Proportion Canon and the Golden Mean in Arvo Pärt's *Cantus in Memory of Benjamin Britten*

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Abstract

Arvo Pärt's Cantus in Memory of Benjamin Britten was written to convey the composer's intense emotions upon learning of the death of musical icon Benjamin Britten. Pärt utilizes several key compositional techniques in Cantus. Written in 1980, it incorporates his newly discovered tintinnabuli style of composition alongside the use of proportion canon, which occurs when more than one voice enters simultaneously, each presenting the same melodic material, however with note values that are augmented or diminished according to a fixed ratio. Additionally, the composer marks a significant point in the composition at the Golden Mean, the point at which the ratio of a smaller section (x) to its larger counterpart (y) is equal to the ratio of the larger section to the whole (x:y = y:x+y).

Keywords: Arvo Pärt, Cantus, Benjamin Britten, proportion canon, golden mean, tintinnabuli

Introduction

Arvo Pärt's *Cantus in Memory of Benjamin Britten* is an extremely powerful and moving musical work that combines the composer's tintinnabuli style with the compositional devices of proportion canon and Golden Mean proportion to convey the intense emotions of the composer at the death of musical icon Benjamin Britten. The British composer passed away on December 4, 1976 before Pärt had the opportunity to meet him, and this affected him deeply. "…I could recognize the magnitude of such a loss…I had just discovered Britten for myself. Just before his death I had begun to appreciate the purity of his music…for a long time I had wanted to meet Britten personally – and now it would not come to that" (Pärt, 1981).

The emotional impact of Pärt's *Cantus* can be directly linked to the compositional devices that he incorporates. The first to be examined is his tintinnabuli style, drawn from the worship traditions of the Orthodox faith. The precise definition of tintinnabulum is "a small tinkling bell," and it is the sound of a bell and its accompanying overtones that Pärt seeks to recreate with his tintinnabuli technique. In Orthodox tradition, the ringing of bells involves the use of predetermined rhythmic patterns, and this use of patterns and prototypes is an essential element of its theology (Sizmic, 2004, p. 127). The smaller bells used during worship are very likely the prototype for Pärt's compositional style: "The three notes of the triad are like bells. And that is why I call it tintinnabulation" (Hillier, 1997, p. 87).

Materials and Methods

1. Tintinnabulation

Pärt's compositional method of tintinnabulation involves the application of simple rules that govern the interrelationship between melodic and harmonic voices. The melodic voice (known as the M-voice) is sung or played by one or more voices or instruments, and the harmonic framework is known as the tintinnabuli or T-voice. The T-voice sounds the note of a tonic triad directly above or below the M-voice (1st Superior or 1st Inferior, respectively), or one triadic interval removed, directly above or below the M-voice (2nd Superior or 2nd Inferior, respectively). An additional alternative employed by the composer is for the T-voice to alternate between a note of the tonic triad above the M-voice, and one below the M-voice.

In a personal conversation about his tintinnabuli technique, Pärt indicated to interviewer Paul Hillier (1997, pp. 93-97) that the melody, or M-voice "always signifies the subjective world, the daily egoistic life of sin and suffering; the T-voice, meanwhile, is the objective realm of forgiveness. The M-voice may appear to wander, but is always held firmly by the T-voice. This can be likened to the eternal dualism of body and spirit, earth and heaven, but the two voices are in reality one voice, a twofold single entity…he felt strongly that this…is fundamental to the music's operation, and that it both precedes and dominates the actual process that underwrites each individual tintinnabuli composition."

1.2 Tintinnabulation in *Cantus*

In *Cantus*, Pärt uses a simple application of tintinnabulation in the position of 1st Inferior. The T-voice exclusively utilizes the pitches of an A minor triad, and the M-voice that of Aeolian (A minor) mode. For example, as the M-voice sounds the pitch classes A-G-F, the T-voice sounds pitch class E. Once the M-voice descends to pitch class E, the T-voice sounds C directly below it; when the M-voice descends to C, the T-voice sounds A below that, and so forth (see Example 1). While the melodic and harmonic materials revolve around the tonal center A, Pärt's *Cantus* is hardly tonal in nature. The alignment of major and minor seconds (D-C and F-E) that result from the combination of tintinnabuli technique described above, and the various speeds at which the melodic material is presented, produce a number of vertical sonorities that exhibit extreme dissonance. For example, the vertical sonority at the beginning of m. 15 contains a tonal cluster of the pitch classes A-G-F-E-D-C, or set (0,1,3,5,8, 10). Such vertical dissonances occur throughout the composition (see Example 2).

Results and Discussion

2. Analysis of *Cantus*

Cantus is scored for bell and strings. Four of the five string sections are played divisi– the 1st and 2nd violins, cellos, and basses – with the upper parts presenting the M-voice and the lower the T-voice. The violas, however, present only the M-voice throughout. Typical to many of Pärt's instrumental works, the M-voices in *Cantus* utilize a pattern based on a mode or scale, in this case the Aeolian (A minor) mode. Each M-voice begins on the tonic A, then sounds the next lowest pitch of the mode (G) before returning to A again, then descending to one further note of the mode (F) before returning to the tonal center. This pattern continues in the M-voice at least until reaching the pitch of the mode that is one octave below the starting pitch, as is the case for the contrabass and cello, or progressing further, as is the case for the violins and violas. Each voice also follows the rhythmic pattern of a long note followed by one half its duration. For the 1st violins, this is a half note followed by a quarter note. Each successive instrumental entrance utilizes an augmentation of the previous entrance, so that the 2nd violins sound a whole note followed by a half note, etc. (see Example 3).

The basses perform this pattern exactly once, starting on A2 and descending to A1; the cellos also perform it once, beginning on A3 and descending to A2, though repeating the final statement of the entire mode without the T-voice. The violas continue the pattern beyond one octave, continuing to descend stepwise from A4 until reaching E3, also repeating the final statement of the descending scale before sounding the E3 for the final 24 measures of the piece. The 2nd violins perform the pattern for a full two octaves, spanning the mode beginning on A5 and descending to A3, repeating the final statement before sustaining the A3 for the final 34 measures. The 1st violins span the largest distance, beginning on A6 and descending to C4, repeating the final statement of this descending scale before sustaining the C4 for the final 44 measures. Thus, for the final 24 measures of the work there is a sustained A minor triad in second inversion; the final sonority of A minor in root position is reached when the basses arrive at A1 in m. 103.

The bell sounds pitch center A4, presenting a sparse rhythmic ostinato: a two measure pattern repeated twice (six measures) followed by two measures of rest. This continues until the entire A minor triad is being sustained by the violins and violas, at which point the bell stops. This is consistent with Pärt's use of the term tintinnabuli: once the triad is sounding continuously, the bell is no longer needed. It sounds one more time in the sixth measure of the final A minor sonority, used only to punctuate the final sonority and echo beyond the sound of the strings.

2.1 Proportion Canon

A second compositional device utilized by the composer is that of proportion canon. For purposes of definition, proportion canons should be understood to occur when more than one voice enters simultaneously, each presenting the same melodic material, however with note values that are augmented or diminished according to a fixed ratio. This concept has sometimes been conflated with the concept of a mensuration canon, but in the latter one or more note values are changed from ternary to binary, or vice versa. Pärt uses a strict pattern of augmentation to create the proportion canon of this work.

The time signature in *Cantus* is 6/4. Pärt's composition begins with six measures in which only the bell sounds on pitch center A4. The strings enter with the melodic and harmonic material in m.7 as the 1st violins enter on the fourth beat, repeating a pattern of a half note followed by a quarter note (2 beats – 1 beat). The note values are doubled with each successive instrumental entrance, including the first three beats of rest (see Example 3). Thus, the 2nd violins have six beats of rest and enter on the downbeat of m. 8, repeating a pattern of a whole note followed by a half note (4 beats – 2 beats). The violas double the note values of the 2nd violins when they enter in m. 9 after 12 beats of rest and repeat a pattern of a dotted whole note tied to a half note (8 beats) followed by a whole note (4 beats). The cellos enter in m. 11 after 24 beats of rest and double the note values of the violas (16 beats – 8 beats), and the basses enter after 48 beats of rest in m. 15, doubling the note values of the cellos (32 beats – 16 beats).

In addition to the gradually descending Aeolian scale, *Cantus* begins with the 1st violins entering at a dynamic level of *ppp*. The 2nd violins enter at *pp*, the violas and cellos at *p*, and the basses at *mp*. A gradual crescendo takes place in each of the parts, until they reach the dynamic level of *fff*in m. 63. The combination of the descending motive in each of the string parts, which constitutes a type of tonal painting designed to illustrate sighing or weeping, combined with this gradual crescendo create a powerful emotional impact that makes *Cantus* one of Pärt's most moving works.

2.2 Golden Mean Proportion

The third compositional technique that will be examined here is Pärt's use of Golden Mean proportion. The Golden Mean, also known as the Golden Ratio, Divine proportion, and Golden Section, is present when the ratio of a smaller section (x) to its larger counterpart (y) is equal to the ratio of the larger section to the whole (x:y = y:x+y). In visual art and architecture the Golden Mean has been considered by many to be the most visually pleasing proportion, and can be traced back at least as far as Euclid, who in his Elements referred to this as the "division in extreme and mean ratio." The 1509 publication of *De Divina Proportione* by Luca Pacioli, illustrated by Leonardo da Vinci, popularized the term "divine proportion"; it was not until the 1835 publication of *Die reineElementar-Mathematik*by Martin Ohm that the term "goldener Schnitt" ("golden section") came into use (Markowsky, 1992, pp. 2-4). Mathematically, the Golden Mean marks a point approximately 61.8% of the whole, because the remaining 38.2%, when divided into 61.8, itself equals 61.8%.

Thus 38.2/61.8 and 61.8/100 are equal, orx : y (61.8)= y : x+y(61.8).Because the Golden Mean is an irrational number, however, since the early twentieth century it has been represented by the Greek symbol phi ϕ, equal to .61803398875…Directly related to the Golden Mean is the Fibonacci numerical series, where each number is the sum of the previous two: 0 1 1 2 3 5 8 13 21 34 55 89 144 233, etc. The ratio of any two consecutive numbers in this series approximates the Golden Mean, with the ratio getting closer as the numbers get higher (Roig-Francoli, 2008, p. 22).

2.2.1 Golden Mean proportion in music. Many claims have been made related to the use of the Golden Mean within the fields of architecture, sculpture, and painting. However, claims for its presence in music are a recent phenomenon, appearing only within the past century. Research into the works of Mozart and Beethoven, for example, has pointed to use of the Golden Mean as the formal basis for many sonata-allegro first movements in the piano sonatas and string quartets of these composers, and in the symphonies of both Beethoven and Brahms. Writing in 1950, author J. H. Douglas Webster describes the appearance of the Golden Mean in architecture, dating back to the ancient Egyptian pyramids, art, nature, poetry, even birdsong. He cites numerous examples of its appearance in music, going back as early as Bach's 48 Preludes from the Well-tempered Clavier, to the works of many nineteenth- and twentieth-century composers including Schoenberg and Bartók. Yet he acknowledges that its appearance in other forms, particularly rondo, fugue, and variation, is extremely rare, and raises the question as to whether these composers intentionally incorporated such proportions. He concludes that "it seems more probable that the form has been expressed instinctively so far by all musicians."

A similar question is raised in an article by Roy Howat (1977) in *Music & Letters*, in which he analyzes one composition each of Ravel and Debussy with respect to the Golden Mean. He does so to evaluate the analysis of Hungarian musicologist Ernö Lendvai, who claimed its prevalence in the music of Bela Bartók, the latter often looking to his French predecessors as a source of inspiration. Howat's analysis does indeed point to the importance of the Golden Mean in both Ravel and Debussy's works, which leads him to question "whether such planning is conscious or the result of an exceptionally refined instinct. None of the three composers discussed here left any direct written evidence of his technical methods in this respect…"

2.2.2 Acceptable range of deviation from the Golden Mean. Skeptics have questioned the accuracy of many claims related to the Golden Mean in art, architecture, even in nature. George Markowsky, a professor at the University of Maine who earned his Ph.D. in Mathematics from Harvard University, sought to disprove claims of Golden Mean proportion about the Great Pyramids of Egypt, the Greek Parthenon, and the United Nations building in New York City, among others, in his "Misconceptions about the Golden Ratio" (1992) published in *The College Mathematics Journal*. Music theorist Stuart Woronecki extended many of Markowsky's critiques to claims about the Golden Mean in music in his 2000 thesis "A Critical Study of the Use of Golden Ratio in the Analysis of Musical Form, With Recommendations for Effective Applications."

Since the Golden Mean is itself an irrational number, central to the discussion of its presence in music is to determine what degree of deviation from ϕ is acceptable to assert the presence of Golden Mean proportion. Markowsky (1997) puts forth the argument that ± 2% is a generous range for deviation. That would provide an acceptable range of deviation from .606 to .630. It is also important to remember that both the ratio of x:y and that of y:x+y must fall within this range. Many analysts have focused exclusively on the ratio of the larger section to the whole, that of y:x+y. However, as John Putz(1995) points out in his article "The Golden Section and the Piano Sonatas of Mozart," for any two numbers this ratio will always be closer to the Golden Mean than the ratio x:y.Thus, the latter ratio must be also within the range of acceptable deviation for Golden Mean proportions to be present.

Conversely, Rudolf Arnheim of the University of Michigan (1981) argues that artists may be visually drawn to the Golden Mean because of its pleasing proportions, whether or not it matches the mathematical proportions precisely. The same reasoning is valid for music, as well. John Putz, while calling into question the mathematical accuracy of Golden Mean proportion in Mozart's piano sonatas, still concludes that "(p)erhaps the golden section does, indeed, represent the most pleasing proportion, and perhaps Mozart, through his consummate sense of form, gravitated to it as the perfect balance between extremes. It is a romantic thought."

2.2.3 Golden Mean proportion in *Cantus*. In *Cantus*, Pärt has the first violins repeat the final scale passage that descends from A6 to C4, before sustaining the C4 for the remainder of the composition. The point at which they begin to sustain the C4 is m. 65 of the composition, which itself comprises a total of 108 measures. Two measures later (m. 67) the second violins first arrive at the low A3 that they will eventually sustain to the end of the composition. Prior to this point, the M-voice in the 1st violins has been the most prominent voice to which the listener's ear is drawn. But at the conclusion of m. 67, as the 1st violins sustain the pitch C4, it is the M-voice of the 2nd violins that takes the melodic lead, marking that point between m. 67 and 68 as one of significance (see Example 4). This point in the composition aligns perfectly with the Golden Mean, clearly falling within the ± 2% degree of deviation, with y:x+y = .620, and x:y = .611.Add to this that the strings first reach the dynamic marking of *fff* in m. 63, and it is clear the composer intends this to be a climactic point in the composition. Given the augmented note values played by the second violins, there is a distinct sense that the music has begun a deliberate march to the conclusion of the work, and thus the fact that this is precisely at the Golden Mean is of significance not only to the formal structure, but to the aural and emotional impact of *Cantus*.

2.3 Variation

While the rules of tintinnabulation are very fixed, it is not unusual for Pärt to deviate from the strict application of these rules in order to highlight an aspect of his compositions. The composer himself speaks to his deviations from the rules of tintinnabulation. In his 1989 interview with Jamie McCarthy, Pärt suggested that the principles of construction formulated for the tintinnabuli mode of composition "must not be the most important part of the music. They must be simple – they fall away and are only a skeleton. Life arises from other things." In fact, the composer's very first composition in the style, *Für Alina*, provides an excellent example of how deviating from the established rules of tintinnabulation produces a remarkable point in the music.

The work begins with a B2 - B0 pedal, serving as a drone, held until the eleventh measure. After this has sounded, the right hand of the piano produces the M-voice while the left hand produces that of the T-voice in the position of 1st Inferior, sounding the pitches of a B minor triad. This relationship is maintained throughout the work with one exception. In measure 11, as the pedal bass finally ends, the T-voice leaves its role for a moment as the left hand plays a C#5. It is a remarkable moment, for just as the listener's ear has become accustomed, even in such a short period of time, to expect the D5 to sound with the F#5 of the right hand, instead the interval of a fourth at this point creates a dramatic gesture. In addition to the sonic impact, in Pärt's handwritten score of the 1976 work, he drew a flower directly in the center of the interval, as if to underscore his conception that "Life arises from other things" (Example 5).

2.3.1 Variation in *Cantus*

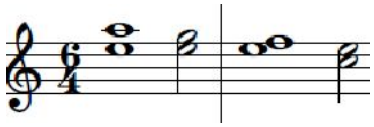
As previously mentioned, Pärt's use of tintinnabulation in *Cantus* ceases at various points in the composition for each of the different instrument voices. Once each voice reaches the lowest pitch it will sound, the entire descending scale is repeated (with the exception of the contrabass), with the final, lowest pitch being sustained to the end of the composition. As the concept of tintinnabulation is tied to the triad, representative of the sounding of a bell and its accompanying overtones, once the entire triad is being sustained, beginning in m. 87, the bell falls silent. In the repetition of the cellos' final statement of the descending theme, the T-voice disappears and the M-voice sounds alone. At this point (m. 87) the T-voice of the basses also disappears. As this marks the same point in the composition that the A minor triad is being sustained by the violins and violas and the bell ceases to play, the dismissal of the T-voice is significant, as the sustained triad has taken its place. (Example 6). The bell, however, is played one last time, when it is rung in order to accentuate the final sonority of the strings and allow the music to echo out into silence.

Conclusions

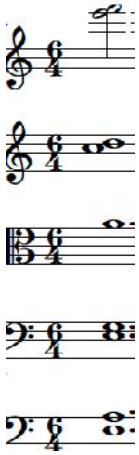
Arvo Pärt's *Cantus in Memory of Benjamin Britten* utilizes his tintannabuli style of musical composition to create an emotionally powerful tribute to the late Benjamin Britten, weaving together the melodic and harmonic voices according to the rules of tintinnabulation in a descending theme based on the Aeolian mode, with tonal center A. From the outset of the presentation of melodic material in m. 7 to its concluding sonority in m. 103, the theme descends five octaves from A6 in the first violins to A1 in the contrabasses, a descent that is accompanied by a crescendo from *ppp*to *fff*. This descending theme is typical of tonal painting that is intended to illustrate sighing or weeping, and is particularly relevant for this memorial to the fallen Britten. In addition to using tintinnabuli techniques, Britten incorporates a proportion canon, in which the rhythmic values performed as each instrument enters are in augmentation of those used in the previous instruments' entrance. Thus the rhythmic values of the first violins, a half note followed by a quarter note, is doubled by the second violins; the violas double the note values of the seconds, the cellos of the violas, and the basses of the cellos. This not only produces a variety of consonant and dissonant sonorities, but creates variety in the number of repetitions of the theme that each instrument presents, and the length of the theme itself, which varies from one octave in the cellos and basses to almost three octaves in the first violins.

While the presence of Golden Mean proportion is conjectural, it is important to note its presence at a significant point in the composition, the point at which the second violins take over the most prominent statement of the theme, while the first violins have begun to sustain C4 to the end of the work, and all the instruments have reached the loudest dynamic of *fff*. This marks a significant point in the composition, as the augmented note values of the second violins create a powerful emotional sense that the music is marching to its ultimate climax, a sustained A minor sonority that takes over the role previously performed by the bell and the T-voices. The bell sounds one last time, just as the strings release the final chord, as if to echo out into eternity. As stated by Paul Hillier (1997, pp. 93-97), for Pärt the M-voice represents "the daily egoistic life of sin and suffering," while the T-voice is "the objective realm of forgiveness." At the conclusion of *Cantus* the M-voice has disappeared and only the sustained A minor sonority remains, representing this "objective realm of forgiveness," as if the composer sought to dissolve Benjamin Britten's earthly life into a heavenly realm of divine grace. Nora Pärt, the composer's wife, states that "[t]he last chord of *Cantus* is seemingly never-ending. It just stands there, neither growing nor decaying. Something has been achieved and it shouldn't be given up. The content of the whole work leads up to this point" (Pärt, 1981). It is a profound and fitting eulogy for one of the twentieth century's greatest composers.

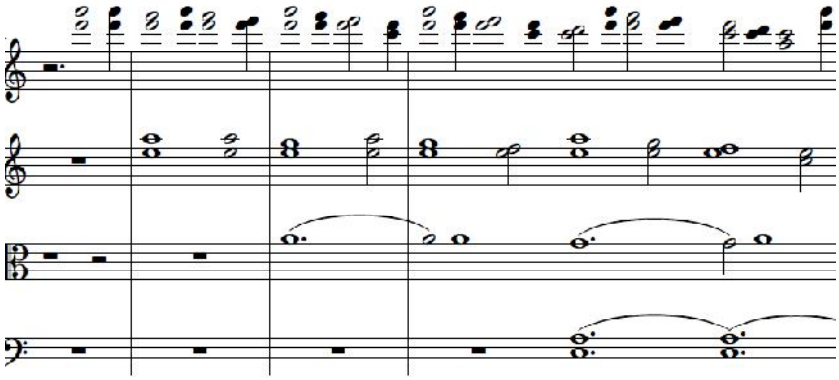
Examples



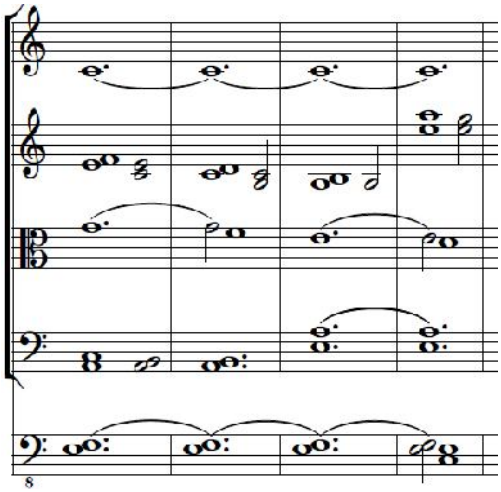
Example 1: M-voice and T-voice in position of 1st Inferior in 2nd Violin



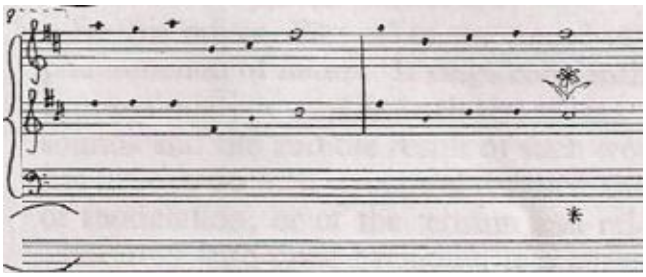
Example 2: Tonal cluster in m. 15 of set (0,1,3,5,8,10)



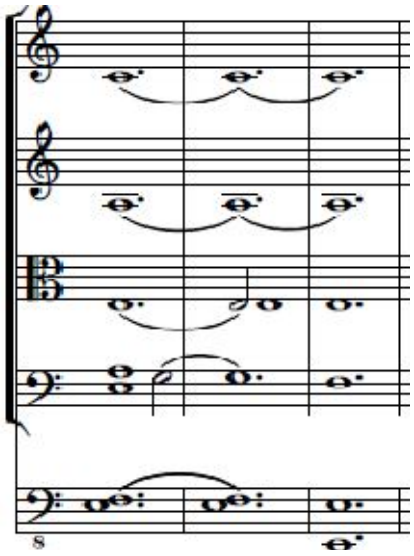
Example 3: Descending melodic pattern and rhythmic augmentation in mm. 7-12



Example 4: Measures 65 to 68, showing the Golden Mean between mm. 67 and 68



Example 5: Für Alina, measures 10-11 (McCarthy, 1989, p. 133)



Example 6: Measures 85 to 87 showing A minor triad in the violins and viola, and the cessation of the T-voice in the cellos and basses.

Author's note

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