often been closely related to areas of music cognition, especially in the works of Larson. If desired, music cognition could begin exploring what sort of mental connections listeners make with atonal music and how that can confirm or deny listeners' awareness of musical forces.

Finally, there is a limited amount of research on the pieces *Double Canon* and *Epitaphium* themselves. While these works are admittedly very short, the small quantity of Stravinsky serial works means that every single piece is valuable and can show something about Stravinsky's compositional methods. Musical forces is merely one lens theorists can use to examine these pieces, and work on them should not stop here.

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