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AN INVESTIGATION OF AXIS-BASED SYMMETRICAL STRUCTURES IN TWO COMPOSITIONS OF BÉLA BARTÓK

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AN INVESTIGATION OF AXIS-BASED SYMMETRICAL STRUCTURES
IN TWO COMPOSITIONS OF BÉLA BARTÓK

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To my mother and father

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure | Page

Figure | Page

Chapter I

INTRODUCTION AND PROCEDURE

Introduction

Among the composers of the twentieth century, Béla Bartók holds a place of prominence. According to Grout, Bartók is "one of four or five composers active between 1910 and 1945 whose music is likely to endure for several generations to come."[1] Because of the stature of the composer and the subsequent enduring quality of his music, it is appropriate that musicians be thoroughly acqainted with every aspect of his compositional style.

Purpose of the Study

The present study was concerned with the use of symmetrical structures in two compositions of Béla Bartók. Specifically, the study addressed itself to the following questions: (1) What types of symmetrical structures are present in each of the two compositions, and by what techniques are they produced? (2) With what frequency do symmetrical structures occur in the two compositions? (3) At which architectonic levels do various symmetrical structures occur? (4) What relationships are present among

[1] Donald Grout, A History of Western Music (New York: W.W. Norton & Company, Inc., 1960), pp. 612-13.

the various types of symmetrical structures and the architectonic levels at which they occur?

Hypothesis

The hypothesis upon which this investigation was founded is that the axis-based symmetrical structure is a recurring and therefore important feature of the compositional style of Béla Bartók. Beardsley states that style is a collection of recurrent characteristics.[1] Compositional style, then, is a collection of characteristic features which recur in the works of one composer. Thus, any one of those features is considered to be a part of the composer's style. Prior to the commencement of the present study, several of Bartók's shorter compositions were analyzed. Analysis of these compositions (taken primarily from the Mikrokosmos) revealed a number of different types of symmetrical patterns occurring at various architectonic levels of structural design. The preliminary analysis thus lent support to the hypothesis that symmetry is a recurring feature of Bartók's compositional style.

Justification of the Study

Twentieth-century musical style is a conglomerate of the individual compositional styles of diverse composers of the period. In this century every composer seems intent on

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[1]Monroe C. Beardsley, Aesthetics (New York: Harcourt, Brace & World, Inc., 1958), p. 173.

evolving a language of his own.[1] Each individual language is in turn a conglomerate of the recurring features of the composer's music. Thus, analysis of each characteristic feature of that language contributes to the complete understanding of the individual composer's style and the style of twentieth-century music in general.

Some composers have obligingly set forth their methods in theoretical writings. This is not the case with Bartók who left his music to speak for itself.[2] It is therefore the responsibility of the theorist to deduce the method from the music by the process of analysis. If the music "carries conviction, as Bartók's does to an ever-growing number of music-lovers of all kinds, it must be as capable of analysis as any music of the past."[3] Although the ultimate greatness of Bartók's music is not to be grasped in terms of analysis of specific features, analysis is valuable as it contributes to a deeper understanding of both the composer's style and the style of the period.

Limitations of the Study

Although the purpose of the study was to develop a construct of the use of symmetrical structures in two compositions by Bartók, the study did not attempt to prove any volition on the part of the composer in producing those

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[1] Stuart Thyne, "Bartók's 'Improvisations,'" Music and Letters, XXXI (January, 1950), 30.

[2] Thyne, 30-31.

[3] Thyne, 31.

structures. Rather, the study dealt with specific types and uses of symmetrical structures as they appear in Bartók's music without speculation regarding the composer's intent.

Thorough analysis of symmetrical structures was limited to two of Bartók's compositions. These two selections exemplify both vocal and instrumental compositional techniques, and each is recognized as an important composition in its own right. In addition, each is readily accessible in both recording and score. The two compositions are <u>Music for String Instruments, Percussion, and Celesta</u> (1936) and <u>Cantata Profana</u> (1930).

<u>Definition of Terms</u>

<u>Architectonic level</u>. Symmetrical structures are found to encompass areas of music ranging in length from a span less than one measure long to the length of an entire multi-movement composition. Areas of music encompassed by symmetrical structures are grouped by length into six architectonic levels. Level I encompasses three or fewer measures and may include the following structural components: cell; figure; motive; semi-phrase. Level II encompasses three to seven measures and may include the structural component, phrase. Level III encompasses six to sixteen measures and may include the structural component, phrase group. Level IV encompasses sixteen or more measures with a maximum length equal to one less than the total number of measures contained in one movement. Level Va

encompasses an entire movement of a composition as it is designated by the composer. Level Vb encompasses two consecutive movements of a composition. Level VI encompasses an entire multi-movement composition.

Golden Section. This term refers to the division of a distance in such a way that the proportion of the whole to the larger part corresponds geometrically to the proportion of the larger to the smaller part. If the whole is taken as a unity, the resulting proportion of the larger part is the irrational number 0.6180340.[1] In other words, the larger part of any distance divided as above is equal to the whole length multiplied by 0.6180340. Thus the Golden Section is used to describe a specific proportion as well as the dividing point at which that proportion occurs.

Inversion. This term refers to the mutual exchanging of parts so that the upper part becomes the lower and vice versa.

Macro-meter. This term refers to a metric entity.

Micro-meter. This term refers to a subdivision of a complex metric entity as expressed in simple meter.

Mirror. This term refers to the projection of an interval (melodic or harmonic) in the opposite direction.

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[1] Ernő Lendvai, Béla Bartók: An Analysis of his Music (London: Kahn & Averill, 1971), p. 17.

Parameters of music. This term refers to the division of musical elements into the following categories: pitch; duration; timbre; texture; dynamics; and structure. Each parametric division of elements may be further divided into various subdivisions of musical elements. For example, the parameter of pitch includes the subdivisions represented by scale basis, melody, harmony and tonality. The parameter of duration includes the subdivisions represented by rhythm, meter, tempo and temporal span.

Pervasiveness. This term refers to the state of diffusion of symmetrical structures as they are found at various architectonic levels of design within the two compositions.

Symmetrical structure. This term is used to denote a structure whose elements correspond in position as they are distributed about an axis. The correspondence may be a product of repetition or of the presence of a linking characteristic such as the proportions of the Golden Section. The axis of symmetry may or may not be stated as part of the symmetrical structure. In cases where the symmetry is a product of pitch, the axis may be a single pitch or a semitonal duad. Two types of symmetrical structures were included in the study. The first is symmetry by aural axis in which actual parts of the structure are utilized in corresponding positions as they are distributed about an axis. The second is symmetry by visual abstraction in which visual symbols (usually alphabetic letters) stand for similar and contrasting materials stated in corresponding positions about an axis. "Symmetrical pattern" is used synonymously with "symmetrical structure."

Structure. This term represents the formal design of a musical composition.

Texture-set. This term refers to the individual texture of a specific area of music.

Tonal center. This term is used interchangeably with tonality.

Procedure

The research procedure employed in the present study consisted primarily of the analysis of two compositions in an effort to define characteristic varieties of symmetrical structures. Potential symmetrical structures were divided into seven categories representing the various parameters of music. The outline which follows serves as a summation of the divisions and subdivisions of symmetrical structures with appropriate guidelines for their identification.

Outline of Categories of Symmetrical Structures

I. Symmetrical structures formed by pitch.

A. Symmetrical structures formed by scale basis.

Symmetrical structures formed by scale basis were identified by determining the prevailing tonal center of a musical area and utilizing that tonal center as the initial note of the scale. Additional notes of the scale were determined by arranging the remaining pitches of the musical area in scalar order.

B. Symmetrical structures formed by melody.

Certain motives or melodies were considered to be symmetrical if the symmetry was contained within the boundaries of identifiable structural entities. These boundaries were found to be created primarily by melodic contour, cadence, repetition or duration.

C. Symmetrical structures formed by harmony.

Symmetrical patterns were derived from the intervallic content of a single harmonic structure or from the root progression and/or chord qualities of a series of harmonic structures. Individually symmetrical harmonies were identified whether or not the root from which the symmetry was determined appeared in the lowest voice of the chord. Symmetrical harmonic structures were identified in both simultaneous and arpeggiated forms.

D. Symmetrical structures formed by tonality.

Tonal centers were frequently determined by one of the following techniques: the identification of a modified stereotyped harmonic pattern; the identification of durational emphasis which may be achieved by pedal tones or metric stress; the identification of repetition (ostinato); the identification of the recurrence of a fragmentary harmonic pattern.[1]

II. Symmetrical structures formed by duration.

A. Symmetrical structures formed by rhythm.

The music of Bartók is so pervaded with examples of complex symmetrical rhythm patterns that the inclusion of measures of common pulse in this category of symmetrical structures seemed irresponsible. Therefore, individual measures of rhythm expressed in equal note values without rests were not considered to be illustrative of the category.

B. Symmetrical structures formed by meter.

A complex meter involving more than four beats per measure is capable of being analyzed both as a macro-meter which contributes to the symmetry of a larger symmetrical structure and as a micro-meter which may be symmetrical in itself. Possible visual symmetry created by the repetition of a single micro-meter was not considered to be illustrative of the category.

C. Symmetrical structures formed by tempo.

Symmetrical structures formed by tempo are a product of variations in the rate of speed of the musical pulse. The actual temporal span allotted to individual beat

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[1]William Christ and others, Materials and Structure of Music, II (2d ed.; Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1973), pp. 416-22.

notes, as expressed in the number of beat notes per minute, was considered to be more important to the aural impact of symmetry than was the actual type of beat note utilized in the written score.

D. Symmetrical structures formed by temporal span. Temporal span refers to the amount of time encompassed by the performance of a musical area. In the study, temporal span was designated by two means: the actual time required for the performance of a musical area was expressed in minutes and fractions of minutes; in cases where corresponding sections of music are written in the same meter at the same tempo, temporal span was expressed in the number of measures encompassed by each musical area.

III. Symmetrical structures formed by timbre.

The correspondence of similar combinations of instruments or families of instruments or the correspondence of similar registers within one instrumental or vocal family utilized in various sections of music was considered sufficient to produce symmetry. Instrumentation was expressed in terms of the prevailing timbre combination of a musical area. In such cases, instruments providing musical punctuation or melodic reinforcement which do not detract from the aural impact of symmetry produced by timbre were excluded from the illustrations.

IV. Symmetrical structures formed by texture.

Hall defines texture as "the number of concurrently sounding constituents, their disposition, and the relations between them."[1]

A. Symmetrical structures formed by number of parts.

The correspondence of numbers of parts sounding in two or more musical areas was considered to produce symmetry. The number of parts was expressed either as the number of individual notes being played at any given instant or as the number of individual musical lines sounding less octave and unison doubling.

B. Symmetrical structures formed by texture organization.

The correspondence of texture organization in two or more musical areas likewise was considered to produce symmetry. According to Meyer, texture is organized in the following ways:

1. monody--one figure
2. polyphony--several figures sounding simultaneously
3. homophony--one or more figures with accompaniment
4. accompaniment alone--introduction to a figure
5. heterophony--several figures combined

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[1]Anne Hall, "Texture in the Violin Concertos of Stravinsky, Berg, Schoenberg and Bartók," (unpublished doctoral dissertation, University of Michigan, 1971), p. 1.

simultaneously which show little real independence of motion.[1]

C. Symmetrical structures formed by texture-sets. The individual texture of a specific area of music is referred to as a texture-set. Within a single texture-set, the correspondence of individual lines distributed about an axis was considered to form symmetry. Such correspondence was produced primarily by the technique of simultaneous mirror in which case symmetrical arrangements of intervals are organized about an axis. Additional symmetrical texture-sets were found to be created by inexact mirror and imitative mirror.[2]

V. Symmetrical structures formed by dynamics. A single dynamic symbol may represent a wide variety of precise levels of volume. Even in musical areas marked by one general dynamic symbol, performance practices are such that the actual dynamic level rarely remains constant. In addition, changes from one dynamic level to another frequently imply gradations in volume. Because the examination of minute variations in dynamics would have approached the impossible, only major or general dynamic levels were considered in the analysis with corresponding

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[1]Leonard Meyer, Emotion and Meaning in Music (Chicago: University of Chicago Press, 1956), p. 186.

[2]Hall, pp. 86-87.

gradations in volume indicated only if they contribute to the symmetry of the structure.

VI. Symmetrical patterns formed by structure.
Symmetry formed by the structure of an individual musical area was considered to be symmetry by visual abstraction. In the illustrations which accompany the text of the study, similar materials from any of the parameters of music were designated by the same alphabetic letter with superscripts indicating variants of that material. Motivic or thematic derivation was also represented visually by the presence of the same alphabetic letter and was discussed as such in the text. Contrasting materials from any of the parameters of music were represented visually by different alphabetic letters in the illustrations.

VII. Symmetrical structures formed by text.
Textual symmetry produced by similarity in kind or number of actions was considered to be symmetry by visual abstraction. Thus, symmetry formed by the text of a composition was represented visually with the same alphabetic letter standing for similar types of action and a contrasting alphabetic letter standing for dissimilar types of action.

General Guidelines for Analysis of Symmetry

In general, symmetrical patterns were determined if the symmetry was found to be contained within the boundaries of the following identifiable structural entities: cell;

figure; motive; semi-phrase; phrase group; section; movement; work. Although a change in or a repetition of any of the elements of music was considered sufficient to establish such boundaries, they were most frequently found to be created by a change in or a repetition of melodic contour or rhythm or by the presence of a melodic or harmonic cadence. Generally, symmetrical patterns were not identified if the subtraction of the symmetry resulted in the unexplained presence of a single note.

Illustrations of Symmetry

Examples of structures from the various categories of symmetry are illustrated visually in the many diagrams which accompany the text of the study. In each diagram, correspondence is represented visually by brackets which connect similar elements of music. Axes of symmetry are represented visually by broken lines which dissect the structures horizontally, vertically, or diagonally. In each of the diagrams the symmetry of the structure is illustrated in the clearest possible visual means. Melodic and harmonic intervals are described visually by integers representing the number of semitones encompassed by two pitches. Notes are expressed at concert pitch in the most accessible adjacent position of tones, and pitches are shown in octave equivalents if the symmetry of the structure can better be demonstrated visually. In the illustrations a pitch is often described by its enharmonic equivalent. Bartók's own choice of alternatives seems to have been guided by the desire to make the music easy for the player to read.[1] The writer's choice of alternatives was guided by the desire to make the symmetry of a given structure easy for the reader to perceive.

Frequency Tables

During the course of the analytical process, each symmetrical structure was recorded in a frequency table according to figure number and measure numbers for the architectonic level at which that structure appears. In cases where symmetrical structures were considered to be created by a common means at small architectonic levels, one or two representative examples are discussed in the text with each instance of symmetry recorded in the appropriate place within the frequency tables. Occasionally a symmetrical structure was found to be a product of two categories of symmetry. In such cases, the symmetrical structure is discussed under the general heading which best facilitates its description and then recorded in the appropriate frequency table under each category of symmetry represented. Examples of near symmetry expressed in the music were not included in the frequency tables unless that symmetry was verified aurally. Total frequency tabulations were computed for each parametric division and subdivision of symmetrical

[1]Thyne, p. 32.

structures and for each architectonic level containing those divisions and subdivisions of symmetry.

In evaluating the data drawn from these tables, it is important to keep in mind the fact that the number of symmetrical structures possible within an architectonic level decreases as the number of measures encompassed by an architectonic level increases. For instance, Architectonic Level I encompasses three or fewer measures. In many cases symmetrical structures were found at Level I which encompass an area of music smaller than one measure in length. Since there are a total of 1,481 measures in the two compositions, there are at least that many subdivisions of Level I at which symmetrical structures might appear. However, Architectonic Level V contains only seven subdivisions at which symmetrical structures might appear. At Level VI the possibilities are reduced even further. Therefore, it is important that conclusions not be drawn between frequency tabulations made for different architectonic levels without reference to the fluctuating number of possibilities inherent in the definition of each level. Since the number of possible occurrences of symmetry could not be estimated, the greatest frequency with which symmetry is produced by one parametric division of symmetrical structures within the architectonic level served as a reference number for comparison. The results of the frequency tabulations made for each parametric division and subdivision of symmetrical structures as they are found at each of the six architectonic levels contributed to a final statement concerning the use of symmetrical structures in the two selected compositions.

Chapter II

REVIEW OF RELATED LITERATURE

Literature related to the present study falls into three main categories: biographical literature which provides sources of critical evaluation of the importance of the compositions selected for analysis; literature which provides information concerning symmetrical structures; literature which provides insights into the compositional style of Bartók.

Biographical Literature

The Life and Music of Béla Bartók by Stevens[1] is probably the most important biography of the composer written in the English language. The book approaches Bartók's music from two different points of view: first, from the point of view of chronology and second, from the point of view of classification. Part I, "Biographical study," concerns itself with three periods in the composer's creative life: the formative period (1881-1905); the first creative period (1906-1921); and the second creative period (1921-1945). Both compositions analyzed in the present study are products of the second creative period:

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[1] Halsey Stevens, The Life and Music of Béla Bartók (rev. ed.; New York: Oxford University Press, 1964).

the Cantata Profana was written in 1930 while Music for String Instruments, Percussion, and Celesta was written in 1936.

A second important biography is Ujfalussy's Béla Bartók[1] which approaches the composer's music strictly from a point of view of chronology. This second biography is important to the study for its many insights into pertinent conditions which greatly affected the life and musical creativity of the composer.

The two compositions analyzed in the present study were chosen for their importance within Bartók's compositional style and for their representation of two essential categories of the composer's music; Music for String Instruments, Percussion, and Celesta is an orchestral work while Cantata Profana is a vocal work. Critical evaluations by biographers Stevens and Ujfalussy as to the importance of these two compositions justify the choice. Stevens describes Music for String Instruments, Percussion, and Celesta as one of Bartók's best works,[2] while Ujfalussy hails it as one of the "incomparable masterpieces of the twentieth century."[3] Stevens states that Bartók's

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[1]József Ujfalussy, Béla Bartók (Boston: Crescendo Publishing Company, 1971).

[2]Stevens, p. 73.

[3]Ujfalussy, p. 318.

most important vocal work is the Cantata Profana and classifies it as among his finest achievements.[1]

Literature Concerning Symmetrical Structures

Very few articles or dissertations have been written concerning symmetrical structures. The most important is an article by Perle[2] in which a brief though interesting history of the use of symmetrical structures is presented. According to Perle, the derivation of harmonic structure and motion by means of symmetrical patterns was originally a radical Impressionistic device which was popularized with the diffusion of Impressionism. The formations were derived primarily by dividing the octave into equal parts, with only those intervals the semitonal content of which is a factor of twelve fulfilling this purpose. Thus, the whole tone (two semitones) generates the whole-tone scale; the minor third (three semitones) generates the diminished seventh chord; the major third (four smitones) generates the augmented triad; and the tritone (six semitones) divides the octave equally in half. Perle concludes his comments on Impressionistic symmetrical structures with a discussion of

[1] Stevens, pp. 74 and 164.

[2] George Perle, "Symmetrical "Formations in the String Quartets of Béla Bartók," Music Review, XVI, 3 (November, 1955), 300-312.

Voiles, Debussy's second prelude for piano, which is derived entirely from symmetrical structures.[1]

Although axis-based symmetry was not used with much consistency in Western music until the advent of Impressionism, curious earlier examples of symmetry may be found in the music of the Russian nationalist school. Perle points out that symmetrical elements serve as the basis for the "Clock Scene" from Mussorgsky's Boris Godunov written as early as 1871.[2] These elements may have served as a musical stimulus to Debussy, for Grout states: "Russian music, especially Mussorgsky's Boris . . . , revealed to Debussy potential new directions . . . ."[3]

The article by Perle continues with analysis of symmetry produced in melody, harmony, tonality and structure in certain of the string quartets by Bartók. The article does not include a discussion of symmetrical structures produced by other parameters.

An article by Rimmer[4] is significant in its attempt to relate symmetry to parameters of music other than pitch. In discussing the Cantata Profana, Rimmer notes that the time signature does not reveal the true grouping of beats.

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[1] Perle, 300-301. [2] Perle, 301.

[3] Donald Grout, A History of Western Music (New York: W.W. Norton & Company, Inc., 1960), p. 603.

[4] Frederick Rimmer, "Sequence and Symmetry in Twentieth-Century Melody," Music Review, XXVI, 1 (February, 1965), 28-50; 2 (May, 1965), 85-96.

He states that the ordering of tones by duration emphasizes the attraction for Bartók of a symmetrical triple and duple grouping which, when set down as "triple-duple-triple-duple-triple" can be seen in embryo.[1] Furthermore, the article is interesting for its discussion of melodic symmetry as it relates to the works of composers other than Bartók. These include Stravinsky, Britten, Hindemith, Vaughan Williams, Schoenberg, Webern, and Boulez.

The importance of the Rimmer article is somewhat qualified, for although it makes reference to the "tonal symmetry" of the Cantata Profana, it never clearly defines the term. It is apparent that the author does not consider symmetry to be solely that which is axis based, for he describes the pattern "8-11-8-11" which possesses no axis of symmetry, as symmetrical.[2]

Olivier Messiaen is one twentieth-century composer who has written in great detail about his compositional style. In his two-volume work entitled The Technique of My Musical Language,[3] the composer discusses a compositional device which inherently produces symmetry. This device is based on certain mathematical impossibilities residing in modes which cannot be transposed beyond a certain number

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[1]Rimmer, Music Review, XXVI, 1, 34.

[2]Rimmer, Music Review, XXVI, 1, 34.

[3]Olivier Messiaen, The Technique of My Musical Language, I, II (Paris: Alphonse Leduc, 1956).

of transpositions and in rhythms which cannot be used in retrograde.

An example of a nonretrogradable rhythm given by Messiaen is a long-short-long pattern in which the outer rhythmic values are identical and the middle value free. The retrograde form of such a rhythm pattern repeats the order of rhythmic values exactly and thus is unusable. Messiaen continues by pointing out that all rhythms of three values thus disposed are nonretrogradable and that these rhythms are capable of successful juxtaposition to produce lengthy examples of nonretrogradable rhythm patterns. Messiaen ultimately describes the symmetry of such rhythms as retrograde symmetry.[1]

The modes of limited transposition are formed by several repetitive groups of notes, the last note of each group always being common with the first note of the following group. At the end of a certain number of chromatic transpositions which varies with each mode, the transposed form repeats enharmonically the same notes as the original mode. The first mode of limited transposition is the whole-tone scale, a symmetrical hexatonic scale subdivided into three groups of three notes each, presenting the intervallic pattern tone-tone. The whole-tone scale is capable of two transpositions. The second mode of limited transposition is a symmetrical octatonic scale subdivided

[1]Messiaen, I, pp. 20-21.

into four groups of three notes each, presenting the intervallic pattern tone-semitone. This alternating scale is capable of three transpositions. By beginning the mode on the second scale degree, another symmetrical scale is produced with the same number of note groups presenting the intervallic pattern semitone-tone. The third mode of limited transposition is a nine-note scale divided into three groups of four notes each, with each tetrachord presenting the interval pattern tone-semitone-semitone. This scale is capable of four transpositions. The third mode is not symmetrical in its original form but does produce a symmetrical order of intervals by beginning the mode on the second or third scale degree. There are four other modes, limited to six transpositions each, which also produce a symmetrical order of intervals. These modes provide less interest for the very reason of their too great number of transpositions. Messiaen continues by pointing out that all the modes of limited transposition can be used melodically and especially harmonically.[1]

An interesting aspect of the Messiaen text is the composer's effort to describe the aural impact produced by mathematical impossibilities:

> It is a glistening music we seek, giving to the aural sense voluptuously refined pleasure. At the same time, this music should be able to express some noble sentiment . . . .[2]

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[1] Messiaen, I, p. 13.

[2] Messiaen, I, p. 13.

Messiaen continues by noting the complementary nature which relates nonretrogradable rhythms and modes of limited transposition; the rhythms realize in the horizontal direction (retrogradation) what the modes realize in the vertical direction (transposition).[1] A combination of the two forms produces the charm of impossibilities:

> . . . a certain effect of ubiquity in the nontransposition, a certain unity of movement (where beginning and end are confused because identical) in the nonretrogradation . . . .[2]

Literature Concerning Bartók's Compositional Style

Biographical literature contributing information about Bartók's compositional style may also provide information related to his use of symmetrical structures. Stevens suggests that Bartók's style was eclectic in nature:

> With Bartók there were frequent additions to his creative equipment, but seldom subtractions; "influences" were quickly assimilated, and no matter from what source, they became so personally a part of his style or his technique that their gravitation lost its pull and he continued undeviating in his own orbit.[3]

In 1907, Bartók discovered the music of Debussy, and probably it is through this source that he became aware of the symmetrical structures of Impressionism. In Debussy's music, Bartók found similarities to Hungarian peasant music which he attributed to influences of Eastern European folk-song, especially Russian[4] (the influence of Russian music on

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[1]Messiaen, I, p. 13. [2]Messiaen, I, p. 21.

[3]Stevens, pp. 306-307. [4]Stevens, p. 40.

Debussy has already been mentioned). It is known that Bartók incorporated symmetrical structures into his music shortly after his 1907 encounter with Impressionism. In discussing Ten Easy Pieces (1908) Stevens states:

> His recent discovery of the music of Debussy is witnessed by the fourth piece, Sostenuto, and the seventh, Dawn, with their clouded tonalities and their sensitive reticence. The former closes with a whole-tone scale in the bass . . . .[1]

At about the same time Bartók was discovering the music of Debussy, he was also discovering the folk music of his native country. In an article written in 1920, Bartók states that peasant music may influence modern music in three ways. First, previously existing folk melodies may be set to an accompaniment with the optional addition of one or two formal sections; or they may be utilized as part of a larger composition. Second, a composer may imitate the sound of a folksong. Third, a composer's music may be pervaded by the atmosphere of peasant music until it is completely absorbed into the idiom.[2]

The influence of peasant music further contributed to the incorporation of symmetry into Bartók's compositional style. One symmetrical harmonic structure utilized by the composer is the quartal chord. In the above mentioned article, Bartók states that the quartal chord, suggested to

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[1]Stevens, p. 113.

[2]Béla Bartók, "The Influence of Peasant Music on Modern Music," in Béla Bartók: A Memorial Review (New York: Boosey & Hawkes, 1950), p. 75.

the composer from the frequent use of intervals of a fourth in peasant melodies, is the adaptation of a horizontal procedure in a simultaneous vertical structure.[1] The dorian mode and the pentatonic scale are additional examples of symmetrical structures originating in folk music.

Bartók wrote:

> For the majority--and most valuable of the melodies I collected during my research tours, moved in the old church tonalities, that is, in the Greek and certain other even more primitive (pentatonic) modes . . . . It is now clear that the ancient scales, . . . have lost none of their vitality. Their application has made possible new types of harmonic combinations.[2]

Finally, a melodic pattern frequently presented in a symmetrical form in Bartók's music is the long circling motive. This motive may have been a product of the influence of similar melodic structures which serve as ornaments in Croatian folk music.[3]

Certain symmetrical aspects of duration found in the music of Bartók are also products of the influence of folk music. Rhythmic characteristics of Eastern European folk song, specifically the short-long-short rhythm pattern, are taken directly from Rumanian folk music. In addition, the division of $\frac{8}{8}$ meter into a symmetrical triple-duple-triple pattern of micro-meters is taken directly from Bulgarian folk music. The frequently changing meters found

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[1]Bartók, p. 73. [2]Ujfalussy, p. 80.

[3]Otto Deri, Exploring Twentieth-Century Music (New York: Holt, Rinehart and Winston, Inc., 1968), pp. 235-36.

in the first movement of the Music for String Instruments, Percussion, and Celesta which also result in symmetrical arrangements of micro-meters are faint reminders of the metric changes in folk music which have been subliminally incorporated into the style of the composer.[1]

One particular biographical anecdote provides evidence that Bartók used symmetrical structures created by extramusical elements. The composer actually altered the libretto of The Wonderful Mandarin to produce symmetry.

> The structure of the work is symmetrically designed: three times the enticing gestures of the girl attract the three vagrants, one after the other; next comes the double scherzo at the centre of the structure; lastly, the work is balanced by the three successive murders. It was in order to preserve this balanced structure that Bartók omitted the fourth murder.[2]

A biographical article by Mason[3] is particularly interesting in its discussion of Bartók's preoccupation with the mechanical aspects of music. It is Mason's view that Bartók's interest in counterpoint was almost entirely concerned with its more mechanical forms where the symmetry of melodic shapes are the dictators of harmony. The fascination with mechanical procedures extended beyond the sphere of counterpoint into that of harmony and profoundly affected Bartók's conception of form. This is evidenced in the arch forms of String Quartets IV and V as well as in

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[1]Deri, pp. 241-42. [2]Ujfalussy, p. 162.

[3]Colin Mason, "Bartók, Béla," Grove's Dictonary of Music and Musicians (5th ed.), ed. Eric Blom, Vol. I, 1954, 463-76.

the ternary form of the Violin Concerto. Mason adds:

> The rigid symmetrical forms . . . were employed not to give logic where beauty was lacking, but to contain the inexhaustable fund of new and marvellous sounds that his fertile imagination constantly produced.[1]

Dissertations concerning specific aspects of the style of Bartók have also been found to provide information on subjects which relate to the present study. "Idiomatic Writing of the Piano Music of Béla Bartók"[2] is such a dissertation. Information relevant to the present study is included in discussions of elements which connote symmetry. These elements are as follows: harmony built by repetition of the same interval; harmony built from repeated series of interval patterns; the simultaneous sounding of major and minor triads built on the same fundamental; and variable scale degree technique.

A second dissertation, "Two-Voiced Textures in the <u>Mikrokosmos</u> of Béla Bartók,"[3] is important for the information it provides concerning texture and texture manipulation as well as for the simple test it provides for texture classification. In the study, all compositions were classified according to the number of single-line

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[1]Mason, 470-471.

[2]Herbert Horn, "Idiomatic Writing of the Piano Music of Béla Bartók" (unpublished doctoral dissertation, University of Southern California, 1963).

[3]William Dustin, "Two-Voiced Textures in the <u>Mikrokosmos</u> of Béla Bartók" (unpublished doctoral dissertation, Cornell University, 1959).

instruments required to play all tones. Compositions entirely of a single texture-weight but for a brief closing were classified as of consistent texture. Such occasions required a judgment as to whether the change in voice-number was incidental or significant in the entire effect of the composition.

Another dissertation, "Texture in the Violin Concertos of Stravinsky, Berg, Schoenberg and Bartók,"[1] is important to the present study for the information provided concerning texture and its analysis. Hall defines texture as the "number of concurrently sounding constituents, their disposition, and the relations between them."[2] This definition of texture was a determining factor in the proper placement of structures in the many categories of symmetry. In addition, Hall's discussion of symmetrical texture and its analysis[3] lent support to the writer's own convictions concerning the aural perception of textural symmetry.

The dissertation, "Thematic, Formal, and Tonal Structure of the Bartók String Quartets,"[4] is important in its conclusions as they relate to structure. Symmetry was found to be a product of the following structures: sonata

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[1] Anne Hall, "Texture in the Violin Concertos of Stravinsky, Berg, Schoenberg and Bartók" (unpublished doctoral dissertation, University of Michigan, 1971).

[2] Hall, p. 1.

[3] Hall, pp. 86-87.

[4] Mark Walker, "Thematic, Formal and Tonal Structure of the Bartók String Quartets" (unpublished doctoral dissertation, Indiana University, 1955).

allegro form with reversed order of Themes I and II in the recapitulation (Theme I-Theme II-Development-Theme II-Theme I); three-movement form with the first and third movements in the same key with a common theme (A-B-A); four-movement form with the tonality pattern A-B-B-A; and five-movement form in the pattern A-B-C-B-A.

Summary

The articles, books and dissertations which provide information related to the topic of the present study fall into three main categories. Biographical literature provides sources of critical evaluation of the importance of those compositions selected for analysis in the study. Historical and analytical literature provide information concerning symmetrical structures in general. Finally, biographical and analytical literature provide insights into the compositional style of Béla Bartók as it relates to his use of symmetrical structures. This review of literature supports the justification of the present study in that it reveals the need for further research into this area of Bartók's compositional style.

Chapter III

MUSIC FOR STRING INSTRUMENTS, PERCUSSION, AND CELESTA

Bartók composed Music for String Instruments, Percussion, and Celesta on commission for Paul Sacher and the Basle Chamber Orchestra on the tenth anniversary of that organization. The work is scored for double string orchestra with celesta, harp, piano, xylophone, timpani, and a miscellaneous collection of percussion under the control of one player.[1] The composition is particularly noteworty for its economy of material. One of the most intensively organized of all Bartók's compositions, the entire work is generated from the opening subject of the first movement.[2]

Types of Symmetrical Structures Present

Bartók's attraction to the idea of a mathematically ordered nature was never stronger than during the time he composed Music for String Instruments, Percussion, and Celesta.[3] His predilection for symmetry and its

[1]Halsey Stevens, The Life and Music of Béla Bartók (rev. ed.; New York: Oxford University Press, 1964), p. 272.

[2]Stevens, p. 271.

[3]József Ujfalussy, Béla Bartók (Boston: Crescendo Publishing Company, 1971), p. 319.

implications is evident in each parameter throughout the composition.

Pitch

Movement I. In the first movement, the opening fugue subject, Figure 3.1, is formed from an eight-tone chromatic scale encompassing the range of a perfect fifth. In Figure 3.2 this scale is shown to be symmetrical by reason of its uni-intervallic construction. In measure 5 the second entrance of this subject is pitched a perfect fifth above the original, and the entire chromatic scale is realized. Also by reason of its uni-intervallic construction, this complete scale is shown to be symmetrical in Figure 3.3. The construction of the subject and the interval of transposition result in the utilization of the entire chromatic scale as scale basis for every formal area of from four to eight measures in length except the three areas bounded by measures 1-4, 65-68, and 82-85. (See Table 3.1a, page 130.) This theory of scale basis is aurally reinforced by the complete presentation of the chromatic scale through nearly two octaves near the center of the movement as shown in Figure 3.4.

Logical as it seems, this theory of scale basis does not take into consideration Bartók's meticulous use of accidentals, for it offers no explanation for the presence of both $\underline{d}^{\#}$ and $\underline{e}^{b}$ in the subject. An alternative explanation of the scale basis reveals that the eight-tone

Figure 3.1. Music for Strings, I, 1-4

Figure 3.2. Music for Strings, I, 1-4, Derived Scale

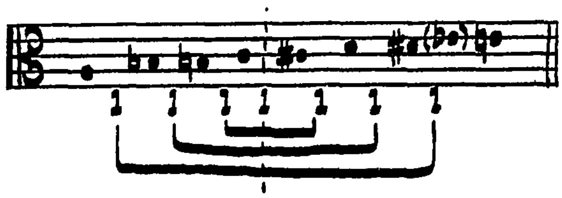

Figure 3.3. Music for Strings, I, 1-8, Derived Scale

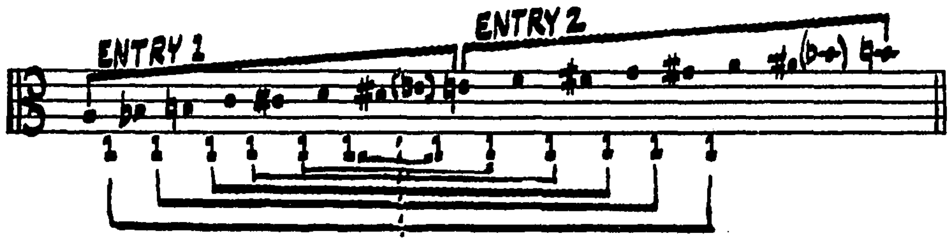

Figure 3.4. Music for Strings, I, 52-56, 1.2.Cb.

chromatic scale of the subject is actually the sum of two individual scales as shown in Figure 3.5. These scales are derived by grouping like accidentals in stepwise patterns as they are used directionally in the subject (Figure 3.1). By naming the notes of the ascending scale "X" and those of the descending scale "Y" in the order of appearance in the fugue subject, the pattern shown in Figure 3.6 results. By referring again to Figure 3.1, one can see that motive "A" is a partial statement of motive "B," and that motive "C" is a partial statement of motive "D." In each of motives "B," "C," and "D" steps and skips of the melody (labeled "ST" and "SK" respectively) are arranged so as to set apart the germ motive from the note of anacrusis, leaving a symmetrical order of tones drawn from the scale basis.

Further analysis of the fugue subject reveals additional symmetry as shown in Figure 3.7. The aural tonal center of the subject, B^b,[1] is effected by repetition of the note as well as by articulatory stress. Notes also receiving metric or articulatory stress are $\underline{d}^{\#}$, $\underline{d}$, and $\underline{c}$. When visually extracted, these tones show the melodic contour to form the outline of an enharmonic perfect fourth and the subsequent interpolation of pitches within the same perfect fourth. The two accessory tones, a symmetrical semitone on either side of the fourth, represent the outer limits of the range of the fugue subject.

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[1]William Graves, Jr., Twentieth-Century Fugue (Washington, D.C.: Catholic University of America Press, 1962), pp. 46-47.

Figure 3.5. Music for Strings, I, 1-4, Derived Scales

Figure 3.6. Music for Strings, I, 1-4, Scale Analysis

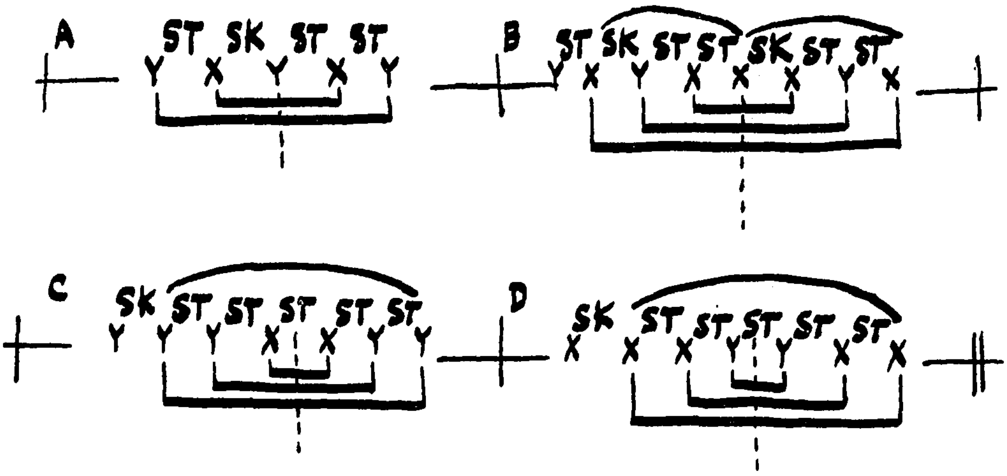


Figure 3.7. Music for Strings, I, 1-4, Contour Analysis

(a)

(b)

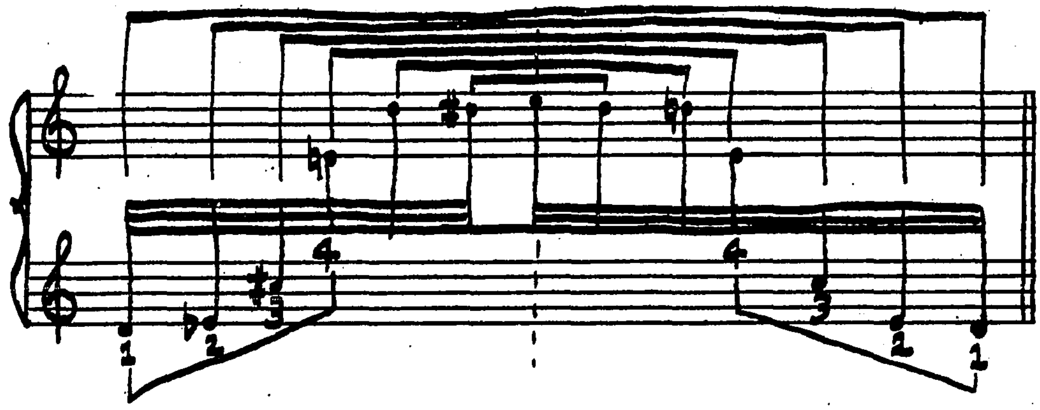
Other symmetrical structures are produced by the wedge-shaped scale bases of individual motives as shown in Figure 3.8. Figure 3.8a represents the construction of motive "A" from the fugue subject (Figure 3.1, page 34). In this motive, notes one and two are stated in ascending semitones with notes three and four interjected in descending semitones before the statement of note five which completes both lines. In this instance, the axis of symmetry is the note b from which the two lines diverge by semitones. The construction of motive "B" from the fugue subject is represented in Figure 3.8b without reference to the anacrusis note as in Figure 3.6. The symmetry of the motive is made clear by the straightforward presentation of the upper notes, then the lower notes in tones 3-4-5 and tones 6-7-8 of the original "B" motive. In this instance the axis is the semitonal duad c-c# from which the lines diverge by semitones. Figure 3.8c represents the wedge-shaped scale basis of the motive from measure 78 shown in Figure 3.9. Its construction is made clear by imagining the simultaneous playing of notes one and two followed by the simultaneous playing of notes three and four. Here the axis is the duad d-e^b from which the lines diverge by semitones.

When stated in its entirety, the motive represented by Figure 3.8c produces melodic symmetry, for its second half is the retrogradation of its first half. Shown in Figure 3.9, the symmetrical structure thus formed is stated seventeen times in only four measures.

Figure 3.8. Wedge-Shaped Scale Bases

(a) (b) (c)

Figure 3.9. Music for Strings, I, 78, Cel.



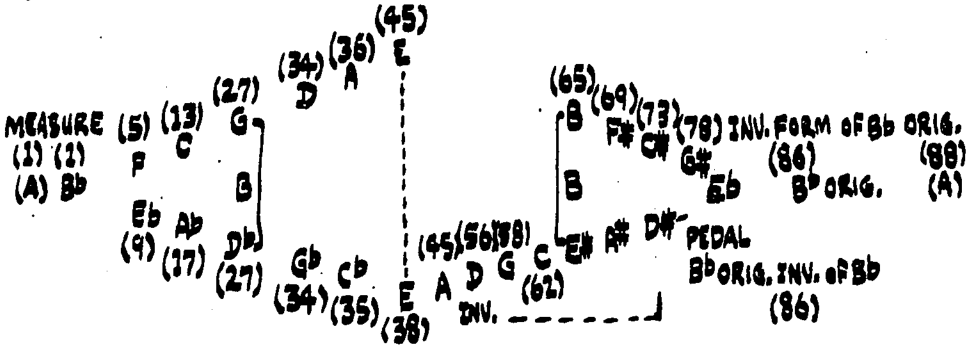
The harmonies of the first movement are almost exclusively dependent upon polyphonic texture and independence of parts. Because the parts move consistently in eighth notes, the harmonies change too quickly to be accessible by analysis. However, the concluding three measures which present the subject and its inversion simultaneously do reveal an interesting symmetrical pattern. Using "U" for unison, "D" for dissonance, and "C" for consonance, Figure 3.10 presents a visual graph of the motion from unison a through corresponding dissonance and consonance to a central unison and finally to a closing unison a. (Dissonances here include seconds, sevenths, and tritones.)

The tonal plan of the first movement forms a symmetrical arch complete with its mirror reflection as is depicted in Figure 3.11a. The a at either end of the arch represents the single pitch which begins and ends the movement. The other letters represent actual tonal centers as they appear at the interval of a perfect fifth above and below the initial B^b tonality. These tonal centers represent either subject entries tonally identified as in Figure 3.7 or tonalities identified by other means. It is important to note that the apex of the arch here emphasizes the interval of the tritone which divides the octave equally into six semitones. The two tonal paths cross at E, tritone of the beginning and ending B^b, on either side of which are

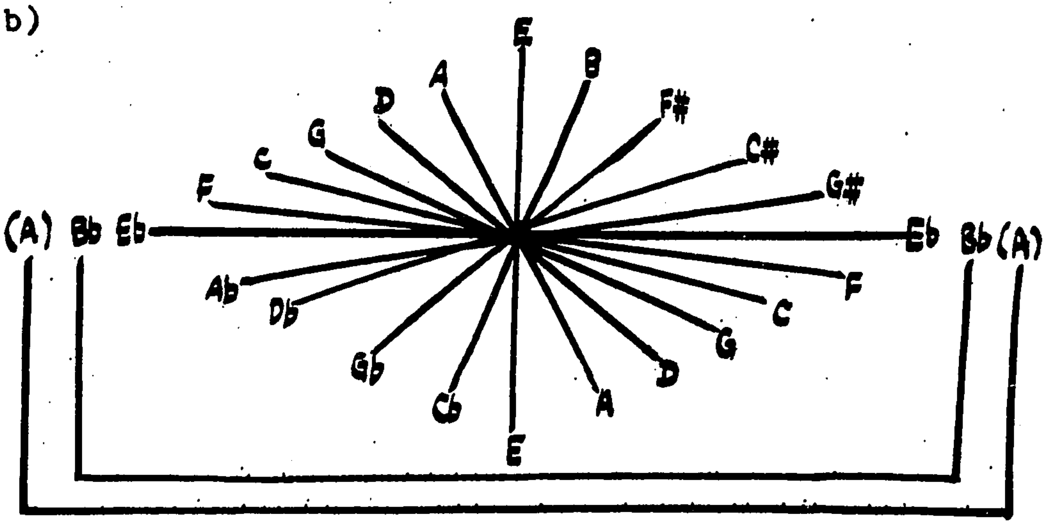
Figure 3.10. <u>Music for Strings</u>, I, 86-88

Figure 3.11. <u>Music for Strings</u>, I, Tonal Plan

(a)



(b)



stated tritone strettos at points G-D^b and B-E$^\#$. Figure 3.11b is a summary of Figure 3.11a.

Movement II. In the second movement, as in the first movement, the symmetrical chromatic scale plays an important role. The themes from the second movement which contain all twelve tones of the chromatic scale are shown in Figure 3.12. Transitions utilizing the entire scale within seven measures occur at measures 93 and 365 and are shown in Figure 3.13. As a symmetrical basis the chromatic scale is further reinforced by a presentation of the scale encompassing the range of an octave plus a tritone between measures 124 and 126.

An additional symmetrical structure is formed by the alternating scale shown in Figure 3.14 which is stated in its entirety in measures 421-22 over the range of an octave. A more obscure statement of a symmetrical alternating scale may be found in measures 13-15 in which the descending final four notes join with the ascending first five notes to form the symmetrical structure shown in Figure 3.15.

In addition to the chromatic scale and the alternating scale, another symmetrical scale is used as a basis for themes and motives in the second movement. This octatonic scale is never clearly stated but rather is created aurally by the merging sounds of two independent motives (shown in Figure 3.16a). Throughout the movement, these motives are stated frequently and prominently in various rhythm patterns and transpositions. During the

Figure 3.12a. <u>Music for Strings</u>, II, 4-10, 1.3.Vl.

Figure 3.12b. <u>Music for Strings</u>, II, 68-77, 1.Vl.

Figure 3.13a. <u>Music for Strings</u>, II, 93-99, 1.Cb.

Figure 3.13b. <u>Music for Strings</u>, II, 365-71, 3.Vl.

Figure 3.14. <u>Music for Strings</u>, II, 421-22, Pfte.

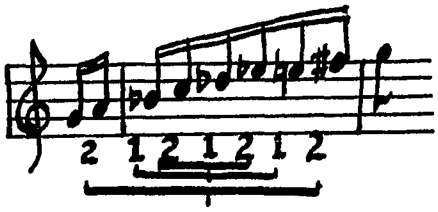


Figure 3.15. <u>Music for Strings</u>, II, 13-15, 3.Vl.

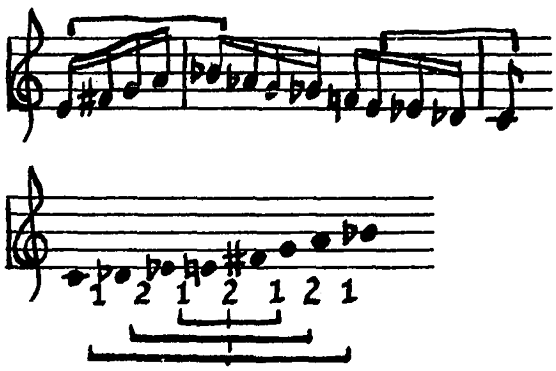
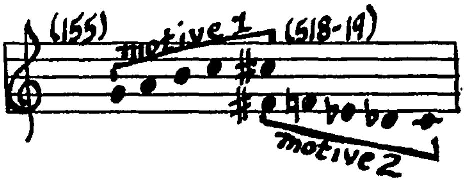
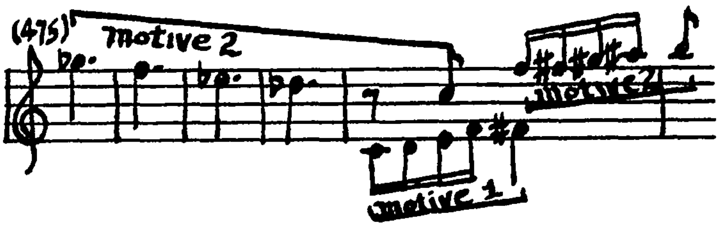


Figure 3.16. Motives from Symmetrical Scale

(a)



(b)



lengthy closing section, they are stated in such close proximity that they tend to dominate the final aural impression of the entire movement. One example of such proximate statements is given in Figure 3.16b. The symmetrical scale itself is given in Figure 3.17, where it is shown to contain both the descending motive of Figure 3.16a with its transposition at the tritone and the ascending motive of the same figure with its transposition at the tritone. In Figure 3.17 this scale is shown to be symmetrical in each half as well as in its complete form.

Many motives and themes from the second movement are derived directly from this one symmetrical scale. The opening introductory motive (Figure 3.18a) contains notes 7, 1, 3 and 4 of the scale (or notes 3, 5, 7 and 8, transposed). In the beginning motive of the main theme (represented by Figure 3.18b, upper staff), all the notes except d and e are present in the scale. However, the pattern c-d-e-f-f# in measures one and two of the figure creates the same intervallic relationship as motive 1 shown in Figure 3.17. In Figure 3.18b, this same melodic idea from the main theme is shown as it appears in combination with another prominent motive also derived from the scale. This latter motive, consisting of notes 1, 6 and 5 transposed (or notes 8, 5 and 4, or notes 5, 2 and 1, or notes 4, 1 and 8, transposed) is shown in the lower staff of the figure. Other prominent motives derived from the scale are presented in Figure 3.18c-k.

Figure 3.17. Symmetrical Scale

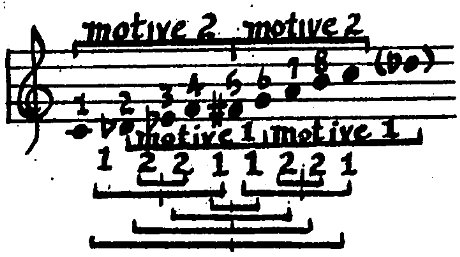


Figure 3.18. Motives Derived from Symmetrical Scale

In many instances in the second movement, melodies are stated whose symmetrical qualities are the product of the alternating principle as it is applied to non-scalar passages. An example of this type of symmetrical melody is shown in Figure 3.19. A variation of this principle of symmetry is shown in Figure 3.20 in which case an interval is repeated in corresponding positions on either side of the alternating pattern, maintaining the symmetry of the central figure. Similarly, the application of the uni-intervallic principle to non-scalar passages may produce symmetrical melodies as shown in Figure 3.21.

Of further interest is the symmetrical melody whose symmetry is a product of retrogression. As in Figure 3.9 of the first movement, many melodies of the second movement divide themselves into halves, the second half reproducing the first half in retrogradation. An example of this variety of symmetrical melody is given in Figure 3.22.

The second movement, being of a more homophonic texture than the fugal first movement, provides a greater opportunity to examine symmetrical harmonies and harmonic progressions. Some of the symmetrical harmonies used in the second movement are those which can be derived from the symmetrical scale shown in Figure 3.17. These include the diminished triad formed by notes 1, 3 and 5, notes 3, 5 and 7, notes 5, 7 and 1, or notes 7, 1 and 3; the augmented triad formed by notes 4, 7 and 2, or notes 3, 6 and 8; the quartal triad formed by notes 2, 5 and 8, or notes 6, 1

Figure 3.19. Music for Strings, II, 69-72, 1.Vlc.

Figure 3.20. Music for Strings, II, 87-88, 3.Vl.

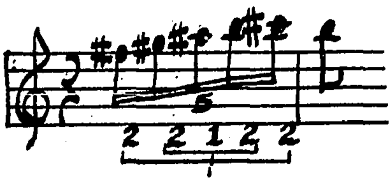


Figure 3.21. Music for Strings, II, 140-42, 1.Cb.

Figure 3.22. Music for Strings, II, 36-39, 2.Vl., 2.Vle.

and 4; and the whole-tone chord formed by notes 2, 3 and 4, 6, 7 and 8 (see Figure 3.22 and Figure 3.23). In addition, the major-major seventh chord and the minor-minor seventh chord (both symmetrical) are also used in the movement as shown in Figure 3.24.

In the second movement there are a few examples of symmetrical chord progressions. One such progression whose symmetry is the result of the alternation of major and minor triads is shown in Figure 3.25. A similar instance of symmetry in a harmonic progression occurs in Theme II of the second movement where the melody outlines diminished and augmented triads as shown in Figure 3.26.

The second movement reveals little tonal symmetry except for an isolated example which occurs in the development section of the movement. Beginning in measure 199, an $\underline{E}^b$ tonal center is established primarily by repetition of an $\underline{E}^b$ major triad. In measure 218 the major $\underline{E}^b$ triad is transposed up by whole steps until the tritone tonality $\underline{A}$ is reached in measure 220. This tonal center is likewise established by insistent repetition of the $\underline{A}$ major triad. In measure 231 another modulation takes place which returns the tonal center ultimately to $\underline{E}^b$ in measure 237. Here again the technique of repeating the $\underline{E}^b$ triad is sufficient to re-establish the original $\underline{E}^b$ tonality. This tonal plan is diagrammed in Figure 3.27.

Figure 3.23. Symmetrical Harmonies

Figure 3.24. Symmetrical Harmonies

Figure 3.25. Symmetrical Chord Progression

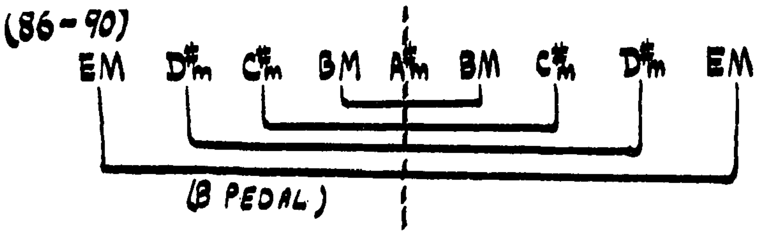


Figure 3.26. Symmetrical Chord Progression

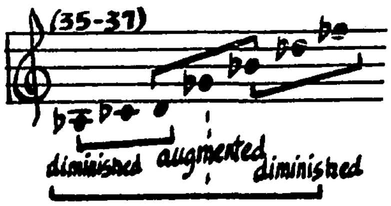
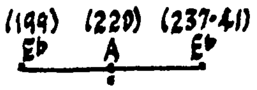


Figure 3.27. Symmetrical Tonal Plan



Movement III. The viola melody found in measures 6-9 of the third movement is related most strongly to the inversion of the first-movement fugue subject as Figure 3.28 shows. Like the fugue subject, this melody also utilizes the complete chromatic scale as its scale basis. Short motives of the melody are drawn from groups of three to five notes descending progressively down the scale shown in Figure 3.28b. As a symmetrical basis the chromatic scale is further emphasized in nearly complete scalar passages represented in Figure 3.29. In the second section of the movement, measures 23-31, another melody which utilizes the complete chromatic scale is presented as shown in Figure 3.30. This melody is transposed almost exactly in measures 63-72, where once again the chromatic scale is present in its entirety. After each section of the movement, at measures 18, 33, 60, and 73, a motive of the original fugue subject of Movement I is presented in isolation providing still another instance of the use of a partial chromatic scale as a symmetrical basis. Here, as in the first movement, the scale basis encompasses the interval of a perfect fifth.

Another symmetrical scale basis is emphasized almost as strongly as the chromatic scale. Between measures 46 and 59 the motive shown in Figure 3.31 appears thirty-two times in transposition, retrograde, and various rhythmically altered forms. When arranged in scalar order as in Figure 3.31, this motive takes on the same symmetrical

Figure 3.28. <u>Music for Strings</u>, III, 6-9, 1.Vle.

Figure 3.29. <u>Music for Strings</u>, III, 14-15

Figure 3.30. <u>Music for Strings</u>, III, 23-31

arrangement of tones and semitones as found in the most prominent motive of the second movement which is labeled "motive 2" in Figure 3.17, page 45. The third-movement melody, plotted with the tones of its harmony arranged in scalar order, produces another symmetrical scale as shown in Figure 3.32. The range of the melody itself (circled notes) lies within the perfectly centered tritone in brackets.

A symmetrical scale basis not yet seen in the _Music for String Instruments, Percussion, and Celesta_ appears in measure 34 of this movement. Here the symmetrical pentatonic scale is stated eighty-one times in nine measures at two different pitch levels, that shown in Figure 3.33 and another transposed up a semitone. The symmetrical scale given in Figure 3.33 is the fifth mode of the diatonic pentatonic scale.[1] One final symmetrical scale basis found in the third movement is shown in Figure 3.34. Persichetti refers to this symmetrical scale as the Neapolitan Major scale and points out that the scale is reflectively identical.[2] As shown in Figure 3.34, the mirror form of the scale exactly reproduces the original in retrograde.

Two varieties of symmetrical melody are found in the third movement. The first is symmetrical melody produced by retrogradation as shown in Figure 3.35. Another symmetrical melody produced by the same technique in measure 65 is shown

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[1]Vincent Persichetti, _Twentieth-Century Harmony_ (New York: W.W. Norton & Co., Inc., 1961), p. 50.

[2]Persichetti, pp. 44-47.

Figure 3.31. Music for Strings, III, 46

Figure 3.32. Music for Strings, III, 46

Figure 3.33. Music for Strings, III, 34

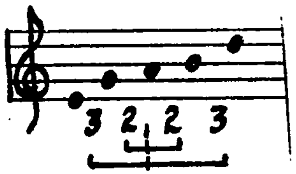


Figure 3.34. Music for Strings, III, 35

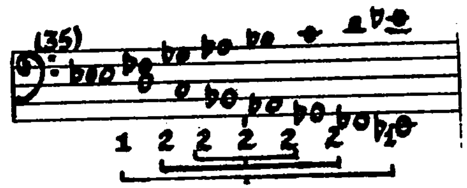
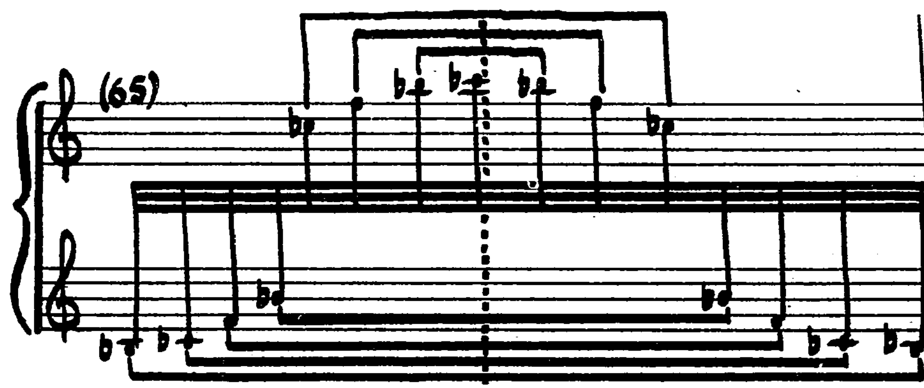


Figure 3.35. Music for Strings, III, 47-48

Figure 3.36. Music for Strings, III, 65



in Figure 3.36. The latter symmetrical melody is stated twenty-nine times within eight measures.

The second variety of symmetrical melody is produced by the alternating principle as applied to nonscalar material. Two isolated examples are reproduced in Figure 3.37 as they appear in measures 22-23 and 73-74.

The strikingly homophonic texture of the third movement creates greater possibilities for symmetrical harmonies and harmonic progressions than the preceding two movements. First, there are examples of uni-intervallic harmonies such as the one created by the pedal tones of measures 20-22 (Figure 3.38a). This harmonic structure is shown to be symmetrical in Figure 3.38b. The stacking of two uni-intervallic diminished triads, each symmetrical in itself, produces the pedal of measures 45-50 as shown in Figure 3.39.

In the third movement there are also harmonies whose symmetry is a product of the alternating principle as shown in Figure 3.40. This harmony presents the combination of two tritones as found in measure 32 (Pfte., Cel., 2.Vlc., and 2.Cb.). The addition of a major triad in the same measure (Timp. and Xyl.) creates a more complex but still symmetrical harmony as shown in Figure 3.41.

One particularly complex and interestingly symmetrical harmonic progression is the product of the simultaneous presentation of two forms of the same symmetrical scale (Figure 3.34) beginning at two different points within that scale. In Figure 3.42a, the scale begun on note one is

Figure 3.37. <u>Music for Strings</u>, III, 22; 73

Figure 3.38. <u>Music for Strings</u>, III, 20-21

(a) (b)

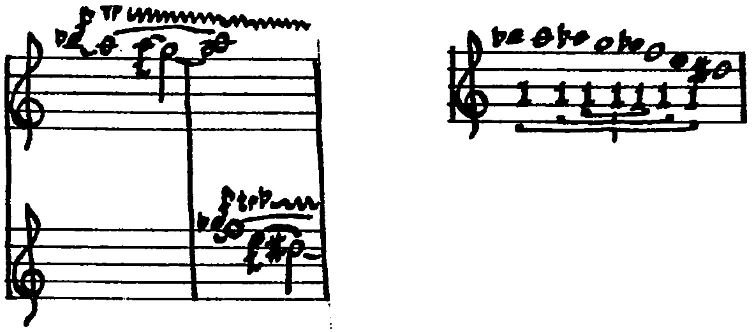


Figure 3.39. <u>Music for Strings</u>, III, 45

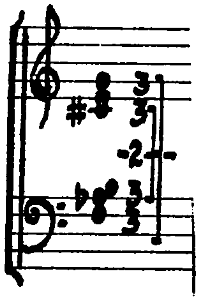


Figure 3.40. <u>Music for Strings</u>, III, 32

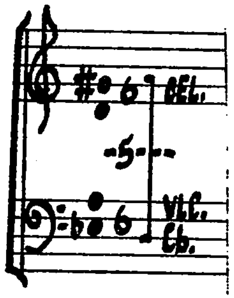


Figure 3.41. <u>Music for Strings</u>, III, 32, Scale Basis

combined with the same scale begun on note four as found in measure 38. Figure 3.42b reproduces the same two scales as before with the addition of a third statement of the scale begun on note seven as found in measure 40. In this figure, the letters represent the interval-class content of the chords as follows: "P" represents the perfect fourth and its inversion the perfect fifth; "M" represents the major third and its inversion the minor sixth; "N" (not present here) represents the minor third and its inversion the major sixth; "S" represents the major second and its inversion the minor seventh; "D" represents the minor second and its inversion the major seventh; and "T" represents the tritone.[1] It is interesting to note the double symmetry of the passage produced by the retrograde principle discussed earlier as it is applied to each half of Figure 3.42b and subsequently to the entire figure.

Movement IV. The chromatic scale is determined to be the scale basis for many areas of the fourth movement. In the melody, measures 27-43 (Pfte.), all the tones of the chromatic scale c#-c# except the tritone g are present as early as measure 35. As shown in Figure 3.43, the g is systematically avoided until measure 41 where it is reiterated for three measures by the strings before the return of the principal theme. The scale is present again in the melody of measures 264-69 as shown in Figure 3.44. The

[1]Howard Hanson, Harmonic Materials of Modern Music (New York: Appleton-Century-Crofts, Inc., 1960), pp. 10-11.

Figure 3.42. Music for Strings, III, 38; 40, Arpa

(a)

(b)

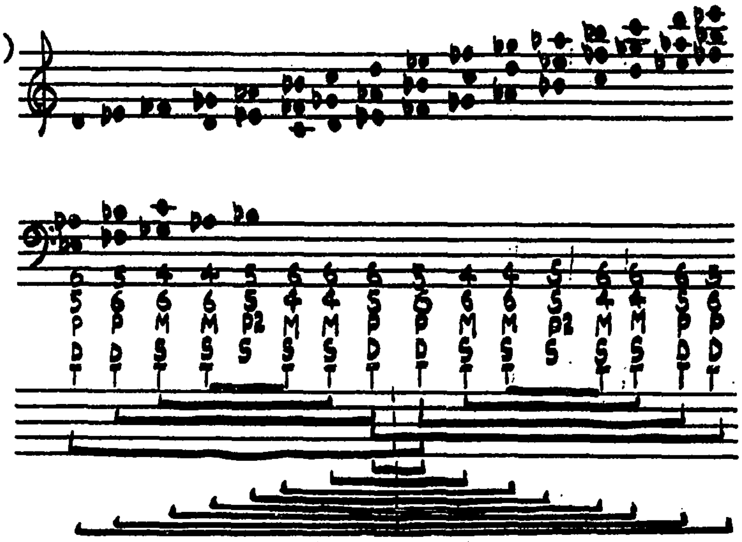


Figure 3.43. Music for Strings, IV, 27-43, 1.Vl.

Figure 3.44. Music for Strings, IV, 264-69, Pfte.

chromatic scale itself is stated in a lengthy presentation spanning more than two full octaves in measures 248-62 (2.Vlc. and 2.Cb.).

The statements of the first-movement fugue subject (Figure 3.1, page 34) as presented in the fourth movement merit special attention here. The chromatic nature of the original subject is expressed in its partial statements found in measures 215-19 of which Figure 3.45 is an example. The section which immediately follows, measures 219-31, further reinforces the chromatic scale basis of the subject in subject-related statements of that scale encompassing intervals which range from the perfect fifth to the double octave. Figure 3.46 is an example of such a statement encompassing the interval of a perfect fifth.

This same fugue subject is presented in a much more diatonic idiom in measures 203-14 of the fourth movement. The subject in its diatonic form is presented with its derived symmetrical scale in Figure 3.47. The scale basis may be described as the second mode of the overtone scale.[1] The note d is named as tonal center by reason of its placement as compared to the tonal center of the original subject, Movement I, as well as by reasons of metric stress and repetition. The use of this scale as a symmetrical basis is reinforced by the many complete statements of the scale found between measures 235-41 as illustrated in the first portion of Figure 3.48.

[1] Persichetti, p. 44.

Figure 3.45. Music for Strings, IV, 215-17, 2.Vl.

Figure 3.46. Music for Strings, IV, 222-23, 2.Vlc.

Figure 3.47. Music for Strings, IV, 203-08, 4.Vl.

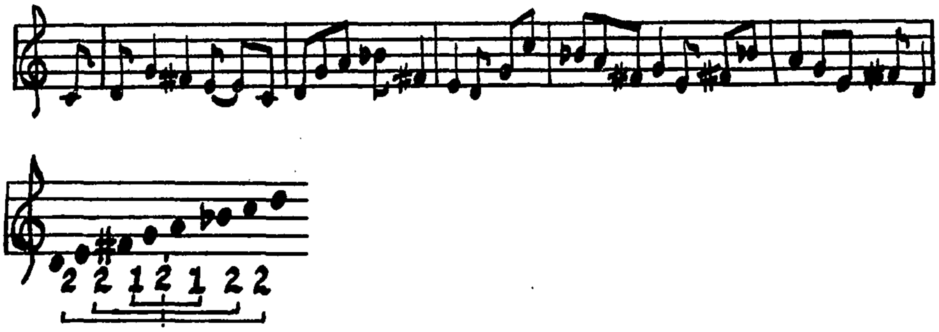


Figure 3.48. Music for Strings, IV, 235-36, 1.Vle.

Used in conjunction with this symmetrical scale is the Neapolitan Major scale also shown in Figure 3.48. (See Figure 3.34, page 53.) This latter scale contains the whole-tone uni-intervallic scale presented vertically in measure 232 (Figure 3.49). Within the same area of music still other symmetrical scales are presented as shown in Figure 3.50. The first of these is a statement of the dorian mode, the only "traditional" scale which is also symmetrical. The dorian mode plays a prominent role in the fourth movement, particularly in the second large thematic area where it is used as the scale basis for the melodies shown in Figures 3.51 and 3.52.

Symmetrical melody plays a less important role in the fourth movement than in the previous movements. However, there are some interesting examples to be noted. The opening theme stated in Figure 3.53 is shown to be symmetrical by the retrograde principle. The melodic contour of the theme is also symmetrical in the descending-ascending-descending pattern of the melody. The highest and lowest notes of the symmetrical melody are the same (b), each acting as an axis for one of the overlapping symmetrical patterns. Another symmetrical melody produced by retrogradation is found in the accompaniment of the opening theme in measures 48-50 as shown in Figure 3.54.

Other symmetrical melodies of the fourth movement are the product of the technique of mirror. The melody shown in Figure 3.55 utilizes four statements of the

Figure 3.49. Music for Strings, IV, 232

Figure 3.50. Music for Strings, IV, 237-39, 2.Vlc.

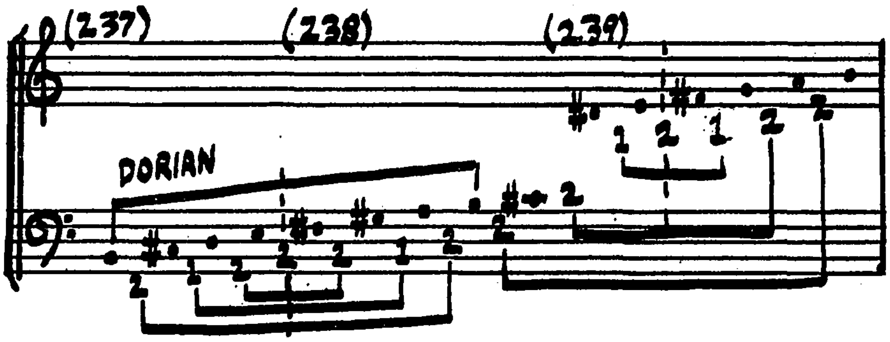


Figure 3.51. Music for Strings, IV, 74-77, Pfte.

(a)

(b)

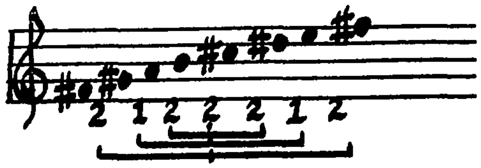


Figure 3.52. Music for Strings, IV, 85-89, 1.Vle.

(a)

(b)

Figure 3.53. Music for Strings, IV, 5-9, 3.Vl.

Figure 3.54. Music for Strings, IV, 48-50, Pfte.

Figure 3.55. Music for Strings, IV, 183-85, 3.Vl., 1.Vl.

three-note motive, semitone-tone. The first half of the melody presents the original form of the motive and its transposed retrograde inversion. The second half of the melody presents the mirror form of the original motive and a transposition of it in retrogradation. In addition, the second half of the melody also mirrors the first half. The entire melody is repeated in transposition and mirror in measures 183-89.

Symmetrical harmonies of varying types appear throughout the fourth movement. In measures 19-25 the arpeggiated diminished triad appears fourteen times in various transpositions. In Figure 3.56, two diminished triads are linked horizontally by a major third to produce the symmetrical pattern shown. Other examples of uni-intervallic harmonies include the quartal chord shown in Figure 3.57, and the whole-tone chord shown previously in Figure 3.49. Examples of chords made symmetrical by the alternating principle include the minor-minor seventh chord and the major-major seventh chord shown in Figure 3.58.

A chord common to many of Bartók's compositions, although not found frequently in the Music for String Instruments, Percussion, and Celesta, is the chord combining major and minor triads with the same root into one chord as shown in Figure 3.59. This symmetrical chord is found twice in each bar between measures 142 and 158.

One chord progression is shown to be symmetrical in chord quality by the principle of retrogradation as shown in

Figure 3.56. Music for Strings, IV, 25, 4.Vl.

Figure 3.57. Music for Strings, IV, 13, Strings

Figure 3.58. Music for Strings, IV, 12; 138

Figure 3.59. Music for Strings, IV, 142, Strings

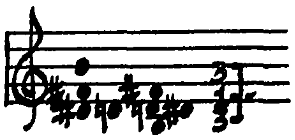


Figure 3.60. In this figure, capital letters stand for major chords, and smaller letters stand for minor chords of the same pitch names. Likewise, "M" and "m" stand for major and minor respectively.

The tonal plan of the fourth movement is symmetrical only in isolated areas. The first tonally symmetrical area is found in measures 1-51 as shown in Figure 3.61. In measures 1-12, the tonal center is clearly A produced by the pedal A major harmony of those measures and the A lydian melody previously shown in Figure 3.53, page 62. Measures 12-25 dissolve the tonality while measures 26-43 tend to establish $\underline{D}^b$ or $\underline{C}^\#$ as the tonal center through the constant $\underline{d}^b$-$\underline{a}^b$ pedal of the timpani and the insistent reiteration of $\underline{c}^\#$ in the melody. The symmetrical pattern is completed in measures 44-51 with the return of the original melody with its A tonality.

The second tonally symmetrical area is present in measures 74-120 and is illustrated in Figure 3.62. In measures 74-81, the tonal center is $\underline{F}^\#$ produced by the $\underline{F}^\#$ dorian melody and the dominant $\underline{C}^\#$ pedal of the harp. In measures 83-95 the tonal center is changed to $\underline{E}^b$ produced by the tonic-dominant pedal of the low strings, the insistent $\underline{E}^b$ harmonies at the beginning of this section, and the $\underline{E}^b$ dorian melody. In measures 96-102 the tonality seems to change with the changing pedal tones, but the $\underline{E}^b$ tonal center of measures 83-95 returns convincingly in measure 103 with a slightly altered melody. This section is followed in

Figure 3.60. Symmetrical Chord Progression

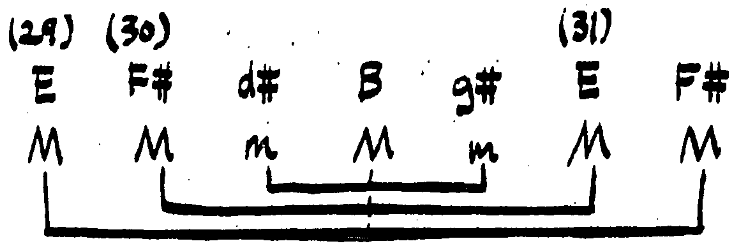


Figure 3.61. Music for Strings, IV, 1-51, Tonal Plan

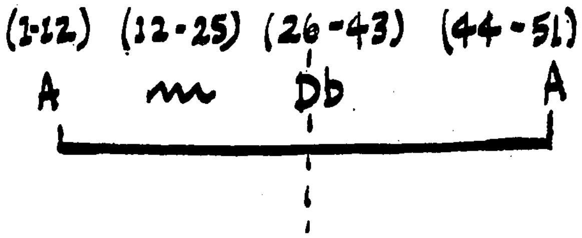
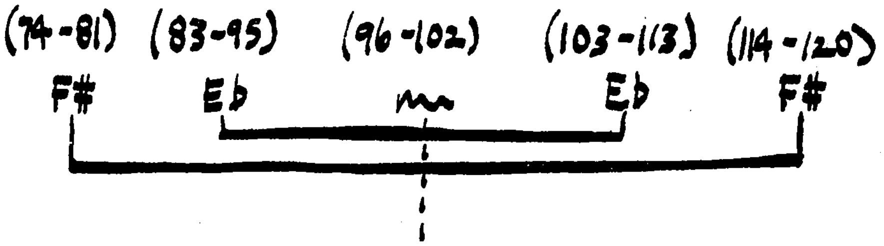


Figure 3.62. Music for Strings, IV, 74-120, Tonal Plan



measures 114-20 by a return of the original F# melody and tonality.

Movements I-IV. According to Deri,[1] the tonal plan of the entire four-movement composition is as follows: Movement I has a tonal center of A established by the opening and closing notes of the movement. Movement II has a tonal center of C established by statements of Theme I (Figure 3.12a, page 42) in C tonality in the exposition and recapitulation sections and by the reiteration of the note c in the introductory and concluding sections of the movement. Movement III has a tonal center of F# established by an F# tritone pedal in the first section of the movement and the final note of the closing melody (an f# which sounds almost continuously during the last four measures of the movement). Like Movement I, Movement IV has the tonal center A established by statements of Theme I (Figure 3.53, page 62) in A tonality in the opening and closing sections of the movement. The above tonal plan is shown to be symmetrical in Figure 3.63 where the symmetry is created by the interval of a minor third which occurs between the tonal centers of Movements I and II and Movements III and IV.

Figure 3.63. Music for Strings, Tonal Plan

I	II	III	IV
A	C	F#	A

3 6 3

[1]Otto Deri, Exploring Twentieth-Century Music (New York: Holt, Rinehart and Winston, Inc., 1968), pp. 252-54.

Duration

Movement I. In the discussion of the pitch parameter of Movement I of the Music for String Instruments, Percussion, and Celesta, the opening fugue subject was shown to contain four motives. Shown in Figure 3.64, the rhythmic content of the subject further subdivides these four motives into smaller rhythmic motives. In motive "A" the anacrusis is omitted leaving rhythmic motive 2. This note of anacrusis is hypothetically added to the final two notes of the subject forming rhythmic motive 1 of which Figure 3.65 is an example. This rhythmic motive is particularly important because it is used throughout the entire four-movement composition. Its fundamental symmetrical rhythm pattern (short-long-short) is the basis for rhythmic motive 2 which repeats the long note value to the right of the axis before restating the short note value. Rhythmic motive 2 is restated in motive "B" preceded by four eighth notes. The symmetry of rhythmic motive 3 is more a product of rests and grouping than of actual rhythm. Like motive 2, rhythmic motive 4 is also derived from motive 1, the difference residing in the symmetrical addition of an eighth note on either side of motive 1 to form the final rhythmic motive.

Other symmetrical rhythmic motives found in the movement and not contained in the subject are given in Figures 3.66-69. Figure 3.66 shows various ways in which the short-long-short symmetry of motive 1 is maintained while actual note values are changed. Figure 3.67 reveals

Figure 3.64. Music for Strings, I, 1-4

Figure 3.65. Music for Strings, I, 49, 1.2.Vle.

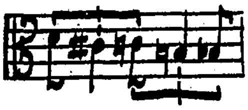
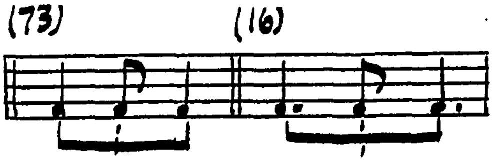


Figure 3.66. Music for Strings, I, Rhythmic Motive 1

Figure 3.67. Music for Strings, I, Rhythmic Motive 1



two examples of the same motive in opposite symmetry substituting long note values for short and vice versa. In the same manner, the example shown in Figure 3.68 is the opposite symmetry of motive 2. An additional example of rhythmic symmetry is shown in Figure 3.69.

In some cases, symmetrical rhythmic motives may be combined in overlapping patterns to produce varying kinds of symmetry. One example has already been given in Figure 3.65. A different example is given in Figure 3.70.

In his article, "Sequence and Symmetry in Twentieth Century Melody,"[1] Rimmer shows how one complex meter may be subdivided into two or more simple meters. For purposes of discussion, each subdivision of the metric entity is referred to as "micro-meter" while the original complex meter is referred to as "macro-meter." During the course of the first movement of Music for String Instruments, Percussion, and Celesta, macro meters $\frac{5}{8}$, $\frac{6}{8}$, $\frac{7}{8}$, $\frac{8}{8}$, $\frac{9}{8}$, $\frac{10}{8}$, $\frac{11}{8}$, and $\frac{12}{8}$ are used. Meters $\frac{5}{8}$ and $\frac{7}{8}$ are used asymmetrically throughout the movement. However, each of the other macro-meters is at one time or another subdivided into a symmetrical pattern of simple duple or triple micro-meters (designated "2" and "3" respectively), as shown in Figure 3.71. Here the patterns which represent measures 24, 32, 22, 17, 57, and 2 are formed by the repetition of one micro-meter, and thus are so neutral that they do not

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[1]Frederick Rimmer, "Sequency and Symmetry in Twentieth Century Melody," Music Review, XXVI, 1 (February, 1965), 33.

Figure 3.68. Music for Strings, I, Rhythmic Motive 2

(5)

Figure 3.69. Music for Strings, I, 70, 1.2.Vlc.

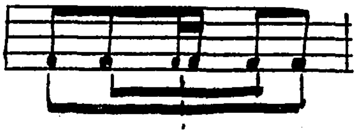


Figure 3.70. Music for Strings, I, 41-42, 1.2.Vlc., 1.2.Cb.

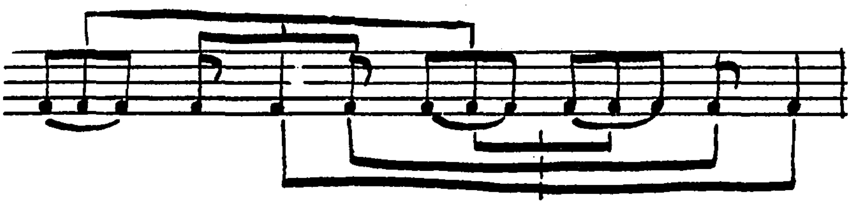


Figure 3.71. Symmetrical Meters

(24) $\frac{6}{8} = \frac{3+3}{8}$ (32) $\frac{6}{8} = \frac{2+2+2}{8}$ (22) $\frac{8}{8} = \frac{2+2+2+2}{8}$ (26) $\frac{8}{8} = \frac{3+2+3}{8}$

(17) $\frac{9}{8} = \frac{3+3+3}{8}$ (41) $\frac{10}{8} = \frac{3+2+2+3}{8}$ (57) $\frac{10}{8} = \frac{2+2+2+2+2}{8}$

(87) $\frac{11}{8} = \frac{2+2+3+2+2}{8}$ (2) $\frac{12}{8} = \frac{3+3+3+3}{8}$ (6) $\frac{12}{8} = \frac{3+2+2+2+3}{8}$

contribute to the aural impact of symmetry. However, these patterns do serve as a foil for the remaining four examples of the figure representing measures 26, 41, 87 and 6. In contrast, the latter examples incorporate more than one micro-meter in unique, symmetrical arrangements within one macro-meter.

The changing tempos of the first movement, when considered as a whole, do not form a symmetrical pattern. However, when the tempo markings of certain areas are abstracted, they do form symmetrical structures as shown in Figure 3.72. In this figure, the two main sections of the movement are shown to divide at measure 65 with a coda beginning in measure 78. The tempos of the first section and those of the movement proper, excluding the coda, form roughly symmetrical patterns. It is the addition of the "night music" closing section (measure 78) which causes the pattern formed by the changing tempos of the whole movement to be asymmetrical. The pattern produced by the mathematical difference between each pair of tempo indications forms the symmetrical structure shown in the lower portion of the figure.

Movement II. In the second movement, many symmetrical rhythm patterns are derived from the short-long-short pattern (rhythmic motive 1, Figure 3.64, page 69) of the first movement. The most frequently recurring example and its many variations are given in Figure 3.73. The final version of the pattern shown is the equivalent of rhythmic

Figure 3.72. <u>Music for Strings</u>, I, Tempo

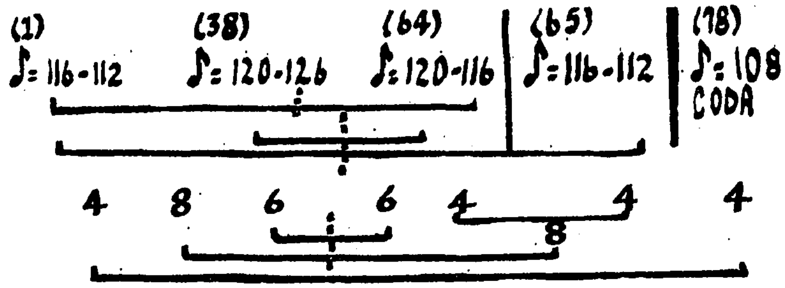


Figure 3.73. <u>Music for Strings</u>, II, Rhythmic Motive 1

motive 1, Movement I. An overlapping pattern similar to that of Figure 3.65, page 69, is shown in Figure 3.74, while Figure 3.75 reveals the same short-long-short rhythm pattern with one or two additional short note values symmetrically added at either end. Rhythmic motive 2 from the first movement (Figure 3.64, page 69) and its opposing symmetry are shown as they appear in the second movement (Figure 3.76).

The next two figures provide additional examples of rhythmic symmetry. In Figure 3.77 rests are shown to be an essential element in the creation of rhythmic symmetry. One final example of symmetrical structures formed by rhythm is shown in Figure 3.78. This structure is entirely symmetrical and is comprised of several smaller symmetrical rhythm patterns shown in the lower brackets.

Meter is found to produce symmetrical patterns only in two small areas of the development section of the second movement. In measure 309 a short fugal development section begins with the first entry of the subject. The changing meters of this subject create the first bracketed symmetrical structure of Figure 3.79. The second bracketed pattern indicates the second entry of the subject in measures 317 through 322 where the symmetry dissolves. Figure 3.80 reveals the symmetrical pattern presented in a later area of the same section where the fugue subject of Figure 3.79 returns in imitation with its mirror image. After this section, once again the symmetry dissolves.

Figure 3.74. <u>Music for Strings</u>, II, 68-70, 1.Vl.

Figure 3.75. <u>Music for Strings</u>, II, Rhythmic Symmetry

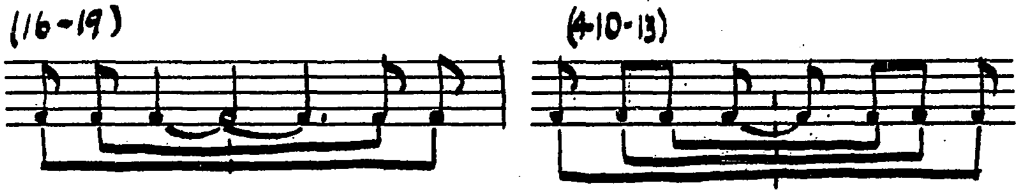


Figure 3.76. <u>Music for Strings</u>, II, Rhythmic Motive 2

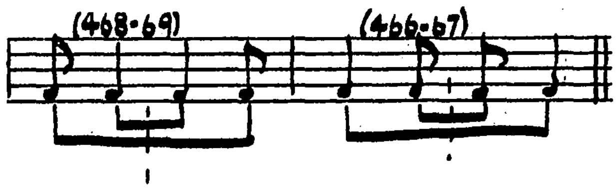


Figure 3.77. <u>Music for Strings</u>, II, Rhythmic Symmetry

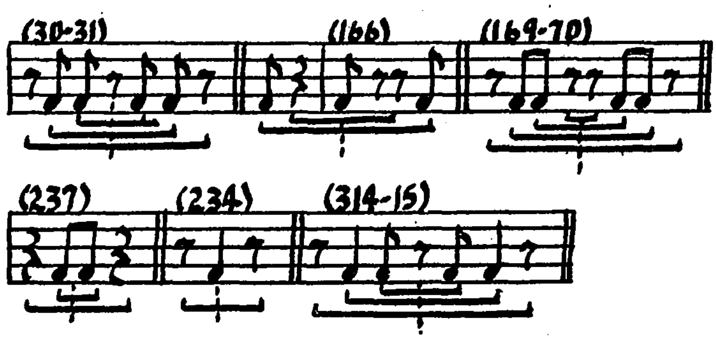


Figure 3.78. Music for Strings, II, Rhythmic Symmetry

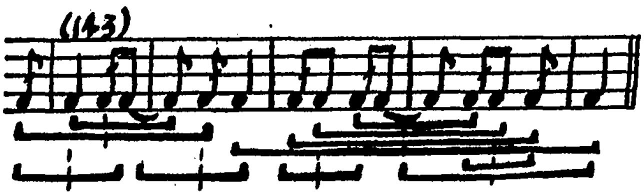


Figure 3.79. Symmetrical Meter Pattern

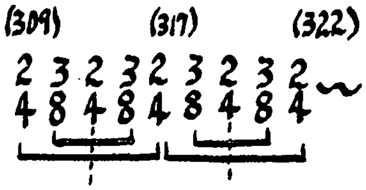
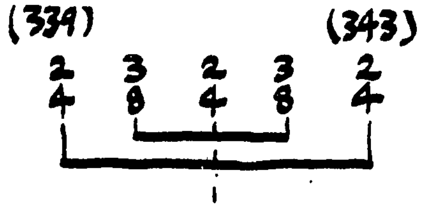


Figure 3.80. Symmetrical Meter Pattern



The pattern of changing tempos forms symmetry only in the exposition section (measures 1-154) as shown in Figure 3.81. The first section of this figure includes the following parts: introductory theme; Theme I; transition; Theme II; Theme III. The second section of Figure 3.81 represents a transition section, while the final section of the figure represents the final theme of the exposition section.

In the second movement, an important symmetrical structure is formed by the temporal spans of the exposition, development, and recapitulation sections. In this movement, the exposition and recapitulation sections each require about two minutes of performance time (2'03" and 1'55" respectively) while the development section between these two equivalent sections requires almost a full minute longer (2'57") to perform. The resultant symmetrical structure is diagrammed in Figure 3.82.

<u>Movement III</u>. The third movement provides extremely intricate and interesting examples of symmetrical structures formed by rhythm. Of primary interest is the opening rhythm of the solo xylophone on the single pitch <u>f</u> shown in Figure 3.83. This rhythm pattern is perfectly devised to produce symmetry several different ways: (1) the second half is the retrogradation of the first half; (2) the notes group themselves to form a symmetrical alternation of duple and triple micro-meters; and (3) the note values themselves steadily decrease in length from that of a quarter note to a

Figure 3.81. Music for Strings, II, 1-154, Tempo

EXPOSITION

(1)	(95)	(114-54)
♩ = 138-144	♩ = 152	♩ = 138

Figure 3.82. Music for Strings, II, Temporal Span

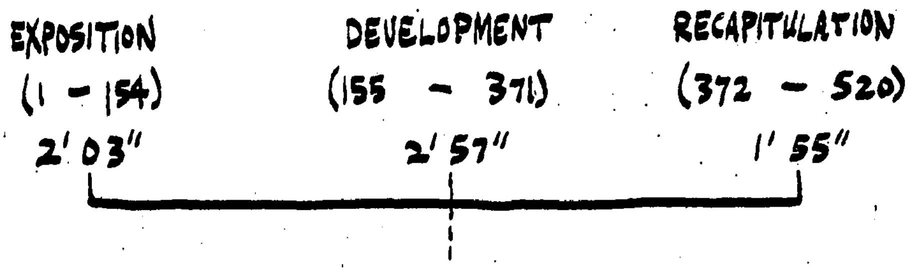
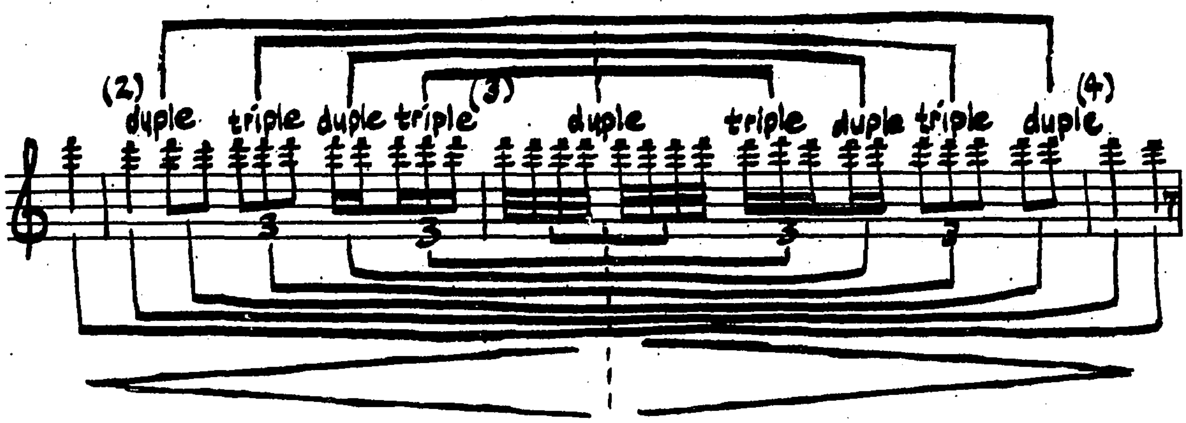


Figure 3.83. Music for Strings, III, 1-4, Xyl.



thirty-second note, increasing again to the length of a quarter note. The additional symmetrical effect provided by the perfectly placed crescendo and subsequent decrescendo makes the aural impression of symmetry unmistakable.

The short pattern which immediately precedes the symmetrical structure of Figure 3.83 is also symmetrical and is important for its prominently placed statements as shown in Figure 3.84. It appears as indicated in the first and last measures of the movement and in diminution in measure 18 which closes the first section.

The symmetrical short-long-short rhythm pattern (motive 1, Figure 3.64, page 69) of the preceding two movements appears in the third movement in sometimes exaggerated note values as shown in Figure 3.85a. In Figure 3.85b variations of the same pattern are shown to form additional symmetrical structures. (Although the example taken from measure 14 lacks three sixty-fourth notes of being truly symmetrical, the aural impact of symmetry is still apparent.) Additional examples of rhythmic symmetry are illustrated in Figure 3.86.

On a somewhat larger scale, one additional symmetrical structure formed by rhythm must be mentioned. Figure 3.87 reveals the different rhythm patterns utilized for one motive in the order in which they appear in measures 45-59. The five-note melody is stated first in steady quarter notes (measures 45-49), then in five eighth notes (measures 50-53), and again in steady quarter notes (measures 54-59) completing the symmetrical structure.

Figure 3.84. <u>Music for Strings</u>, III, 1; 18; 82-83

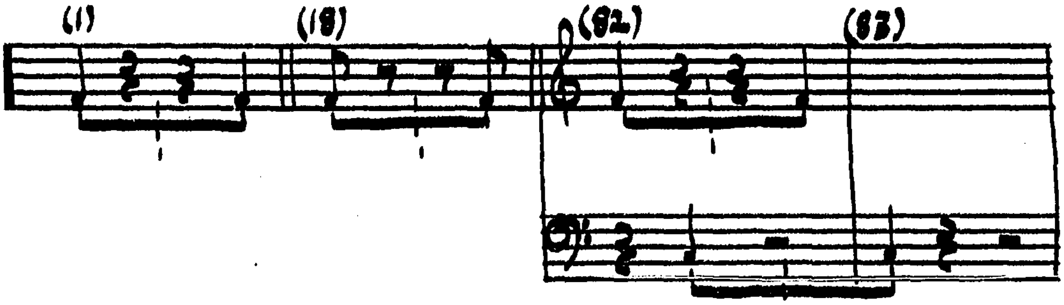


Figure 3.85. <u>Music for Strings</u>, III, Rhythmic Motive 1

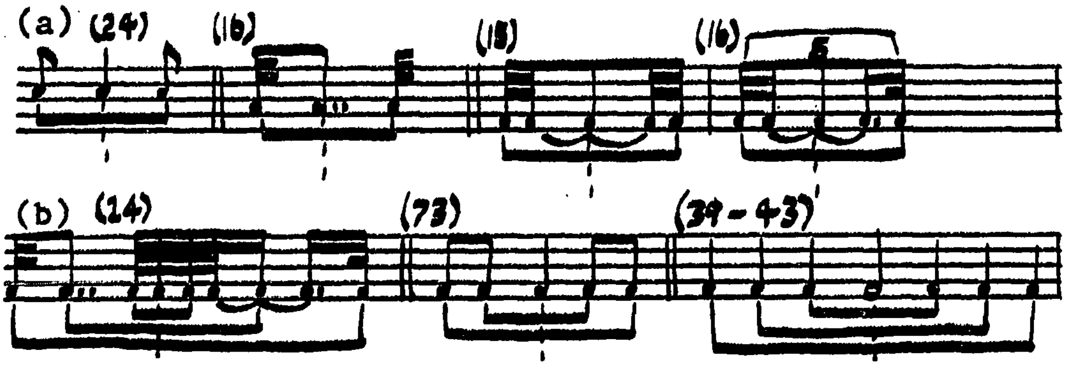


Figure 3.86. <u>Music for Strings</u>, III, Rhythmic Symmetry

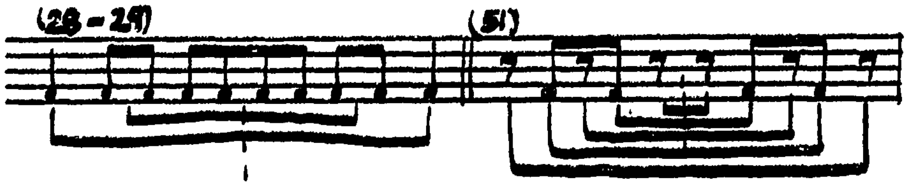
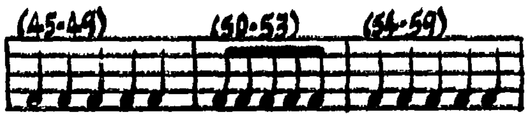


Figure 3.87. <u>Music for Strings</u>, III, 45-59



The pattern formed by changing meters in the third movement is asymmetrical when taken as a whole. However, one area of the movement provides an interesting symmetrical structure when its meter plan is abstracted. The structure shown in Figure 3.88 involves the formal section bounded by measures 36-44 which is written entirely in $\frac{3}{2}$ meter (the metric equivalent of $\frac{6}{4}$). Despite the triple appearance of the given meter, the prevailing rhythms of Group I of the strings divide all but two measures of the section readily in half (𝅗𝅥.𝅗𝅥.). The rhythm patterns found in measures 39 and 43 more readily subdivide each measure into a triple pattern (𝅗𝅥𝅗𝅥𝅗𝅥). It is the pattern of change in real meter as opposed to written meter which creates symmetry in the figure.

The symmetrical structure formed by the changing tempos of various sections of the third movement is somewhat clouded by the fact that at the end of each section, except the section (measures 35-44) which is labeled "B" by the composer, there is a statement of one of the motives from the fugue subject of the first movement. The effect of each of these statements or "tags" is heightened by a accompanying thinning of texture and a slower tempo marking. The tempos of these tag motives do not form a pattern of symmetry, but the tempo markings of the entire movement excluding those of the tag motives do form a symmetrical structure as shown in Figure 3.89.

<u>Movement IV</u>. The symmetrical short-long-short rhythmic motive found in the preceding three movements also

Figure 3.88. Music for Strings, III, 36-44, Meter

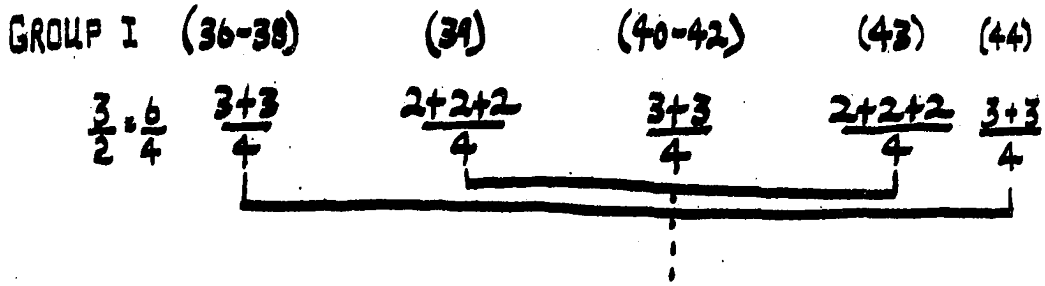
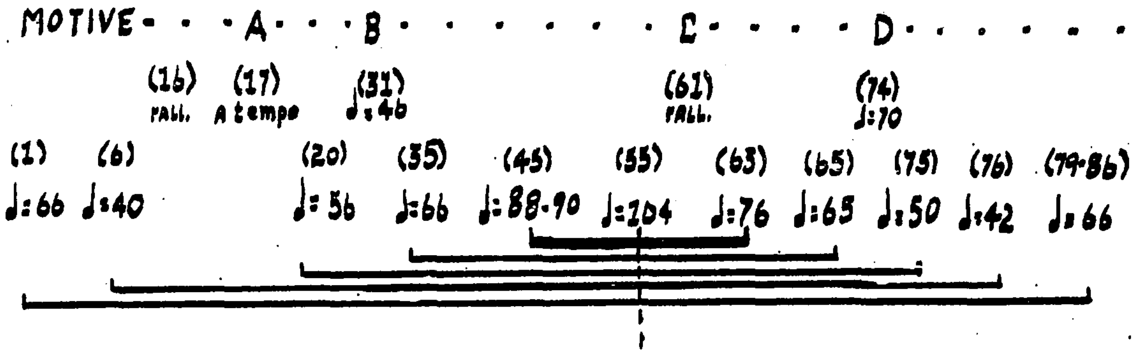


Figure 3.89. Music for Strings, III, Tempo



appears in the final movement. In Figure 3.90 this basic motive and two variations are shown as they appear within the movement. In Figure 3.91 the principal theme of the fourth movement is shown to contain several instances of the same short-long-short rhythm pattern. In addition, this theme is rhythmically retrogressive as well, demonstrating another kind of rhythmic symmetry. Additional examples of symmetrical rhythm patterns are stated in Figure 3.92.

The pattern formed by changing meters in the fourth movement is asymmetrical. However, one short span (the closing statement of the main theme) does produce metric symmetry as shown in Figure 3.93. The overall meter of this final section (measures 248-85) is $\frac{2}{2}$. However, the interjection of two measures of $\frac{3}{4}$ meter at similar melodic points in the section (measures 270 and 272) with an intervening measure of $\frac{2}{2}$ disturbs the duple flow of the music and produces the symmetrical structure shown.

The pattern formed by the changing tempos of the fourth movement create several symmetrical structures as shown in Figure 3.94. The tempo markings in order as they appear in the first large section of the movement delineate the following formal areas: Theme I (1); transition (52); Theme IIa (74); Theme IIb (83); Theme IIa (114); and transition (124). The pattern of tempos thus formed creates the symmetrical structure shown in the first portion of Figure 3.94. An additional example of the creation of symmetry by tempo is shown in the final portion of Figure 3.94

Figure 3.90. Music for Strings, IV, Rhythmic Motive 1

Figure 3.91. Music for Strings, IV, 5-8

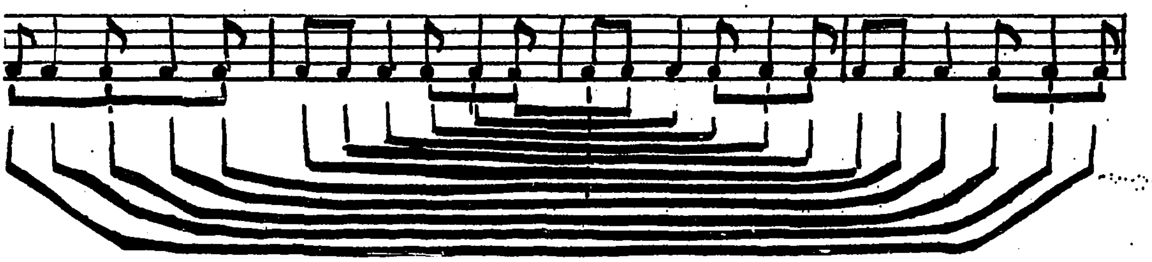


Figure 3.92. Music for Strings, IV, Rhythmic Symmetry

Figure 3.93. Music for Strings, IV, 248-85, Meter

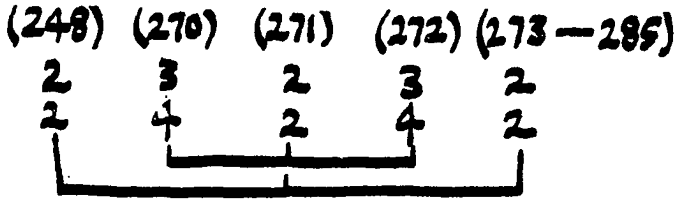
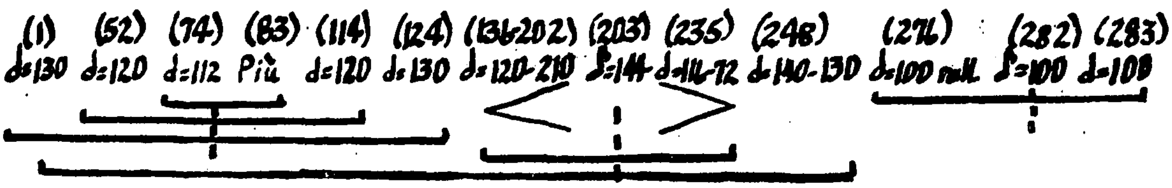


Figure 3.94. Music for Strings, IV, Tempo



which reveals the plan of tempo markings for the concluding section of the movement, laveled "I" by the composer. The tempo markings thus given do not reveal changes of thematic material, but rather a rallentando used to emphasize the finality of the last few measures of brisk tempo which characterizes the final movement.

The third symmetrical structure formed by tempo in the final movement encompasses measures 1-275 excluding the above mentioned closing section. This symmetrical structure delineated in the lower brackets of Figure 3.94 is formed by the correspondence of tempo indications between the first section (measures 1-135) and the section immediately preceding the closing section (measures 248-75). The axis of the structure is formed by the much slower tempo of the central section (measures 203-34) which presents the fugue subject from Movement I. On either side of the axis are placed sections of varying tempo encompassing measures 136-202 and measures 235-47. The first of these sections evinces an accelerando while the latter section evinces a corresponding rallentando.

The only symmetrical structure created by temporal span in the final movement is coincidental to the melodic plan "a-b-a" of measures 5-51 and measures 74-120. As shown in Figure 3.95, the temporal spans of the initial statement and the closing restatement of the theme in each case are roughly the same. The intervening middle thematic area in each case is, by contrast, much longer producing an alternating type of symmetry. (The temporal span of Figure 3.95a is given in numbers of measures at the same tempo while that of Figure 3.95b is given in numbers of seconds of performance time.)

Timbre

Movements I-IV. Bartók's meticulous arrangement of the instruments of Music for String Instruments, Percussion, and Celesta provides a particularly interesting example of symmetry. As shown in Figure 3.96, the two string orchestras are placed on either side of the other instruments with the lower-pitched instruments placed toward the back and the higher-pitched instruments placed toward the front. An obvious attempt has been made by the composer to place instruments of comparable register and timbre in corresponding positions on either side of the central axis.

Movement I. A different type of symmetry is produced in the first movement by register. The symmetrical structure formed by tonality (Figure 3.11, page 40) is reinforced in the first seven entries of the fugue subject by comparable and appropriate changes in register. The resulting wedge-shaped symmetrical structure is diagrammed in Figure 3.97a where vertical distance represents change of register. The remaining designations represent instrumentation and measure numbers of the entries as they open outward from the initial viola fugue subject. All ten string parts are present with the stretto entries of measure 27.

Figure 3.95. <u>Music for Strings</u>, IV, Temporal Span

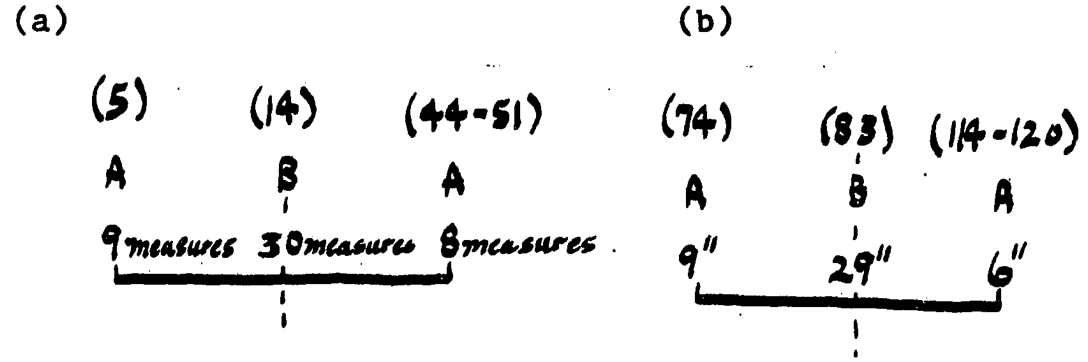
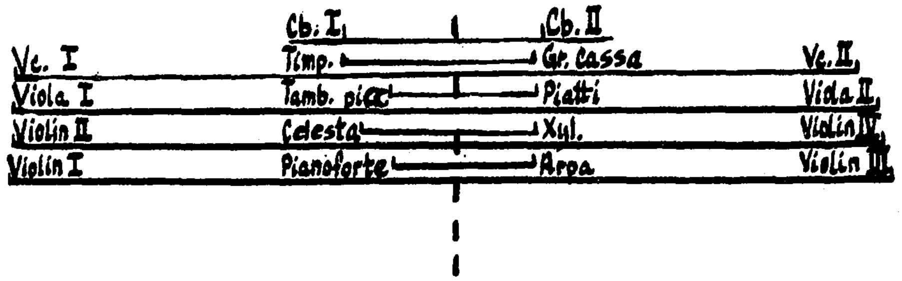


Figure 3.96. <u>Music for Strings</u>, Arrangement of Instruments



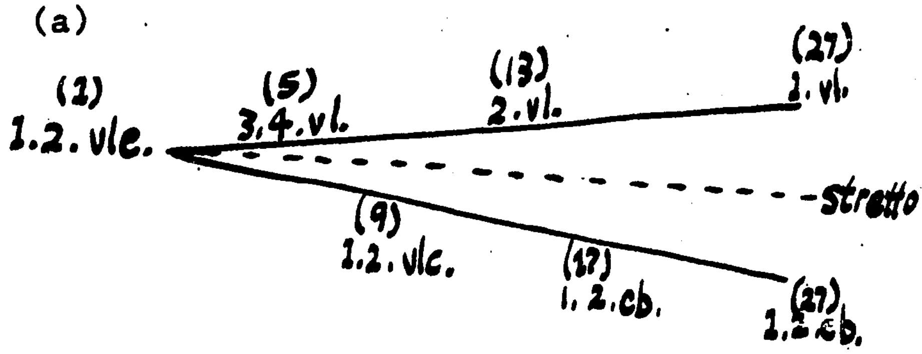
After the completion of these entires, symmetry produced by register dissolves while tonal symmetry continues. A similar pattern of symmetry is produced by register later in the movement as shown in Figure 3.97b.

Movement II. In the second movement, the parameter of timbre creates symmetry by the technique of timbre inversion. At the very beginning of the development section, the pianoforte states the melody shown in Figure 3.18g (page 45) which is supported with chords played by the strings. In measure 163 these roles are reversed so that the strings play the melody in a quasi-mirror form while the pianoforte supports the melody with chords. Diagrammed in Figure 3.98, this symmetrical structure is shown to contain two axes either of which serve to illustrate the symmetry of the area.

Movement III. Additional symmetrical structures are produced by timbre in the third movement. The plan of instrumentation for each section of the movement forms the large symmetrical structure shown in Figure 3.99. (This structure is reproduced disregarding the change of timbre of the "tag" statement of motive "B" from the fugue subject of Movement I, see page 81.) In this analysis of timbre, groups of instruments are considered as follows: strings; pianoforte; harp; celesta; and percussion. The slight change in timbre caused by the inclusion of the harp in Section V is not sufficient to detract from the symmetry of

Figure 3.97. Music for Strings, I, Register

(a)



(b)

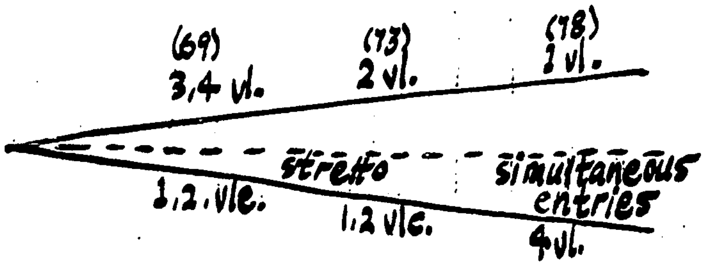


Figure 3.98. Music for Strings, II, Timbre

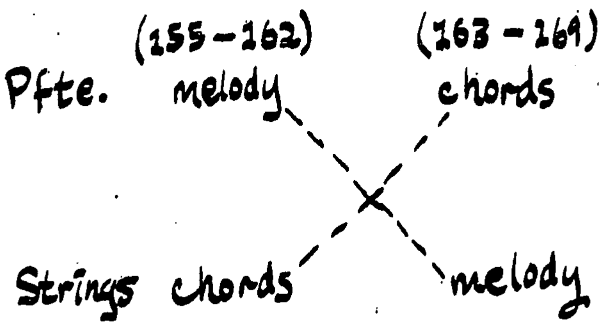
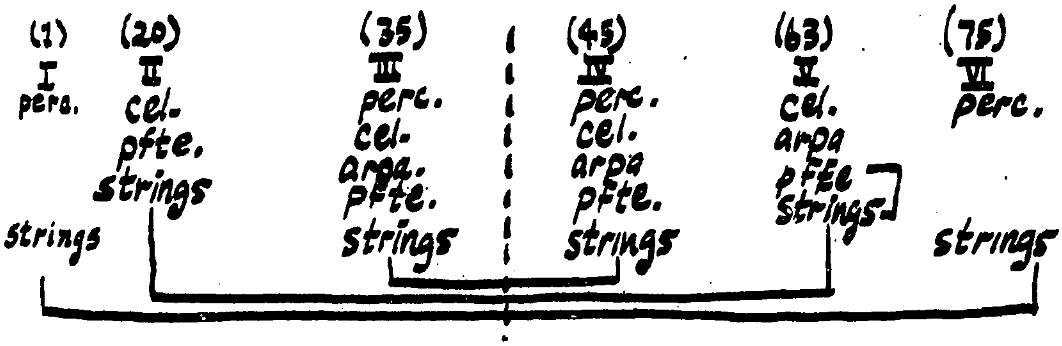


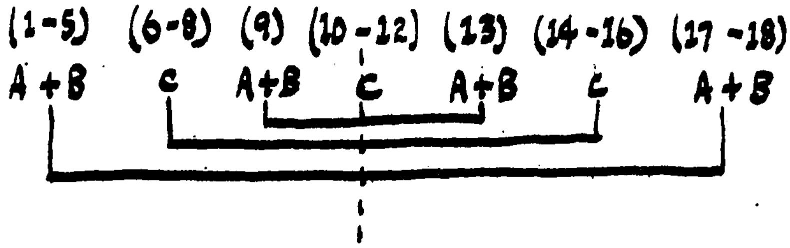
Figure 3.99. Music for Strings, III, Timbre



the structure since the harp functions only to reinforce the pianoforte tremolo.

Another symmetrical structure is effected by more specific changes in timbre in the first section of this movement. This section is characterized by two particular sound combinations. The first is a combination of timpani glissandi and xylophone high-pitched repetitions of a single tone (labeled "A" and "B" respectively). The second is a more homogenous sound combining strings with string and timpani tremolo pedal (labeled "C"). The alternation of these two timbre combinations produces the symmetrical structure shown in Figure 3.100.

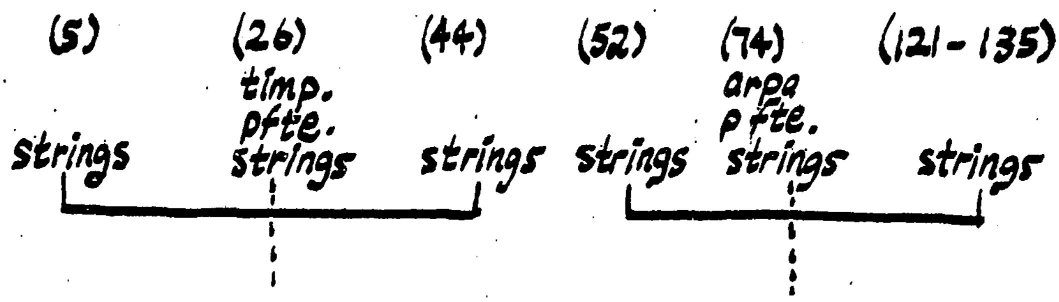
Figure 3.100. Music for Strings, III, 1-8, Timbre



Movement IV. In the fourth movement, timbre creates the symmetrical structures shown in Figure 3.101. The first of these encompasses the initial thematic area of the movement. The main theme of the movement is introduced in measure 5 employing both groups of strings and occasional timpani punctuation. The middle section of the theme appears in measure 26 with an insistent timpani ostinato, dominant pianoforte melody and string accompaniment. The original theme reappears in measure 44 once again with both groups of strings and timpani punctuation. The addition of reinforcing piano doubling in measure 48 does not diminish the aural effect of symmetry.

The second symmetrical structure shown in Figure 3.101 is contiguous with the first. The idea beginning in measure 52 is stated predominantly by strings although occasional punctuation by pianoforte and timpani does occur. The area bounded by measures 74 and 120 is an entirely new thematic area employing strings, pianoforte, harp, and occasional percussion punctuation. The area bounded by measures 121 and 135 is transitional in function and melodically unrelated to either preceding area. It utilizes only the string instruments of both groups.

Figure 3.101. Music for Strings, IV, 5-135, Timbre

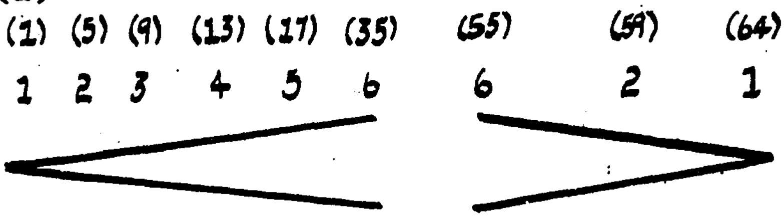


Texture

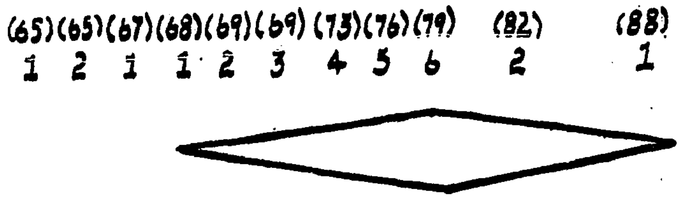
Movement I. Three different types of symmetrical structures are created by the parameter of texture in the first movement of Music for String Instruments, Percussion, and Celesta. First, Figure 3.102 shows the symmetrical structures formed by the number of parts sounding (excluding octave doubling) at given points in each of the two large sections of the first movement. These structures are produced only very generally as the central number of parts in each case is reached by the gradual addition of polyphonic lines, while the final number is achieved by a relatively sudden thinning of texture. The effect of the symmetry in each case is more aural than visual.

Figure 3.102. Music for Strings, I, Texture

(a)



(b)

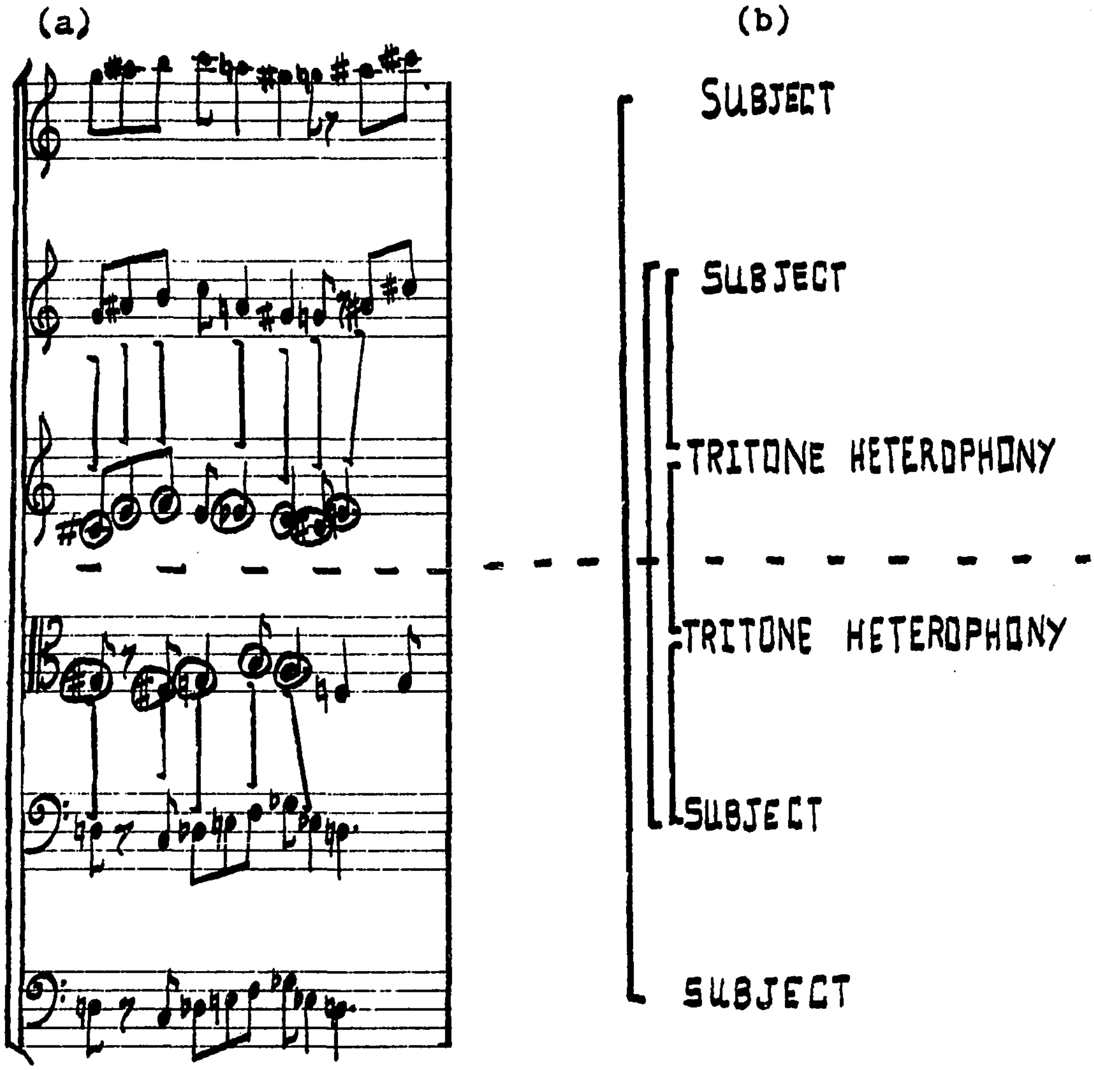


The second type of symmetry found in the first movement is produced by texture organization. Figure 3.103 diagrams the overall texture organization of the entire movement where after 77 measures of strict polyphony, a sudden change in texture occurs. At measure 78 the outer two violins state the original and mirror forms of the fugue subject. In between the two there is an accompaniment which consists of an octave-doubled cluster chord played by the remaining strings and a celesta ostinato reproducing the same tones. The polyphony resumes at measure 82 for the final seven measures.

Figure 3.103. Music for Strings, I, Texture Organization

Third, the individual texture of a specific area of music may itself be symmetrical as shown in Figure 3.104. This figure diagrams the texture of measures 27-30 where octave-doubled stretto entries of the fugue subject are found at either extreme of the texture pitched a tritone apart. Between these two entries are two accompanying lines which almost exactly reproduce each subject at the interval of a tritone.

Figure 3.104. Music for Strings, I, 28



Symmetry within an individual texture-set may be a product of the technique of mirror. Figure 3.105 represents measures 86-88 where motive "B" of the fugue subject is presented simultaneously with its mirror image. In this instance the axis of symmetry is the note a (represented by the horizontal broken line) on either side of which are placed identical intervals in corresponding positions.

In Figure 3.106 the texture-set of measures 78-81 is shown to be symmetrical. The presentation of the original fugue subject with its mirror image in the outer voices produces corresponding intervals on either side of the axis of symmetry. Here the axis is the note e^b represented by the horizontal broken line. This axis is reinforced by the octave-doubled cluster chord d-e^b-e played by the remaining strings and by the celesta ostinato d-e^b-$c^\#$-e (see page 38) which fill in the range between the outer voices.

Figure 3.105. Music for Strings, I, 86-88

Figure 3.106. Music for Strings, I, 78-79

Movement II. The arrangement of the strings in two spatially separated groups (see Figure 3.96, page 87) causes the directional sense of sound to be an important factor in Music for String Instruments, Percussion, and Celesta. Stevens states that the composition is "essentially three-dimensional, requiring actual performance or stereophonic reproduction for the full realization of its spatial relations."[1] This "three-dimensional" quality produces an additional facet of texture, spatial texture. Spatial texture involves the directional relationships between one or more groups of sounding instruments.

Symmetrical structures may be produced by spatial texture just as they are produced by the other qualities of texture. In the second movement of this composition, ideas stated alternately by each string group produce two symmetrical structures. Figure 3.107a illustrates the symmetrical structure created by the antiphonal presentation of motives of the first theme (measures 4-19). Figure 3.107b illustrates the symmetrical structure formed by expanding antiphonal statements of one motive during the transition between Themes I and II (measures 21-28).

The technique of texture inversion is responsible for the creation of the symmetrical structure illustrated in

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[1]Stevens, p. 272.

Figure 3.107. Music for Strings, II, 4-19; 21-28

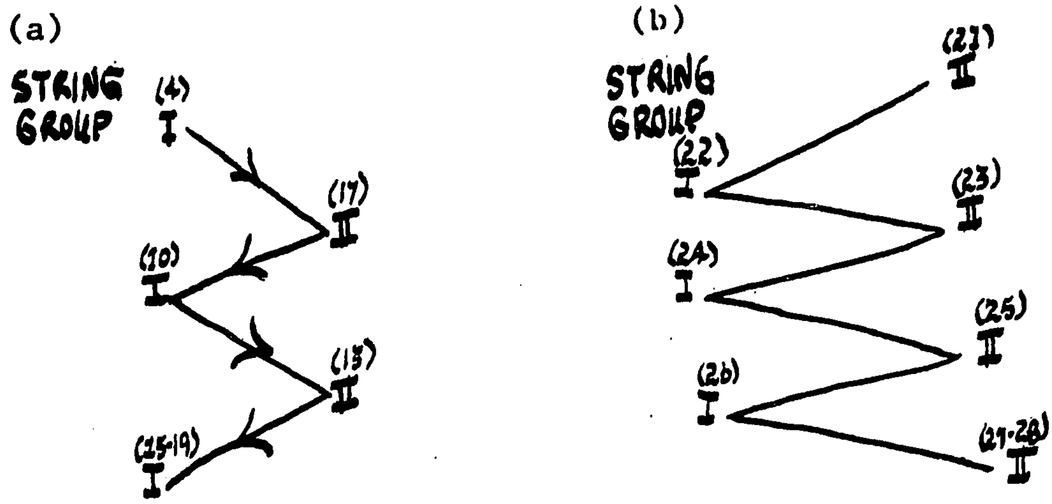


Figure 3.108. Here Theme III (shown in Figure 3.18e, page 45) is represented by the letter "A" while the accompaniment is represented by the letter "B." The theme is first stated in the upper voice of Group I with Group II stating the accompaniment below it. At measure 76 the lower instruments of Group II take up the theme while Group I states the accompaniment above it. Texture inversion creates symmetry by double axes either of which serve to demonstrate the symmetry of this thematic area.

In the second movement, as in the first, textural symmetry may be the product of the technique of simultaneous mirror. One example of this variety of symmetrical structure is given in Figure 3.109. Here the axis of symmetry is the semitonal duad $\underline{c}^{\#}$-$\underline{d}$ represented by the horizontal broken line on either side of which are placed identical intervals in corresponding positions.

Symmetrical structures produced by individual textures are further illustrated in Figure 3.110. In the course of ten measures, a motive shown in the lower staff of Figure 3.18b is developed in three different texture-sets, each one symmetrical. Each texture-set is the product of imitation among four groups of string instruments. In all three texture-sets, the instruments enter one at a time at the distance of an eighth note in the following order: first violin; violoncello and contrabass; second violin; viola. Thus, the instrument groups are paired by their inner or outer position within the texture.

Figure 3.108. Music for Strings, II, 68-85

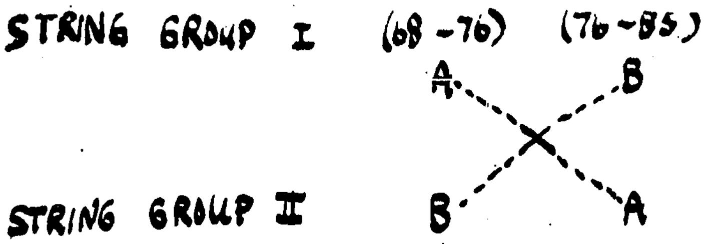
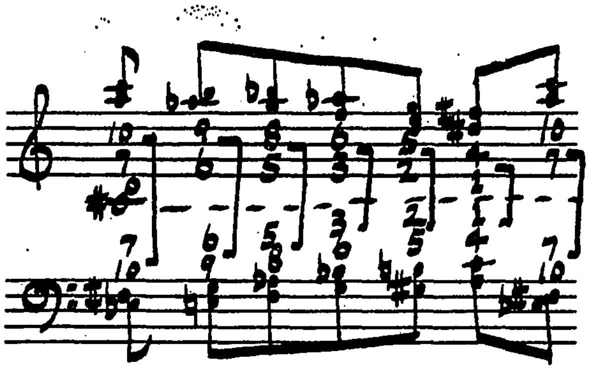


Figure 3.109. Music for Strings, II, 175-77

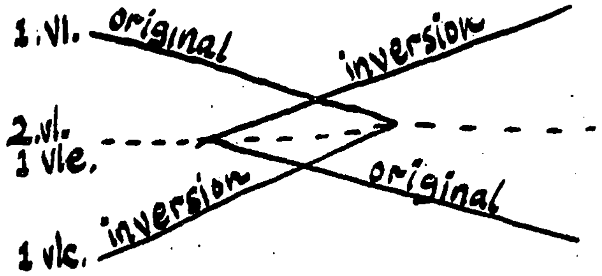


The first texture-set (Figure 3.110a) is produced by imitation between the paired outer strings which state the original and mirror forms of the motive and the paired inner strings which state transpositions of the same forms of the motive. The ascending or descending direction of each line indicates the melodic contour of the entry (no attempt was made to exactly represent the element of time in Figure 3.110). In the second texture-set shown in Figure 3.110b, the upper two parts are transposed up a perfect fourth from equivalent entries of measures 40-44. In this second texture-set, the outer pair of instruments state the original form of the motive while the inner instruments state the mirror form. In Figure 3.110c, once again melodic contour is indicated by the ascending or descending direction of each line. In this third texture-set, the upper part is again transposed up a perfect fourth from the preceding entry. The outer pair states the motive in its original and mirror forms and the inner parts state transpositions of the same forms.

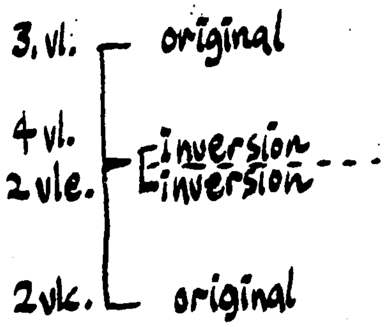
Movement III. Figure 3.111 illustrates the expanding and contracting symmetry formed by the number of parts which sound at various points within the first section of the third movement. In this figure, the number of parts is determined excluding octave doubling of lines. In measures 5 and 18, overlapping textures occur when the two-note pedals which accompany the melodies of the following

Figure 3.110. <u>Music for Strings</u>, II, 40-50

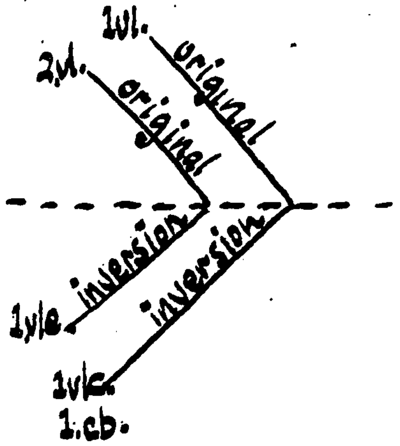
(a) 40-44



(b) 44-47



(c) 47-50



areas are introduced one measure in advance. In each case the number of parts given in the figure does not reflect that overlap. Because the expanding and contracting nature of texture in this section is easily perceived aurally, the effect of symmetry is not diminished by the minute differences in texture which occur at either end of the structure.

Occasionally, textural symmetry is produced in the third movement by the technique of simultaneous mirror as shown in the two melodies presented in Figure 3.112. In Figure 3.112a the axis of symmetry is the note b, while in Figure 3.112b the axis of symmetry is the note f#. Each axis is represented by the horizontal broken line on either side of which are placed identical intervals in corresponding positions.

Movement IV. In the fourth movement, symmetry is produced by spatial texture (see page 97) as shown in Figure 3.113. In measures 142-44 of this final movement, a motive previously stated in measures 136-41 is developed by Group II of the strings. In measures 145-47, that development is continued by Group I of the strings. The symmetry is completed in measures 148-50 with the final version of the motive stated again by Group II of the strings. In measures 151-80 which follow, the motive functions as an ostinato stated insistently by Group II of the strings.

Figure 3.111. <u>Music for Strings</u>, III, 1-18

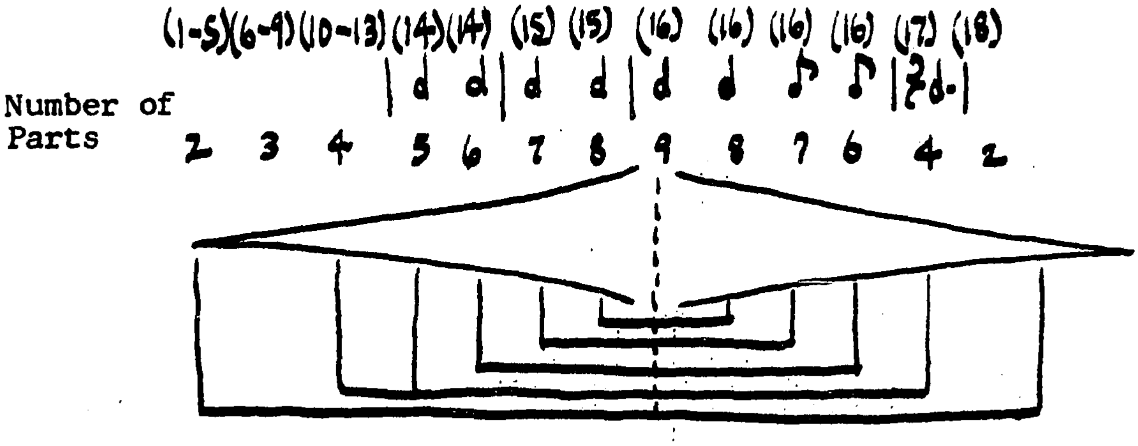
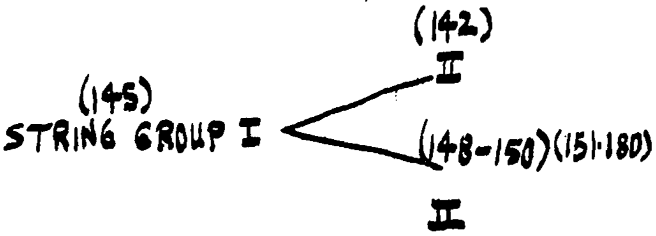


Figure 3.112. <u>Music for Strings</u>, III, 30-31; 43

Figure 3.113. <u>Music for Strings</u>, IV, 142-80



The technique of texture inversion once again is responsible for the creation of symmetry as illustrated in Figure 3.114. Here the melody (shown in Figure 3.51a, page 61) is represented by letter "A," while chordal accompaniment is represented by letter "B." The melody is first stated by the pianoforte with string instruments of both groups playing chords which overlap and extend below the range of the melody. In measure 78 melody "A" is stated in the same range as before by the string instruments, while the pianoforte plays chords which overlap and extend below the range of the melody.

An individually symmetrical texture-set found in the fourth movement is diagrammed in Figure 3.115. In the eleven measures which precede this structure, the motive shown in Figure 3.55 (see page 62) appears in both original and mirror forms. In measure 224 a section of canonic imitation begins which culminates in the two measures diagrammed in Figure 3.115. At measure 229 of the figure, all voices of both string groups are present in the relationships shown. In each string group, the upper three voices state the end of the descending original form of the motive, while the lower two voices state the end of the ascending mirror form of the motive. Symmetry is formed by pairing interior and exterior lines of the figure as well as by the production of identical patterns on either side of the axis.

Figure 3.114. Music for Strings, IV, 74-81

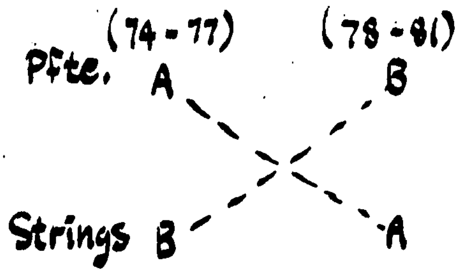
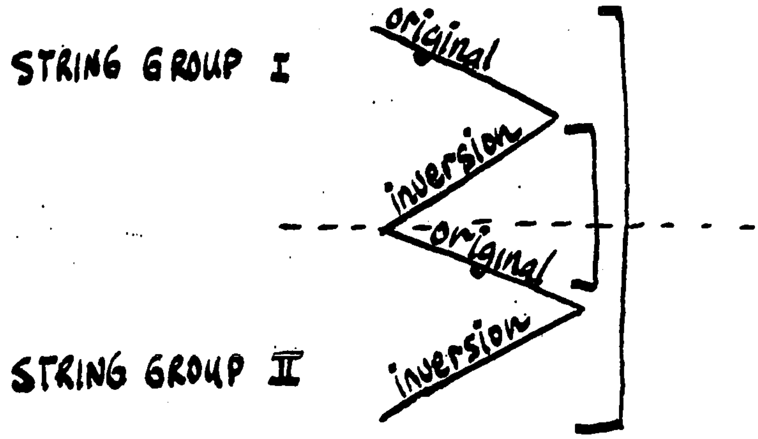


Figure 3.115. Music for Strings, IV, 226-29



Dynamics

Movement I. Stevens states that the first movement of Music for String Instruments, Percussion, and Celesta represents a "single crescendo to a climax and a subsequent falling away to silence."[1] The symmetrical structure created by this plan of dynamics is diagrammed in Figure 3.116 where occasional slight discrepancies in actual dynamic markings do not detract from the aural impact of the symmetry.

Movement II. The overall plan of dynamics in the second movement of the composition does not create symmetry. However, certain areas within the movement do illustrate symmetrical structures formed by dynamics. The examples given in Figure 3.117 are similar to the example given in the preceding figure in that each represents a crescendo to a climax and a subsequent decrescendo to the original dynamic level. Each structure encompasses a complete section or subsection within the development area of the movement.

Figure 3.118 illustrates the plan of dynamics for the second thematic area of the recapitulation. This structure does not incorporate gradual dynamic changes. Rather, it makes use of the technique of alternation to produce its symmetry. Alternation is again used to produce the symmetry of Figure 3.119. The upper level of the figure illustrates

[1] Stevens, p. 273.

Figure 3.116. <u>Music for Strings</u>, I, Dynamics

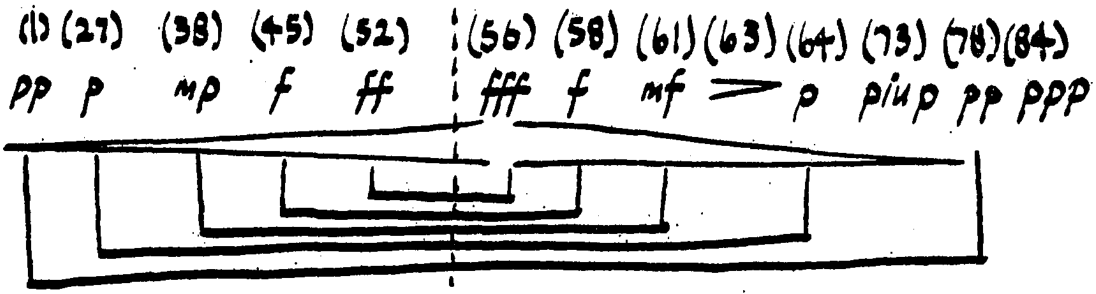


Figure 3.117. <u>Music for Strings</u>, II, Dynamics

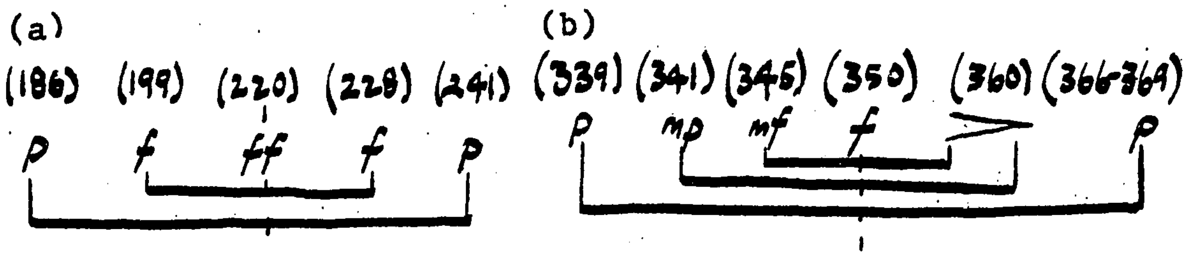
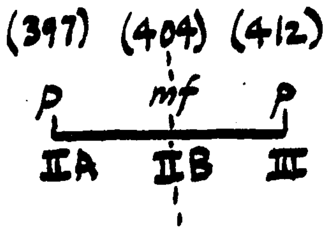


Figure 3.118. <u>Music for Strings</u>, II, 397-412



overall dynamic levels for each subsection. The central "forte" is in turn produced by the alternating pattern given at the lower level of the figure. The symmetry of Figure 3.119 encompasses the first section of the development area. (This section does not actually end until measure 182, but its last six measures are expressed in a different texture and serve as a transition to the next development section.)

The symmetrical structure shown in Figure 3.120 is particularly interesting for its illustration of the technique of inverting dynamics. The structure encompasses the movement's fourth thematic area throughout which the two string groups state different melodic materials of different degrees of importance. The purpose of inverting the dynamic levels therefore is to provide a means by which the greater or lesser importance of each motive may be stressed to the listener. At the beginning of the section, the melody stated by <u>Group I</u> of the strings is of greater importance and is stated in double octaves. In measure 124 inverting the dynamics makes it possible for the melody stated by <u>Group II</u> of the strings in measure 127 to be heard above the higher pitched chords of <u>Group I</u>. In measure 138 the motive stated by <u>Group I</u> resumes its original dynamic level.

<u>Movement III</u>. The symmetrical structure formed by the dynamic levels of each section of the third movement is given in Figure 3.121a. Each dynamic marking given for an

Figure 3.119. Music for Strings, II, 155-77

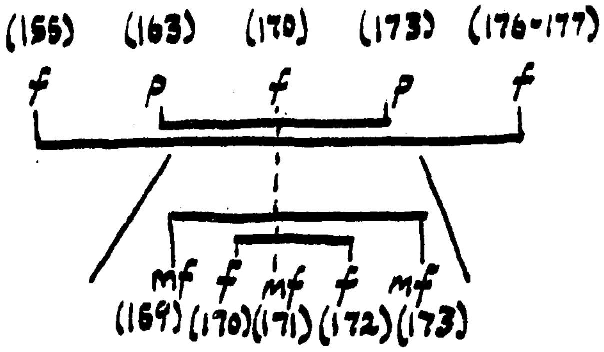
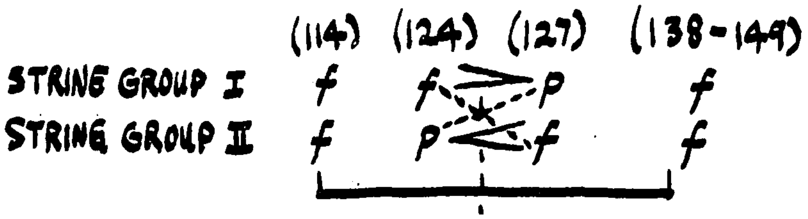


Figure 3.120. Music for Strings, II, 114-49



individual section or subsection expresses the overall dynamic level of that formal area. It should be noted that abrupt changes in dynamics which involve "tag" statements of motives from the first-movement fugue subject are not reflected in the figure (see page 81). In this movement, as in the first movement, the dynamic markings express a crescendo to a climax and a subsequent decrescendo to the initial dynamic level. The same symmetrical crescendo and decrescendo is expressed in miniature within the first section of Movement III as shown in Figure 3.121b.

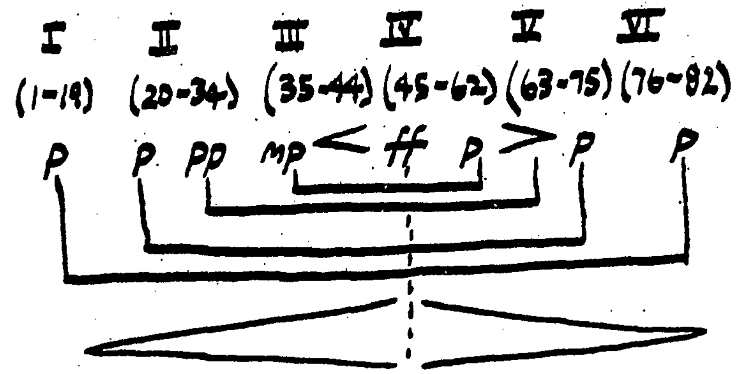
Movement IV. In the fourth movement, Sections E and F (the composer's labels) together express the symmetry produced by crescendo and subsequent decrescendo. Given in Figure 3.122, this symmetrical structure is produced by the dynamic markings which occur at various points within the two sections. Once again, slight discrepancies between corresponding dynamic markings do not diminish the aural impact of symmetry. The only other symmetrical structure produced by dynamics in the fourth movement is given in Figure 3.123. This structure encompasses the first thematic area of the movement and is produced by the alternation of dynamic markings.

Structure

Movement I. The first movement of Music for String Instruments, Percussion, and Celesta is "a movement of

Figure 3.121. <u>Music for Strings</u>, III, Dynamics

(a)



(b)

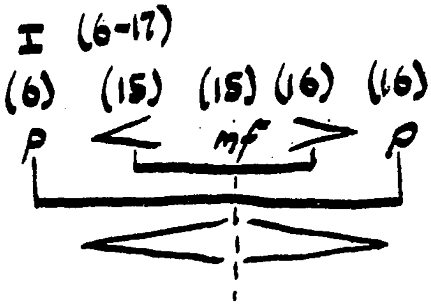


Figure 3.122. <u>Music for Strings</u>, IV, Dynamics

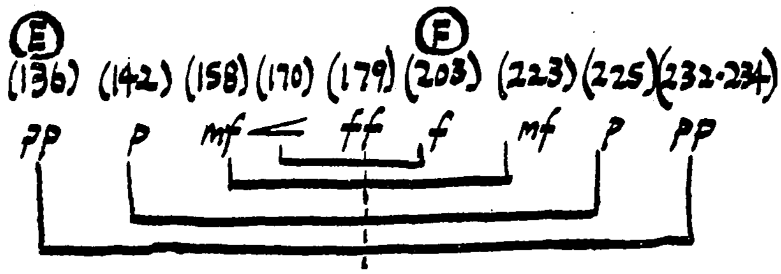
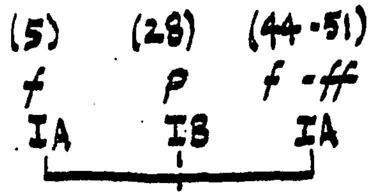


Figure 3.123. <u>Music for Strings</u>, IV, 5-51, Dynamics



almost unparalleled concentration."[1] All motivic materials are derived from the fugue subject virtually eliminating the component of melodic contrast. The elements of tonality and dynamics (Figure 3.11b, page 40 and Figure 3.116, page 108, respectively) conspire to form a single expansion in sound which reaches a climax in measure 56. This climax is further strengthened by increasing harmonic dissonance which culminates in the clash of $\underline{e}^b$ and $\underline{e}$ in the same measure.[2] The climax thus effected is followed by a successive contraction in sound also produced by tonality and dynamics which diminishes to silence at the end of the fugue. The above interpretation of the first movement of the composition produces the structure graphically diagrammed in Figure 3.124a.

Bartók's method of constructing this movement is closely connected with the law of the Golden Section. The Golden Section (referred to as GS) means the division of a distance in such a way that the proportion of the whole to the larger part corresponds geometrically to the proportion of the larger to the smaller part (see page 5). The term GS is used to describe both this proportional relationship and the dividing point at which that relationship is produced. It is in the latter sense that the GS is expressed in mathematical numbers for the following discussion.

---

[1] Stevens, p. 273.

[2] Deri, p. 252.

According to Lendvai,[1] Section II of the first movement (measures 56-88) encompasses a theoretical measure of silence which separates Movements I and II. Thus the number of measures encompassed by the entire movement is actually 89. As shown in Figure 3.124b, Section I of the movement encompasses 55 measures, and Section II encompasses 34 measures. The division at measure 56 coincides with the principles of the Golden Section since the GS of 89 is 55, and the GS of 55 is 34. Each section is further subdivided as follows: Section I is divided at measure 34 by the removal of mutes and the addition of the timpani; Section II is subdivided after 13 measures by the replacement of mutes and the first full statement of the fugue subject in mirror. These subdivisions also reflect the principles of the Golden Section as follows: The GS of 55 is 34, and the GS of 34 is 21; the GS of 34 is 21, and the GS of 21 is 13.

The ultimate arrangement of measures is revealed in Figure 3.124b where the longer section produced by the GS principle is labeled "Long," and the shorter section produced by the GS principle is labeled "Short." The resulting pattern formed by the grouping of measures according to the Golden Section creates the symmetrical structure thus diagrammed. This structure is a product of the correspondence of formal subsections by proportional length. The arrangement of measures into the above pattern

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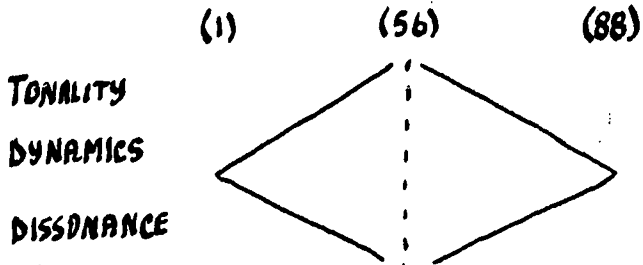
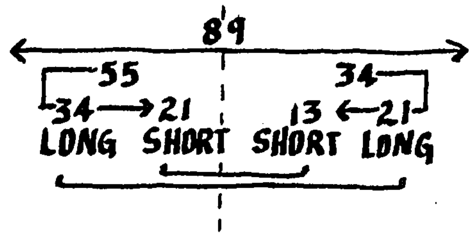
[1] Ernő Lendvai, Béla Bartók: An Analysis of his Music (London: Kahn & Averill, 1971), pp. 27-28.

Figure 3.124. Music for Strings, I, Structure

(a)



(b)



allows for a natural flow of directional motion: before the climax the subdivisions are arranged into a "long-short" pattern which tends to push ahead; after the climax the subdivisions are arranged into a "short-long" pattern which tends to relax the accumulated tension.[1]

Movements II-III. In the second movement, no symmetrical patterns formed by structure are in evidence. The structure of the third movement, however, is ingeniously devised to produce the symmetrical pattern shown in Figure 3.125a. This movement is divided into six sections which are designated by the composer himself with rehearsal letters and time spans required for performance. In Figure 3.125a the motivic content of the sections is represented by letters which reflect similar musical ideas with identical letters and dissimilar musical ideas with nonidentical letters. Section V of the movement combines the melody of Section II and the accompaniment pattern of Section III. The aural effect of symmetry in the third movement is reinforced by elements which tend to treat Sections III and IV as one section rather than as two sections. First, the symmetrical structure formed by the dynamic markings of the two sections (Figure 3.121a, page 112) is complete only within the boundaries of both sections treated as a whole. Second, "tag" statements of

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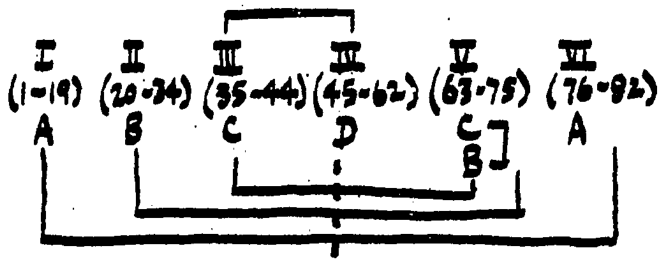
[1]Jonathan Kramer, "The Fibonacci Series in Twentieth-Century Music," Journal of Music Theory, XVII, 1 (Spring, 1973), 120.

Figure 3.125. Music for Strings, III, Structure

(a)



(b)

each motive of the first-movement fugue subject appear as terminal punctuation after each section except Section III. Third, the symmetrical plan of tempo markings for the movement (Figure 3.89, page 82) reveals a steady increase and subsequent decrease in tempo, excluding the very beginning and ending measures. This increase in tempo continues through Section III and culminates at the end of Section IV, further adding to the aural effect of one section rather than two. Finally, Sections III and IV together encompass 28 measures. Beginning at measure 49 (the center of those 28 measures) the preceding three measures are played in retrogradation. This procedure further diminishes the importance of measure 45 as a dividing point. The resultant symmetrical pattern formed by structure is diagrammed in Figure 3.125b. Here, capital letters represent similar and contrasting materials within the movement, and letters within parentheses represent motives from the first-movement fugue subject.

Movement IV. The pattern formed by the highest level of formal structure in the final movement is asymmetrical as shown in Figure 3.126a. However, within the large structural pattern are two smaller symmetrical patterns which are shown in Figure 3.126b and Figure 3.126c. Each of these patterns is the abstracted ternary form of a large thematic area within the fourth movement.

Figure 3.126. Music for Strings, IV, Structure

(a)

(5) (26) (44) (52) (74) (83) (114) (136) (203) (235)
A B A C D E D F G A

(b)

(5) (26) (44-51)
A B A

(c)

(74) (83) (114-120)
D E D

Movements I-IV. Relationships drawn between similar and contrasting elements found in each of the four movements of Music for String Instruments, Percussion, and Celesta create the asymmetrical pattern shown in Figure 3.127. The strongest similarities occur between Movements I and III. Each requires about the same amount of performance time and each is marked at a slower tempo than either of the other two movements. The presence of symmetry created by formal structure and dynamics also serves to link the two movements. The second and fourth movements are related most strongly by similar tempo markings. The absence of symmetry created by form and dynamics also tends to link these two movements.

Coincidence of Symmetrical Structures with Architectonic Levels

In Music for String Instruments, Percussion, and Celesta, symmetrical structures are found which encompass areas of music ranging in length from a span less than one measure long to the length of the entire four-movement composition. Areas of music encompassed by symmetrical structures are grouped by length into six architectonic levels. Level I encompasses three or fewer measures and may include the following structural components: cell; figure; motive; semi-phrase. Level II encompasses three to seven measures and may include the structural component, phrase. Level III encompasses six to sixteen measures and may include the structural component, phrase group. Level IV

Figure 3.127. Music for Strings, Structure

	I	II	III	IV
SPAN	6'30"	6'55"	6'35"	6'40"
TEMPO	Andante	Allegro	Adagio	Allegro Molto
FORM	SYMMETRY	ASYMMETRY	SYMMETRY	ASYMMETRY
DYNAMICS	SYMMETRY	ASYMMETRY	SYMMETRY	ASYMMETRY

encompasses sixteen or more measures with a maximum length equal to one less than the total number of measures contained in a movement. Level V encompasses an entire movement as it is indicated by the composer. Level VI encompasses an entire multi-movement composition.

In Tables 3.1-3.6 (pages 130-41) each symmetrical structure is recorded by movement number and measure numbers for the architectonic level at which it appears. Instances of symmetry not discussed in the text are listed by measure numbers with those of a figure displaying a similar type of symmetry. In evaluating the data drawn from these tables, it is important to keep in mind the fact that the number of symmetrical structures possible within an architectonic level decreases as the number of measures encompassed by an architectonic level increases (see page 16). Therefore, it is important that conclusions not be drawn between frequency tabulations made for different architectonic levels without reference to the fluctuating number of possibilities inherent in the definition of each level. Since the number of possible occurrences of symmetry cannot be estimated, the greatest frequency with which symmetry is produced by one parametric division of symmetrical structures within each architectonic level serves as a reference number.

In Table 3.7, page 142, <u>Music for String Instruments, Percussion, and Celesta</u> is shown to contain symmetrical structures at all six architectonic levels of structural design. This table presents the frequency tabulation for each division and subdivision of symmetrical structures at each architectonic level, and from it additional information about the use of symmetrical structures in this composition may be derived.

First, symmetrical structures formed by the parameter of pitch are the most important in terms of total frequency of occurrence and in terms of pervasiveness. In regard to the latter quality, symmetrical structures formed by pitch occur at all six architectonic levels, while no other parametric division of symmetrical structures produces symmetry to this extent. As regards total frequency of occurrence, symmetrical structures formed by pitch account for nearly half of the total instances of symmetry in the entire composition. In addition, at Architectonic Levels II, III, V and VI, symmetrical structures formed by pitch occur with a frequency equal to or greater than the frequency of occurrence of any other parametric division of symmetry. Of the symmetrical structures formed by the parametric subdivisions of pitch, those formed by scale basis appear with greater frequency at Architectonic Levels I-IV than those formed by any other parametric subdivision of the parameter of pitch. At Levels V and VI, symmetrical structures formed by tonality occur with equal or greater frequency than those formed by any other parametric subdivision of pitch.

Symmetrical structures formed by duration account for the second greatest frequency tabulation. Compared to the other parametric subdivisions of duration, symmetrical structures formed by rhythm appear with greater frequency at Architectonic Levels I-III. At Levels IV and V, symmetrical structures formed by tempo occur with equal or greater frequency than those formed by any other parametric subdivision of duration. (No symmetrical structures formed by the parameter of duration are found at Architectonic Level VI.)

Next in decreasing order of total frequency tabulations after those of symmetrical patterns formed by pitch and duration are the tabulations of symmetrical patterns formed by texture, dynamics, timbre and structure. In regard to pervasiveness, symmetrical structures produced by the parametric divisions of duration and texture occur at five of the six architectonic levels. Thus, symmetrical structures formed by these parametric divisions are second in order of total pervasiveness after the symmetrical structures formed by pitch. Next in decreasing order of total pervasiveness are symmetrical patterns produced by the parametric divisions of timbre, dynamics and structure.

By comparing the actual frequency with which a parametric division of symmetry occurs at each of the six architectonic levels to the greatest frequency tabulation computed for a parametric division of symmetrical structures within each architectonic level, some idea of the appropriateness of each division of symmetry to individual architectonic levels may be gained. For instance, symmetrical patterns formed by texture occur with comparatively greater frequency at Architectonic Levels III-V than at the smaller levels (I-II). Symmetrical patterns formed by dynamics, timbre and structure occur with comparatively greater frequency at the larger architectonic levels (IV-VI) than at the smaller levels of design (I-III). In contrast, symmetrical structures formed by pitch occur with a comparatively high frequency at all six architectonic levels of design. Within the parameter of pitch, symmetrical structures formed by tonality occur with comparatively greater frequency at the larger architectonic levels of design, while those formed by melody and harmony occur with greater frequency at the smaller levels of design. Symmetrical structures formed by scale basis occur with great frequency at all levels except Level VI. Symmetrical structures formed by duration occur with a comparatively high frequency at the smallest architectonic level of design (I) as well as at Levels III-V. Within the parameter of duration, symmetrical structures formed by meter, tempo and temporal span occur with comparatively greater frequency at Architectonic Levels III-V, while symmetrical structures formed by rhythm occur with comparatively greater frequency at the smaller levels of design (I-III).

Summary

<u>Music for String Instruments, Percussion, and Celesta</u> exhibits profuse examples of symmetry formed by pitch, duration, texture, timbre, dynamics, and structure.

Symmetrical structures are produced by the following elements of the parameter of pitch: scale basis; melody; harmony; and tonality. Symmetrical scale bases include the chromatic scale, the dorian mode, the second mode of the overtone scale, the Neapolitan Major scale, the alternating scale, the fifth mode of the diatonic pentatonic scale, and various other scales created by the retrogradation of an interval pattern or by the technique of mirror. Symmetrical melodies are created by the retrogradation of a pitch pattern or an interval pattern, the alternation of two intervals, the repetition of one interval, and the technique of mirror. Individual symmetrical harmonies include uni-intervallic structures such as the quartal chord, the chromatic chord, the whole-tone chord, the diminished triad, and the augmented triad. Symmetrical tertian harmonic structures include the minor-minor seventh chord and the major-major seventh chord. Additional symmetrical harmonies are produced by the retrogradation of an interval pattern. Symmetrical harmonic progressions are produced by the retrogradation of a chord pattern or a pattern of chord qualities, or by the correspondence of harmonies with the same interval-class content. Symmetrical tonal patterns are produced by the techniques of mirror and retrogradation as well as by the correspondence of intervals between tonal centers.

Symmetrical structures are produced by the following elements of the parameter of duration: rhythm; meter;

tempo; and temporal span. Symmetrical structures formed by rhythm include the short-long-short pattern and the short-long-long-short pattern with their respective antithetical rhythm patterns as well as other rhythm patterns produced by retrogradation. Additional symmetrical rhythm patterns are produced by the overlapping of several individually symmetrical rhythms. Symmetrical metric structures are produced by the retrogradation of a pattern of macro-meters or micro-meters. Symmetrical structures formed by tempo are produced by retrogradation or by the correspondence of an accelerando with a subsequent rallentando. Symmetrical structures are also formed by the correspondence of temporal spans about an axis.

Additional symmetry is formed by the parameters of timbre, texture, dynamics and structure. Symmetrical structures formed by timbre are produced by the physical arrangement of instruments, the mirroring of registers, timbre inversion, the alternation of timbre groups, and the correspondence of timbre combinations. Symmetrical structures formed by texture are produced by the correspondence of the number of concurrently sounding constituents, the correspondence of texture organization, spatial texture, and texture inversion. Symmetrical texture-sets are produced primarily by the technique of mirror. Symmetrical structures formed by dynamics are produced by patterns of crescendo and subsequent decrescendo, the alternation of two dynamic levels, and by the inversion of dynamic levels.

Symmetrical patterns formed by structure are produced by the expansion and subsequent contraction of tonality, dynamics and dissonance within a movement utilizing only one primary motive. Additional symmetrical patterns of structure include arch patterns and simple repetitive ternary patterns.

Symmetrical structures permeate Music for String Instruments, Percussion, and Celesta at all six architectonic levels of structural design. Symmetrical structures formed by pitch are the most important in terms of total frequency of occurrence and in terms of pervasiveness. Symmetrical structures formed by pitch account for almost half of the total instances of symmetry in the entire composition and are found at all six architectonic levels of design. Of the symmetrical structures formed by parametric subdivisions of pitch, those formed by scale basis occur with greater frequency at the lower four architectonic levels while symmetrical structures formed by tonality become increasingly frequent at the higher two architectonic levels. Symmetrical structures formed by duration account for the second greatest total frequency tabulation. Compared to the other parametric subdivisions of duration, symmetrical structures formed by rhythm appear with greater frequency at Architectonic Levels I-III, while symmetrical structures formed by tempo occur with greater frequency at Levels IV and V. Symmetrical patterns formed by duration are not present at the highest architectonic level of structural design. Next in decreasing order of total frequency tabulations after those of symmetrical structures formed by pitch and duration are tabulations of symmetry formed by texture, dynamics, timbre and structure. In decreasing order of total pervasiveness are symmetrical patterns formed by pitch, duration and texture, timbre, dynamics, and structure.

Table 3.1a. Coincidence of Symmetrical Scale Bases with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.2		(1-4)(5-8)(9-12)(13-16)(17-20)(27-30)(34-37)(69-72)(73-77)(78-81)				
3.3		(5-8)(9-12)(13-16)(17-20)(21-26)(27-30)(31-33)(34-37)(38-44)(45-51)(52-56)(69-72)(73-77)(78-81)(86-88)	(1-8)(57-64)	(1-64)(65-88)	(1-88)	
3.6b	(2)(6)(10)(14)(18)(28)(35)(36-37)(41)(59)(70)(74)(79)(86-87)					
3.6c	(3)(7)(11)(15)(19)(29)(36)(42)(43)(71)(75)(80)					
3.6d	(4)(8)(12)(16)(20)(30)(37)(44)(72)(76)(77-78)(81)					
3.7		(1-4)(5-8)(9-12)(13-16)(17-20)(27-30)(69-72)(73-76)(78-81)				
3.8a	(1)(5)(9)(13)(17)(27)(34)(35)(57)(65)(66)(69)(73)(78)(82)(83)					
3.8b	(2)(6)(10)(14)(18)(28)(35-36)(36-37)(41)(59)(70)(74)(79)(86-87)					
3.8c	(78)(79)(80)(81)					
Mvt. II						
3.12a			(4-10)(372-78)			
3.12b			(68-77)			
3.13	(124-26)	(93-99)(365-71)				
3.14	(421-22)					
3.15	(13-15)					
3.18e		(68-74)				
Mvt. III						
3.2		(18-19,33-34,60-62,73-74)				
3.6c	(61-62)					
3.6d	(73-74)					
3.8a	(19)					
3.28b	(76)(77)	(6-9)(10-13)(14-16)	(6-17)(23-31)(63-72)	(1-19)		
3.31	(46)(47)(48)(49)(50)(51)(52)(52-53)(54)(55)(56)(57)(58)(59)	(46-50)(51-54)(55-59)	(46-59)			
3.33	(34)(35)(36)(37)(38)(39)(40)(41)(42)					
3.34	(35)(36)(37)(38)(39)(40)(41)					
Mvt. IV						
3.43				(27-43)		
3.44	(183-85)(186-87)(188-89)	(264-69)				
3.45		(189-93)(193-97)(224-30)	(150-58)(158-67)(248-62)			
3.47	(235-36)(236-37)(237-38)(238-39)(239-40)	(203-08)(210-14)				
3.48	(235-36)(237-38)(239-40)					
3.49	(232)					
3.50	(235-36)(237-38)(239-40)(93-95)	(74-77)(85-89)(124-27)				
other	(234)					

Table 3.1b. Coincidence of Symmetrical Melodies with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.9	(78)(79)(80)(81)					
Mvt. II						
3.17	(12)(89)(390)(391)(392)(479) (518)(519-20)					
3.19	(69-70)(71-72)(73-74)(77-78) (79-80)	(86-90)(90-94)(471-74)(475-79)				
other	(57)(58)(60)(61)(62)(63)(64) (65)(72)(80)(82)(83)(84)(85) (87-88)(114-16)(116-18)(123-24) (132-34)(140)(141-42)(145) (242-44)(243-45)(253-55)(305-07) (364)					
3.21	(140-42)					
3.22		(31-35)(36-39)(396-400)				
Mvt. III						
3.35	(47-48)(49-50)					
3.36	(65)(66)(67)(68)(69)(70)(71)(72)					
3.37	(22)(23)(24)(25)(26)(27)(28) (73)(74)					
Mvt. IV						
3.53	(232)	(5-8)(9-12)(44-47)(48-51)(244-47)				
3.54	(48-50)					
3.55	(183-84)(184-85)(185-86)(186-87) (187-88)(188-89)(189-91)(190-91)					

Table 3.1c. Coincidence of Symmetrical Structures Formed by Harmony with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.10	(86-88)					
Mvt. II						
3.22	(36-37)					
3.23	(28)(86)(87)(88)(109)(155) (156)(157)(158)(159)					
3.25		(86-90)				
3.26	(35-37)(37-39)					
Mvt. III						
3.38		(20-23)(24-27)(28-30)	(20-30)			
3.39		(50-54)(45-49)	(45-54)			
3.40	(31-33)					
3.42a	(35)(36)(37)(38)(39)(40)(41)					
Mvt. IV						
3.49	(231)(232)(233)					
3.56	(19)(20)(21)(22)(23)(24)(25)					
3.57	(13)(14)(89)(268)					
3.58	(12)(51)(97)(138)					
3.59	(142)(143)(144)(145)(146)(147) (148)(149)(150)(151)(152)(153) (154)(155)(156)(157)(158)					
3.60	(29-31)					

Table 3.1d. Coincidence of Symmetrical Structures Formed by Tonality with Architectonic Levels

Figure Numbers	Architectonic Levels					
	I	II	III	IV	V	VI
Mvt. I						
3.11					(1-88)	
Mvt. II						
3.27				(199-241)		
Mvt. IV						
3.61				(1-51)		
3.62				(74-120)		
3.63						(I,1-IV,285)

Table 3.2a. Coincidence of Symmetrical Rhythms with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.64,1	(8)(9)(28)(29)(30)(31-32)(33-34)(40)(41)(43)(46)(49)(51)(55)(57)(67)(72-73)(77)(78)(81)(83-84)(84)					
3.64,2	(1)(2)(5)(6)(7-8)(9)(10)(13)(14)(15-16)(17)(18)(24)(27)(28)(29)(34)(35)(38)(39)(45)(46)(50)(51)(58)(65)(66)(69)(70)(73)(74)(74-75)(82)(83)					
3.64,3	(2-3)(6-7)(10-11)(14-15)(19-20)(28-29)(70-71)(74-75)(75-76)					
3.64,4	(3-4)(7-8)(11-12)(15-16)(19-20)(26)(29-30)(30)(33)(36-37)(42-43)(71-72)(75-76)					
3.67	(16)(18)(44)(45)(73)(75)(77)					
3.68	(5)(12)(13)(28)(29)					
3.69	(70)					
3.70	(43)					
Mvt. II						
3.73	(16-18)(16-19)(40-42)(44-46)(45-47)(46-47)(47-49)(48-50)(49-50)(50-52)(51-52)(52-54)(68-70)(69-71)(71-73)(73-75)(76-78)(77-79)(79-81)(80-82)(144)(153-54)(154-55)(155-56)(366)(367)(368)(369)(404)					
3.75	(410-13)					
3.76	(466-67)(468-69)					
3.77	(30-31)(65-66)(134-35)(135-36)(136-37)(165-66)(166)(169-71)(180)(181-82)(237-38)(286-88)(287-89)(288-90)(289-91)(290-92)(291-93)(292-94)(293-95)(294-96)(295-97)(314-16)(316-18)(358-59)					
3.78	(140-44)(144-47)					
other	(2-5)(187-90)(189-92)(191-94)(192-95)					
Mvt. III						
3.83	(1-4)					
3.84	(1)(18)(51)(52)(81)(81-82)					
3.85	(14)(15)(16)(24)(26)(30)(39-40)(65)(66)(67)(68)(73)(74)					
3.86	(28-29)(69-70)					
3.87			(45-59)			
Mvt. IV						
3.90	(5)(6)(7)(8)(9)(10)(11)(12)(15)(16)(17)(18)(19)(20)(21)(22)(23)(24)(25)(26)(44)(45)(46)(47)(48)(49)(50)(51)(52)(58)(62)(66)(70)(74)(76)(78)(80)(215)(215-16)(217)(217-18)(219)(220)(221)(222)(224)(225)(226)(227)(228)(229)(235)(236)(237)(238)(239)(240)(241)(242)(243)(259)(260)(261)(263)(264)(265)(269)(271)(273)(274)(275)(280)					
3.91		(5-8)(9-12)(44-47)(48-51)(235-40)(241-43)(248-51)(252-55)(256-61)(280-85)	(5-12)(44-51)(248-61)(235-43)			
3.92	(216-17)(218-19)	(41-43)(54-58)				

Table 3.2b. Coincidence of Symmetrical Structures Formed by Meter with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.71	(6)(14)(26)(41)(57)(87)					
Mvt. II						
3.79		(317-22)	(309-18)			
3.80			(339-50)			
Mvt. III						
3.88			(36-44)(45-58)			
Mvt. IV						
3.93				(248-85)		

Table 3.2c. Coincidence of Symmetrical Structures Formed by Tempo with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.72				(1-64)(1-77)		
Mvt. II						
3.81				(1-154)		
Mvt. III						
3.89					(1-82)	
Mvt. IV						
3.94				(1-135)		
3.94			(276-85)	(1-275)		

Table 3.2d. Coincidence of Symmetrical Structures Formed by Temporal Span with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. II						
3.82					(1-520)	
Mvt. IV						
3.95a				(5-51)		
3.95b				(74-120)		

Table 3.3. Coincidence of Symmetrical Structures Formed by Timbre with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.96						(I,1-IV,285)
3.97a				(1-30)		
3.97b			(69-81)			
Mvt. II						
3.98			(155-69)			
Mvt. III						
3.99					(1-82)	
3.100				(1-18)		
Mvt. IV						
3.101				(5-51)(52-135)		

Table 3.4. Coincidence of Symmetrical Structures Formed by Texture with Architectonic Levels

Figure Numbers	Architectonic Levels: I	II	III	IV	V	VI
Mvt. I						
3.102				(1-64)(65-88)		
3.103					(1-88)	
3.104		(27-30)(82-85)				
3.105		(86-88)				
3.106		(78-81)				
Mvt. II						
3.107a			(4-19)			
3.107b		(21-27)				
3.108			(68-85)(413-24)			
3.109	(175-77)					
3.110	(52-54)(54-55)(55-57)(56-58) (57-59)(59-60)(60-62)(61-63) (63-64)(339-40)(341-42)(366) (367)(368)(369)(370-71)	(40-44)(44-47)(47-50)(50-52)	(127-34)			
Mvt. III						
3.111				(1-18)		
3.112	(30-31)(43)					
Mvt. IV						
3.113			(142-50)			
3.114			(74-81)			
3.115		(218-22)(226-29)				

Table 3.5. Coincidence of Symmetrical Structures Formed by Dynamics with Architectonic Levels

Figure Numbers	Architectonic Levels: I	II	III	IV	V	VI
Mvt. I						
3.116					(1-88)	
Mvt. II						
3.117				(186-241)(339-69)		
3.118			(397-412)			
3.119				(155-77)		
3.120				(114-49)		
Mvt. III						
3.121a					(1-82)	
3.121b			(6-17)			
Mvt. IV						
3.122				(136-234)		
3.123				(5-51)		

Table 3.6. Coincidence of Symmetrical Patterns Formed by Structure with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
3.124a					(1-88)	
3.124b				(1-64)(65-88)		
Mvt. III						
3.125					(1-82)	
Mvt. IV						
3.126				(5-51)(74-120)		

Table 3.7. Frequency Tabulations for Parametric Divisions of Symmetrical Structures and Architectonic Levels at which They Appear

	Architectonic Levels I	II	III	IV	V	VI	Total
Pitch							
Scale Basis	126	53	12	4	1	0	
Melody	74	13	0	0	0	0	
Harmony	58	6	2	0	0	0	
Tonality	0	0	0	3	1	1	
Total	258	72	14	7	2	1	354
Duration							
Rhythm	258	12	5	0	0	0	
Meter	6	1	4	1	0	0	
Tempo	0	0	1	5	1	0	
Span	0	0	0	2	1	0	
Total	264	13	10	8	2	0	297
Texture	20	11	6	3	1	0	41
Dynamics	0	0	2	6	2	0	10
Timbre	0	0	2	4	1	1	8
Structure	0	0	0	4	2	0	6
							716

Chapter IV

CANTATA PROFANA

One of Béla Bartók's most significant compositions is the Cantata Profana. Completed in Budapest on September 8, 1930, the cantata was not performed until May, 1934. The Cantata Profana is unique among Bartók's compositions in that it is scored for double mixed chorus, tenor and baritone soloists, and a large orchestra. Its singularity is emphasized by the fact that Bartók intended to add to it two more compositions of similar scope linked by a connecting idea.[1] However, this triptych was never completed, and the Cantata Profana stands alone as Bartók's most important vocal composition.

Types of Symmetrical Structures Present

The Cantata Profana has been described as "the most personal confession made by the composer."[2] However, the emotional nature of the composition does not preclude the use of symmetry. On the contrary, symmetrical structures

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[1] János Demény (ed.), Béla Bartók: Letters (New York: St. Martin's Press, 1971), p. 440.

[2] József Ujfalussy, Béla Bartók (Boston: Crescendo Publishing Company, 1971), p. 283.

are found in every parameter of the cantata, even in the text itself

Text

The libretto of the Cantata Profana is based on Bartók's own translation of one of the Rumanian Christmas songs known as the kolindas. Bartók found the texts of the kolindas to be particularly interesting both from the point of view of folklore and cultural history.[1] The composer's marked interest in the songs is evidenced by the fact that in 1935 Bartók took it upon himself to publish his collection of them at his own expense.[2]

Although the Rumanian kolindas are described as Christmas songs, they do not correspond to the religious carols of Western Europe. In fact, the most important parts of the texts are not even related to the Christian Christmas, but rather to the "festivals which in pagan ritual are associated with the rebirth of Nature in the Spring."[3] The text of one of these songs concerns the legend of nine brothers who hunt in the forest until they are turned into nine enchanted stags. Working from the original Rumanian text, Bartók translated this text into Hungarian for himself and used it as the basis for the libretto of the Cantata Profana. Later, in 1944, he

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[1]Ujfalussy, p. 281.

[2]Demény, p. 182.

[3]Ujfalussy, pp. 286-87.

translated the text again, this time into English, labeling it the "first product of my career as an English poet."[1] This English translation of the text of the Cantata Profana is reproduced with the composer's own spacing in Figure 4.1, and provides the opportunity to examine symmetrical structures produced in a purely extramusical form.

The divisions of the Cantata Profana (marked by Roman numerals in the score as they are provided by the composer) do not refer to the internal articulation of the music itself.[2] Rather, they refer to the natural divisions of the text. Thus, the Cantata Profana is performed without pauses between the three movements.

The text of the Cantata Profana divides itself into three sections. In the first section (paragraphs one and two) the father and his nine sons are described, and the sons are changed into enchanted stags. In the second section (paragraphs three and four) the father finds the stags and presents them with the opportunity to return to the world of man. The second section of the text closes with the sons' affirmation that they will remain stags. The third section of the text recapitulates the first two sections in abbreviated form. The major events of the text thus described create the pattern of symmetry shown in Figure 4.2.

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[1] Demény, p. 337.

[2] Ujfalussy, p. 285.

Figure 4.1. Bartók's English Translation of the Text of the Cantata Profana*

Once upon a time there
Was an aged man. He
Had nine handsome boys, they
Came to life through him. He
Has not taught them any
Trade nor handicraft:
Neither ploughing lands, nor
Herding cows and hogs, nor
Rearing horses, oxen.
Yet he has them taught to
Hunt in forests dark.

Off they went to hunt in
Forests dark and wild.
There they hunted till they
Found a brook, a bridge and
Trace of wondrous deer.
Those they traced, hunted
So they've gotten lost and
Changed into stags.

Yet their father could not
Bear to stay at home: he
Took his bow and went to
Forests dark and wild.
There he found the brook and
Trace of wondrous deer.
After them he went and
To a spring he came:
There he saw nine stags.
On his knees at once he
Sank to aim at them.
Lo! the tallest stag, he
Spake to him these words:
"Dearest father mine! oh
Do not shoot at us!
Else we will thee seize by
Antlers tall and strong.
And we will thee throw from
Mountain slope to slope, from
Mountain woods to woods, from
Rocks to rocks so fast:
Woe! thou wilt, dear father
On the ragged boulders
Break to smithereens."
Yet their father unto
Them he spake these words:
"Oh, my dearest boys, my
Children most beloved!
Come, oh come with me to
Your beloved mother!
Yearning is your mother
Woeful, sad, for you:
Lighted are the torches,
Laid the tables are, and
Full of wine the cups.
Cups are on the table,
Crying stands she there;
Cups replete with wine; yet
Sobbing sits she there
But the tallest stag he
Spake to him these words, and
Gave him answer thus:
"Father, dearest father,
Go thou home, go home to
Our beloved mother!
Yet we shall not go!

We'll not go with you; For
Never shall our antlers
Enter gates and doors, but
Only woods and shrubs;
Never shall our bodies
Wear a shirt and coat, but
Only foliage;
Nevermore our feet shall
Walk on houses' floors but
Only on the sward:
Nevermore our mouth shall
Drink from cups and jugs, But
From the clearest springs.

———— . ————

Once upon a time there
Was an aged man, he
Had nine handsome boys.
Never has he taught them
Any handicraft, he
Taught them only how to
Hunt in forests dark.
There they roamed, hunted
All the year around, and
Changed into stags in
Forests dark and wild.
Never will their antlers
Enter gates and doors, but
Only woods and shrubs;
Never will their bodies
Wear a shirt and coat but
Only foliage;
Nevermore their feet will
Walk on houses' floors but
Only on the sward;
Nevermore their mouth will
Drink from cups and jugs but
From the clearest springs.

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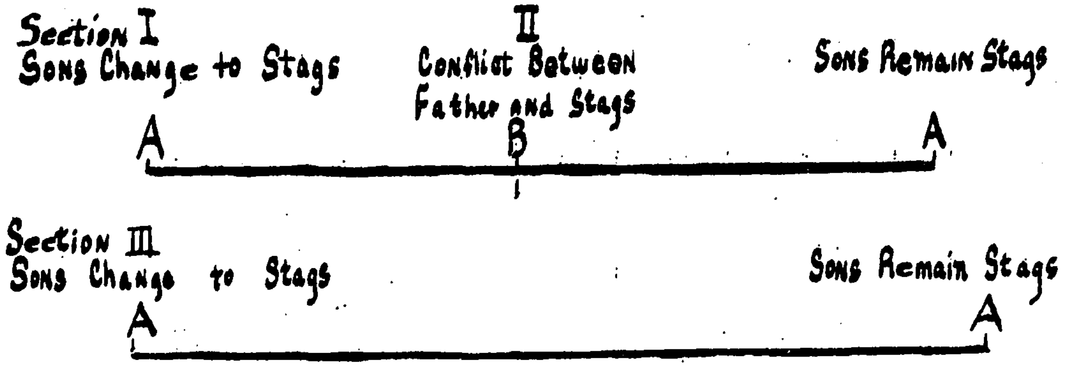
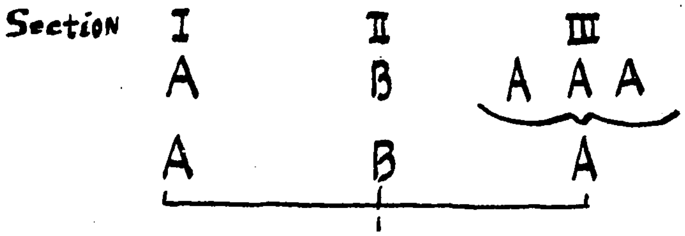
*Demény, p. 296a.

Figure 4.2. <u>Cantata Profana</u>, Textual Symmetry

(a)



(b)



In addition to the large pattern of symmetry produced by the main events of the text, several types of smaller patterns of symmetry are produced by the details of the text. The first type of symmetry is a product of action and reverse-action. In the first paragraph of the text, the point is made that the father gave life to his sons. After the sons are changed into stags, this action is reversed so that the father tries to take that life away by nearly shooting the stags. In the same way, after the father tries to kill the stags, the action is again reversed and the stags threaten to kill the father. The patterns of symmetry thus described are shown in Figure 4.3.

Another type of symmetry formed by the details of the text is that of positive-negative symmetry. In paragraphs three and four, the father asks the stags to return home and seeks to persuade them by enumerating the pleasures that await them there. The tallest stag refuses the plea by declining each of those pleasures. In his answer, the stag compares each of the pleasures enjoyed by man to a similar pleasure enjoyed by the stag, forming still another pattern of symmetry. These symmetrical structures are illustrated in Figure 4.4.

A particularly significant feature of the style of the text is its repetitive nature. Each important kernel of the story is reiterated at length in varying numbers of repetitions. The numbers of times an item is repeated, as

Figure 4.3. <u>Cantata Profana</u>, Textual Symmetry

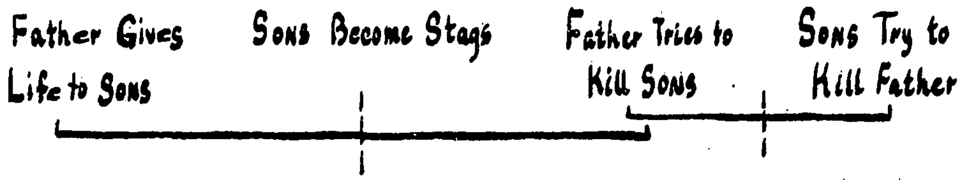
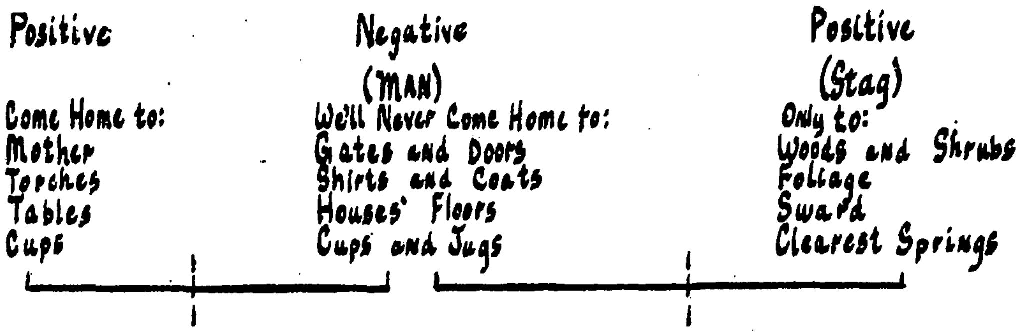
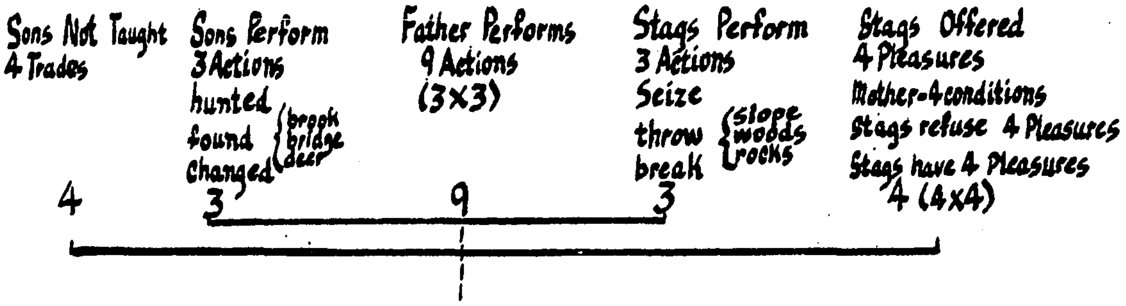


Figure 4.4. <u>Cantata Profana</u>, Textual Symmetry



well as the numbers of items or groups of items which are stated together form the additional symmetrical structure shown in Figure 4.5. In paragraph one of the text, it is explained that the father did not teach his sons four things: a trade or handicraft; ploughing lands; herding cows and hogs; rearing horses, oxen. In paragraph two, the sons perform three actions: they hunt; they find; they become lost. The second of these three actions results in finding three items: a brook; a bridge; a trace of deer. In paragraph three, the father performs nine actions: he cannot bear to stay at home; he takes his bow; he goes to the forest; he finds the brook and trace of deer; he goes after them; he comes to a spring; he sees the nine stags; he sinks; he aims at them. These nine actions form the axis of the symmetrical structure. In the same paragraph, the stags threaten to harm their father three ways: to seize him; to throw him from slope to slope, from woods to woods, and from rocks to rocks; and to break him to smithereens. Once again the second of the three actions is subdivided into three parts. In paragraphs three and four, the symmetry of the number "four" is completed in multiples of fours. First, the father entices the stags with four items: their mother; lighted torches; tables; cups of wine. The mother is said to be in four conditions: yearning; woeful, sad; crying; sobbing. In paragraph four, the stags refuse four groups of items: gates and doors; shirts and coats; floors; cups and jugs. As these four groups of items are refused they

Figure 4.5. Cantata Profana, Textual Symmetry



are compared to four pleasures enjoyed by the stags: woods and shrubs; foliage; sward; clearest springs.

In addition to the symmetrical patterns formed by various literary aspects of the text, symmetry is also produced by the structure of the text. Here, structure refers to Bartók's own division of the text into sections, paragraphs, sentences and lines by literary considerations (marked by Bartók's Roman numerals found in the music), visual spacing, and punctuation.

Bartók's method of constructing the text of the Cantata Profana is closely connected with the law of the Golden Section. The Golden Section (referred to as GS) means the division of a distance in such a way that the proportion of the whole to the larger part corresponds geometrically to the proportion of the larger to the smaller part. If the whole is taken as a unity, the resulting proportion of the larger part is the irrational number 0.6180340. In other words, the larger part of any distance divided as above is equal to the whole length multiplied by 0.6180340.[1] Thus, the term Golden Section is used to describe a specific proportion as well as the dividing point at which that proportion occurs. It is in the latter sense that the GS is expressed in mathematical numbers for the following discussion.

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[1] Ernő Lendvai, Béla Bartók: An Analysis of his Music (London: Kahn & Averill, 1971), p. 17.

The symmetrical construction of the text of the Cantata Profana is illustrated in Figure 4.6. Here, it is shown that the axis of symmetry is paragraph three, the longest of the five paragraphs. On either side of this forty-six line paragraph are two shorter paragraphs. Paragraphs one and two when added together consist of nineteen lines, the GS of which is eleven. Paragraphs four and five when added together consist of thirty-six lines, the GS of which is twenty-three. In Figure 4.6 the larger part is described as "a" and the smaller part is described as "b." The axis of symmetry is further emphasized by the fact that paragraphs two and four, respectively eight and thirteen lines, are also related by the GS.

Paragraphs one, two and five are spoken only by a narrator. Paragraphs three and four, however, are spoken by the tallest stag, the father and the narrator. When arranged in order of appearance according to the speaker, the structure of the entire text produces symmetry as shown in Figure 4.7a. In the same manner, the structure of paragraphs three and four produces symmetry as shown in Figure 4.7b. Here the axis of symmetry is the thirteen lines spoken by the father. The beginning and closing groups of thirteen lines each are spoken by the narrator and stag respectively. The four shorter sections of eleven, two, three and four lines which are located in corresponding positions before and after the axis of symmetry are related again by the GS.

Figure 4.6. <u>Cantata Profana</u>, Symmetry of Textual Structure

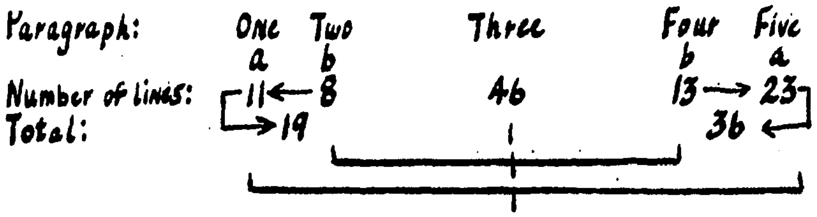
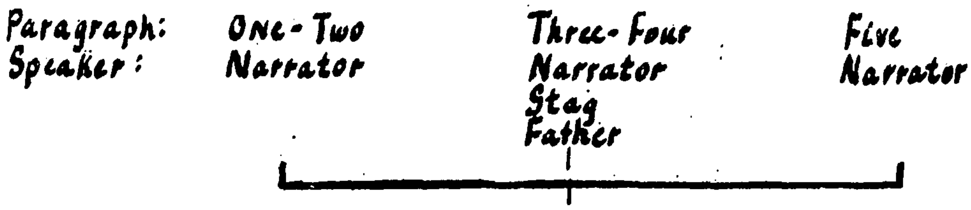
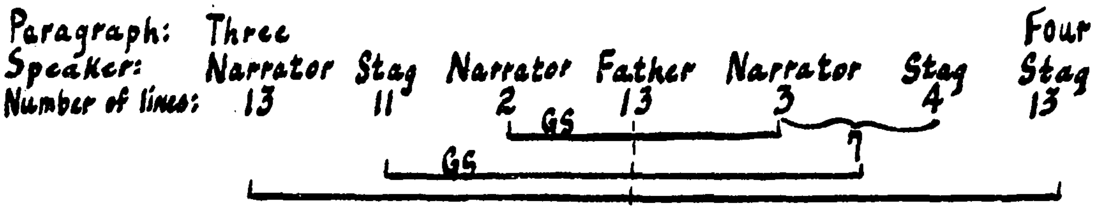


Figure 4.7. <u>Cantata Profana</u>, Symmetry of Textual Structure

(a)



(b)



Pitch

Movement I. The first movement of the Cantata Profana reveals several symmetrical scales which are presented throughout the composition. The most frequently used symmetrical scale is the dorian mode shown in Figure 4.8a. It is introduced in the first entry of the double chorus presented in a wedge-shaped symmetrical texture-set as shown in Figure 4.8b. In measure 17, the tenors enter on the note d which serves as the axis of symmetry. In each successive measure, two notes from the scale are added, one above the preceding upper note and one below the preceding lower note, until the scale is completed in measure 20. In measures 22-25, the process is repeated to produce a transposed dorian mode beginning on the note a as confirmed by the supporting harmony. This symmetrical scale is presented in a slightly different wedge-shaped texture-set as shown in Figure 4.8c. Later in Movement I, the dorian mode serves as the scale basis for a prominent melody heard in measures 55-59 as shown in Figure 4.9.

In the introduction to the first section of the Cantata Profana, a symmetrical hexatonic scale is presented as shown in Figure 4.10a. In measure 6, Fl.1, Fl.2 and Clar.1 play the upper notes of the scale in ascending order, while Clar.2, Fag.1 and Fag.2 play the lower notes of the scale in descending order. These two diverging lines produce another wedge-shaped texture-set as shown in Figure 4.10b.

Figure 4.8. <u>Cantata Profana</u>, I, 17-25, Derived Scale

(a) (b) (c)

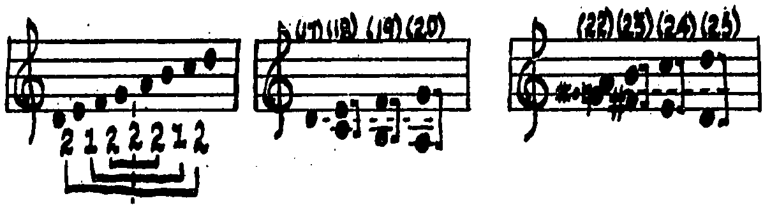
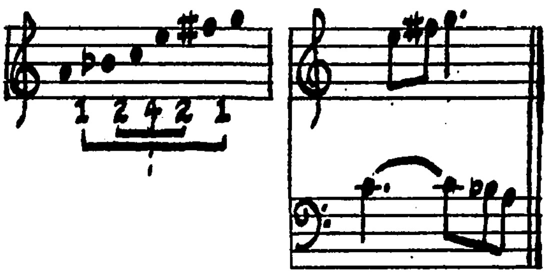


Figure 4.9. <u>Cantata Profana</u>, I, 55-59

Figure 4.10. <u>Cantata Profana</u>, I, 6, Derived Scale

(a) (b)



In measures 10-11, another symmetrical hexatonic scale is presented by F1.1 and V1.1 as shown in Figure 4.11a. In Figure 4.11b, the symmetry of this symmetrical scale is revealed. The scale is a product of two ascending whole steps and the transposition of the three-note pattern a perfect fifth higher. This whole-tone pattern is expanded to produce the complete whole-tone scale in measures 186-87 as shown in Figure 4.12. The whole-tone scale is presented in combination with a symmetrical incomplete scale in measures 15-17 as shown in Figure 4.13.

In addition to the whole-tone scale, another symmetrical uni-intervallic scale is presented in Movement I of the Cantata Profana. The chromatic scale shown in Figure 4.14a serves as the scale basis for measures 164-67 and measures 168-70, the former shown in Figure 4.14b. This scale is reinforced by its partial presentation in the alto voice which follows in measures 172-74 as shown in Figure 4.14c.

A particularly interesting symmetrical structure produced by scale basis is found in measures 29-50 of the first movement of the Cantata Profana (see Figure 4.15). A tonal center of E is produced by an E major-seventh chord on beat one of measure 29. The corresponding accidentals (five sharps) produce an E lydian mode which is heard in measures 29-31. In measure 32, the tonal center E is maintained, but the note a♯ becomes a♮ producing an E major (ionian) scale basis. In measure 33, the tonal center E

Figure 4.11. Cantata Profana, I, 10-11, 1.Fl., Vl. I

(a)

(b)

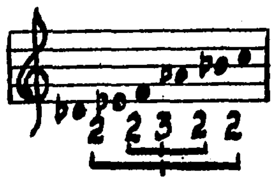


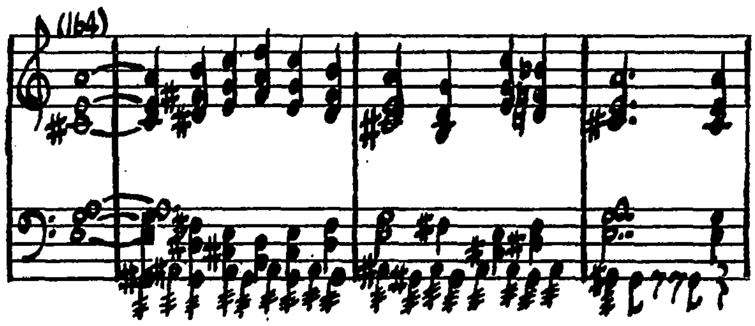
Figure 4.12. Cantata Profana, I, 186-87, Vl. I

Figure 4.13. Cantata Profana, I, 15-17, 1.Fag.

Figure 4.14. Cantata Profana, I, Chromatic Scale Basis

(a)

(b)



(c)

is again maintained although the note $\underline{d}^{\#}$ becomes $\underline{d}\natural$ producing an $\underline{E}$ mixolydian mode as scale basis. Although the note itself is not played in the second half of measure 33, the note $\underline{g}\natural$ is understood; for in the following measure, both $\underline{c}^{\#}$ and $\underline{g}^{\#}$ are replaced by $\underline{c}\natural$ and $\underline{g}\natural$ producing a key signature appropriate for an $\underline{E}$ aeolian mode. The key signature of one sharp is maintained throughout measures 34-41. Measure 42 begins with an $\underline{E}$ minor triad which reaffirms the tonal center $\underline{E}$. However, the note $\underline{c}^{\#}$ once again replaces $\underline{c}\natural$ producing an $\underline{E}$ dorian mode which is heard as the scale basis through measure 43. The symmetry of the structure is completed in measures 44-46 with $\underline{g}^{\#}$ replacing $\underline{g}\natural$, in measures 47-48 with $\underline{d}^{\#}$ replacing $\underline{d}\natural$, and in measure 49 with $\underline{a}^{\#}$ replacing $\underline{a}\natural$. It should be noted that the $\underline{g}\natural$ in measure 45 and the $\underline{d}\natural$ in measures 48-49 are quickly re-sharped and thus do not detract from the aural impression of symmetry.

Additional symmetrical structures are produced by the parameter of melody in the first movement of the <u>Cantata Profana</u>. The opening motive of the composition, played by the low strings in measures 1-3, is imitated in the upper three string parts in measures 2-4. This motive produces melodic symmetry by the technique of retrogradation as shown in Figure 4.16. Similar symmetrical melodies are produced in measures 164-66 and measures 171-75 as illustrated in Figure 4.17. The two melodies presented here are fragments of the opening motive transposed a perfect fifth higher. The melody shown in Figure 4.17b is expanded and altered

Figure 4.15. <u>Cantata Profana</u>, I, 29-50, Scale Basis

Figure 4.16. <u>Cantata Profana</u>, I, 1-3, Vlc.

Figure 4.17. <u>Cantata Profana</u>, I, 164-66; 171-72

(a) (b)

slightly as it is presented in three more statements in measures 172-74.

The opening melody of the Cantata Profana shown in Figure 4.16 is presented in still another symmetrical form in measures 1-2. Here the viola states the opening melody beginning on the note c rather than on the original note d as played by the lower strings. This slight change produces a symmetrical ordering of intervals as shown in Figure 4.18. The melody which results from this change is repeated by the violins in two subsequent statements in measures 2-3 and measures 3-4. Additional melodies containing a symmetrical pattern of intervals are shown in Figure 4.19 and Figure 4.20.

Other symmetrical melodies found in the first movement of the Cantata Profana are the product of the repetition of one interval or the alternation of two intervals. An example of the former type of melody is given in Figure 4.21. With the exception of measures 76 and 84, this motive is used as an ostinato figure in measures 70-86. Similar symmetrical motives are found frequently throughout measures 60-158 (see Table 4.1b, page 257). An example of the latter type of symmetrical melody is given in Figure 4.22. This melody is the product of two motives each consisting of two perfect fourths with a minor third interpolated between. The two motives are joined by the interval of a minor second which causes the melody to be symmetrical in each half as well as in its entirety.

Figure 4.18. <u>Cantata Profana</u>, I, 1-3

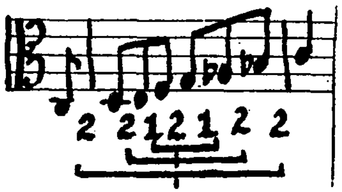


Figure 4.19. <u>Cantata Profana</u>, I, 7-9, 2.Fl.

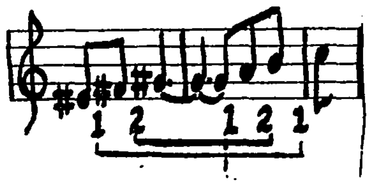


Figure 4.20. <u>Cantata Profana</u>, I, 188-97, Arpa

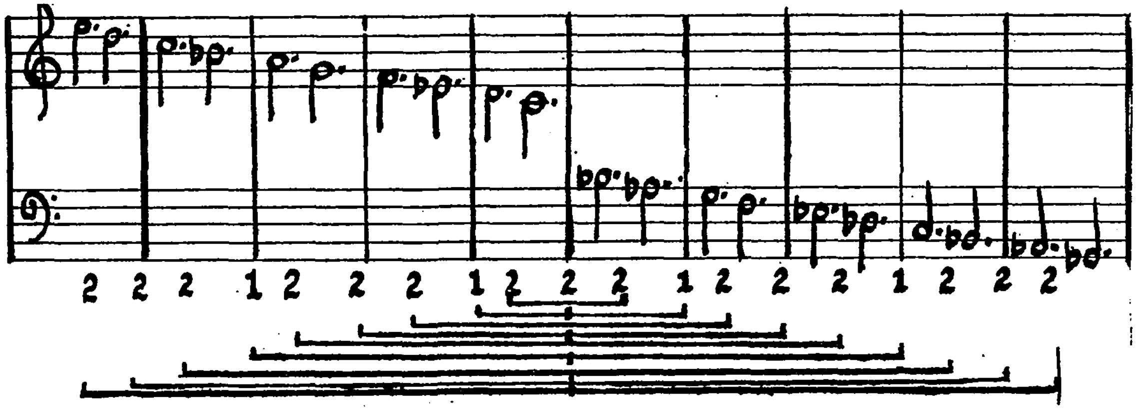


Figure 4.21. <u>Cantata Profana</u>, I, 70, Cb.

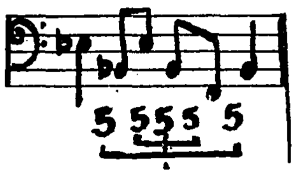


Figure 4.22. <u>Cantata Profana</u>, I, 32-33, Alto

Perhaps the most interesting of the symmetrical melodies presented in the first movement of the Cantata Profana is the fugue subject found in measures 74-78. This subject, shown in Figure 4.23a, is presented in various forms found throughout measures 74-163. As illustrated in Figure 4.23b, the melody is the product of a symmetrical hexatonic scale and its mirror image, each consisting of the interval pattern tone-tone-semitone-tone-tone. The symmetrical construction of this melody is made evident by the examination of each motive of the subject shown in Figure 4.23a as it is found in the two scales presented in Figure 4.23b. The e♮ which appears in motive "c" of this subject is easily explained as part of a miniature two-note motive and its mirror which converge[1] as shown in Figure 4.23c. An additional melody produced by the same technique of mirror is found in measures 180-82 as shown in Figure 4.24a. Although still retaining its symmetry, the latter melody is slightly altered as shown in Figure 4.24b, and the two melodies are stated in transposition and canon throughout measures 180-84.

Several different types of symmetrical harmonies appear in the first movement of the Cantata Profana. The first type is the uni-intervallic structure which includes quartal and quintal chords as well as traditional tertian

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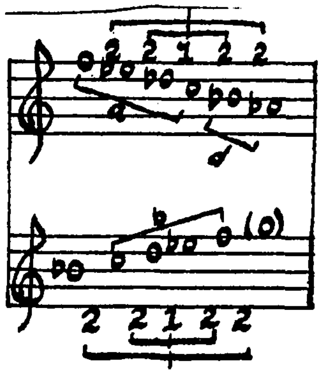
[1]Lawrence Hartzell, "Contrapuntal-Harmonic Factors in Selected Works of Béla Bartók" (unpublished doctoral dissertation, University of Kansas, 1970), p. 59.

Figure 4.23. Cantata Profana, I, 74-78, Tenor

(a)

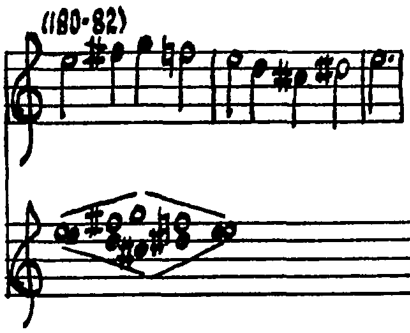
(b)



(c)

Figure 4.24. Cantata Profana, I, 180-84, Soprano, Alto

(a)



(b)

structures such as the diminished triad. The many instances of quartal and quintal chords are too numerous to mention here (see Table 4.1c, page 258). However, one particular section of music merits attention for its simultaneous presentation of both chords. The central section of the first movement of the Cantata Profana is a contrapuntal section encompassing measures 49-164. This section is introduced by an ostinato figure which outlines the quartal triad as shown in Figure 4.21, page 162. Toward the end of this rather long section (measure 154), the brass instruments introduce the quartal triad shown in Figure 4.25 which is heard continuously through measure 163. In measure 158 the quintal chord is introduced contrapuntally, first by the trumpets and later by the trombones in measure 161, as shown in Figure 4.26. The entrances of the two perfect fifths are in such close proximity that the sound accumulates to form a large quintal pedal chord which is also heard continuously through measure 163. A final uni-intervallic strucure, the diminished triad, appears only in isolated instances until the closing measures of Movement I. In measures 188-96 a series of five different diminished triads are presented by the brass instruments as illustrated in Figure 4.27.

A second group of symmetrical harmonies consists of traditional tertian structures which are symmetrical in their construction. These harmonic structures include the minor-minor seventh chord, the major-major seventh chord,

Figure 4.25. <u>Cantata Profana</u>, I, 154, Horns

(a) (b)

Figure 4.26. <u>Cantata Profana</u>, I, 158-62, Trb., Trbne.

(a) (b)

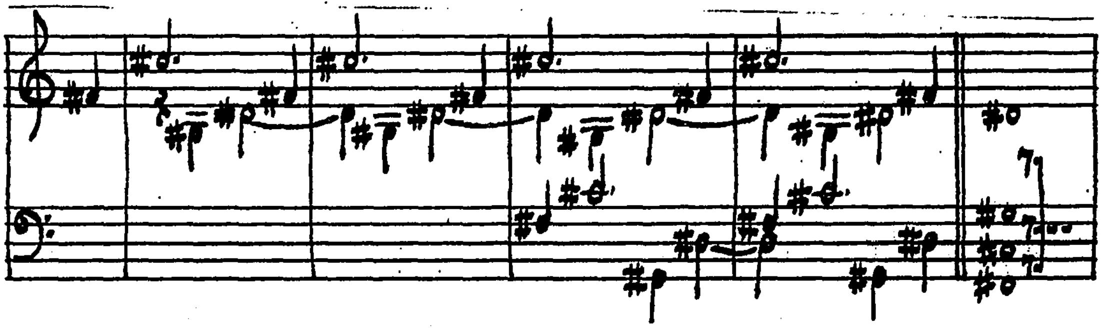
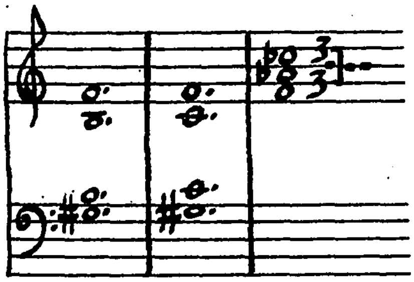


Figure 4.27. <u>Cantata Profana</u>, I, 188-89, Horns

(a) (b)



the major ninth chord, the perfect eleventh chord and the augmented eleventh chord. One example of each of these chords is given in Figure 4.28.

A third group of symmetrical harmonies consists of those harmonic structures which incorporate a mixture of seconds and thirds in their symmetrical construction. Many of these chords appear only in isolated instances throughout the movement. However, the chords shown in Figure 4.29 seem to assume additional importance through repetition. The first of these chords is constructed of major seconds and minor thirds. This chord is played by the full orchestra in measures 164, 167 and 168 at a fortissimo dynamic level and serves to punctuate the end of the second section of the movement. The same harmony is outlined by the two outer major seconds and appears as a pedal harmony in measures 165-66 and measures 168-70 as shown in Figure 4.19b. Another symmetrical chord falling into this third category is important because it foreshadows a melody used prominently later in the first movement and again in the third movement of the cantata. The chord shown in Figure 4.29c appears in measure 57 and is produced by the bass note f♮ used in combination with a D major accompanimental harmony. This major-minor triad is reinforced by its four melodic statements found in measures 184-87 as shown in Figure 4.29d.

A single symmetrical harmonic progression is presented in the first movement of the Cantata Profana.

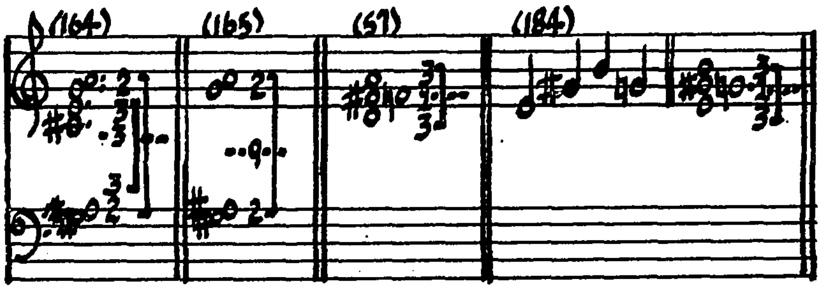
Figure 4.28. Cantata Profana, I, Symmetrical Harmonies

(a) (b) (c)

(d) (e)

Figure 4.29. Cantata Profana, I, Symmetrical Harmonies

(a) (b) (c) (d)



Shown in Figure 4.30, this progression is found in the alto, tenor and bass voices of measures 164-66 where it serves as the accompaniment to the soprano melody of those measures.

The tonal plan of the first movement of the Cantata Profana is asymmetrical when considered as an entity. However, certain formal areas of the movement are shown to be tonally symmetrical as illustrated in Figure 4.31. The initial tonality of the movement is D established by the d pedal tone of measures 2-8 and by the opening choral melody (measures 17-21) which is firmly rooted in the D dorian mode (see Figure 4.8b, page 156). The A tonality of measures 22-26 is relatively brief and is produced by the transposition of the melody first stated in measures 17-21 to the tonal center A. This tonal center is reinforced by the supporting A minor-minor seventh harmony. The rather lengthy E tonal center of measures 29-49 is produced as earlier discussed on pages 157-59. The tonal center A is reaffirmed in measure 52 by a sequence which utilizes the tonal centers $D^{\#}$, C and finally A. The symmetry of the structure is completed in measures 55-59 with a reaffirmation of the opening D tonal center by a melody firmly rooted in the D dorian mode and by a supporting D major triad.

Unlike the homophonic first section of Movement I, the central section of the first movement of the cantata is contrapuntal in nature. After the initial E^b and B^b tonalities of measures 60 and 74 respectively, the section

Figure 4.30. Cantata Profana, I, 164-66

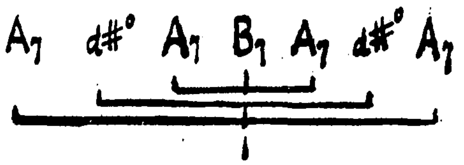
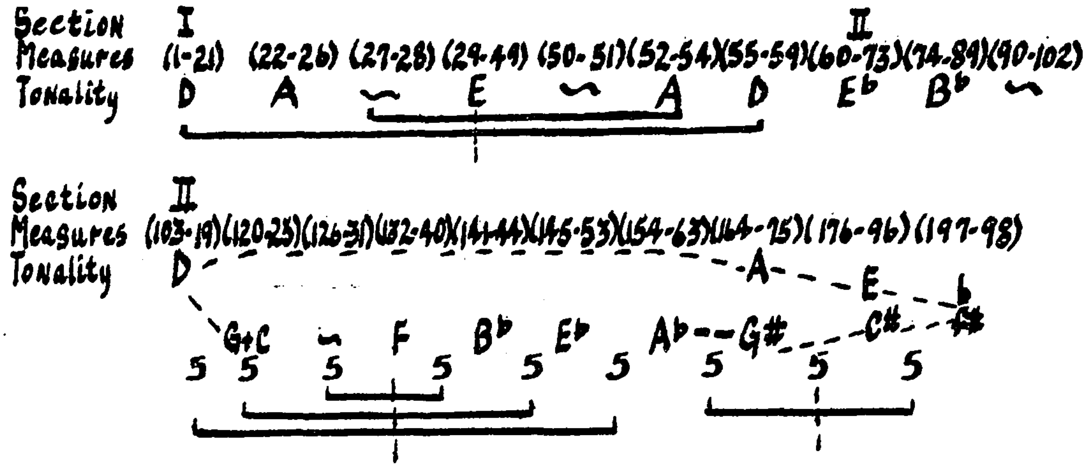


Figure 4.31. Cantata Profana, I, Tonality



does not clearly exhibit one tonal center from measure 90 to measure 102 (see Figure 4.31). The root motion throughout these measures is characterized by a constant sequence through the circle of fifths in a harmonic rhythm of two chords for every measure. In measure 100 the harmonic rhythm suddenly slows to one chord for every two measures emphasizing the uni-intervallic tonal pattern which follows. In measure 103 the tonal center D is established by a D augmented eleventh harmony and a tonic-dominant ostinato sung by the basses in measures 104-108. This tonal center is followed by the dual tonal centers G-C in measure 120 produced by the ambiguity of a quartal tetrad built on the note g and the alternation of both c and g in the bass voice and timpani. The ambiguity is ended in measure 132 with the firm establishment of the tonal center F produced by a seven-measure f pedal tone beneath the fugue subject of measures 74-78 stated clearly in an F tonal center. In measure 141, the tonal center B^b is established by a four-voice canon stating the same fugue subject in B^b. In measure 145, the tonal center E^b is established by a continuation of the four-voice canon now stating an E^b form of the fugue subject. In measures 154-63 the tonal center again is ambiguous, but in retrospect the tonal center $G^\#$ (A^b) is heard due to its final confirmation in measure 165 by a $g^\#$-$a^\#$ ostinato.

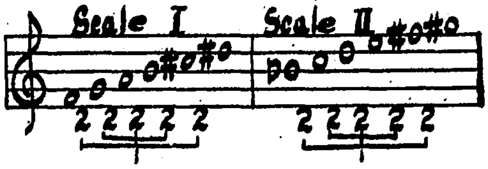
The final section of the movement encompassing measures 164-98 begins with the dual tonal centers $G^\#$ and A.

The $G^{\#}$ is confirmed by the $g^{\#}$-$a^{\#}$ ostinato mentioned previously, and the tonal center A is established by a soprano melody which begins and ends on the note a and the pedal harmony g-a played by the upper strings. The bitonality of these measures is continued in measures 176-96 where the tonal centers $C^{\#}$ and E are established by the same procedure. The symmetrical tonal patterns of Figure 4.31 are completed in the final two measures of the movement by the melody notes of the highest and lowest string parts.

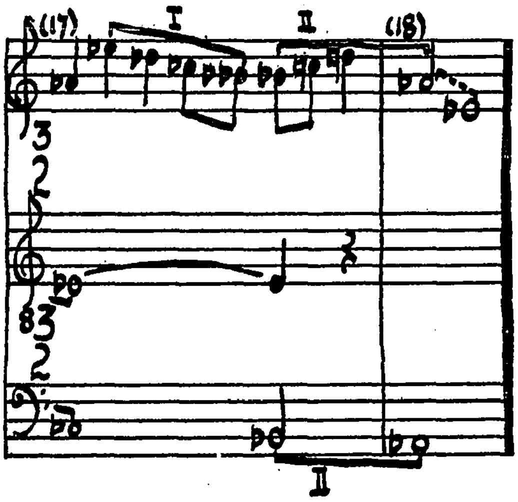
Movement II. The second movement of the Cantata Profana reveals a greater frequency of uni-intervallic scales than the first movement. The most striking use of the whole-tone scale occurs in measures 9-27 where the sound of whole-tone motives gradually accumulates, culminating in simultaneous statements of two whole-tone scales. The chromatic scale contains only two mutually exclusive whole-tone scales which can be built on any two notes that encompass an odd number of semitones between them. As shown in Figure 4.32a, these two scales are constructed on the notes f and b^b and are labeled "Scale I" and "Scale II" respectively. The opening choral melody, sung by the basses in measures 9-18 and imitated by the tenors in the same measures (see Figure 4.32b) consists of many two-, three- and four-note motives comprised of one, two or three whole steps. In Figure 4.32b each of these motives is shown in brackets and is labeled "I" or "II" according to its

Figure 4.32. <u>Cantata Profana</u>, II, 9-18, Chorus

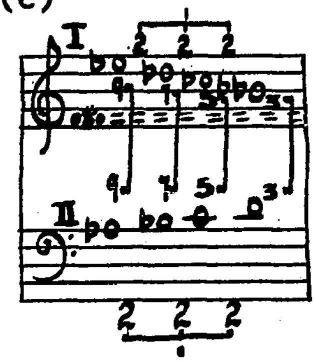
(a)



(b)



(c)



apparent derivation from one of the scales of Figure 4.32a. Other prominent intervals found in the melody of these measures are the tritone designated by a curved line and the perfect fourth designated by a broken line. The tritone is a characteristic interval of the whole-tone scale in that it outlines every segment of four consecutive notes found within it. In Figure 4.32b, each tritone is labeled according to its derivation as above. The perfect fourth of the melody represents the interval of transposition by which Scale II is realized throughout this section of the second movement. In measure 17 a telescoped version of the opening choral melody is stated by the altos. This melody, also shown in Figure 4.32b, further confirms the dual whole-tone scale basis of the opening melody in that it encompasses a four-note segment from each of the two whole-tone scales. In Figure 4.32c the two segments are shown to reproduce each other in mirror. The alto melody is sung in transposition and mirror in three additional statements found in measures 18-20. The mirror form of the melody serves as the subject for the stretto canon of measures 21-25. In measures 25-27, the violoncello and contrabass state the complete whole-tone scale on _f_ (Scale I), while the bassoons present the same scale and its transposition a perfect fourth higher (Scale II). These two whole-tone scales are further reinforced by partial statements of both scales played by the harp and horns and by additional partial statements of Scale II sung in imitation at the interval of a whole step by the chorus in the same measures. The latter procedure ultimately produces Scale II in its complete form.

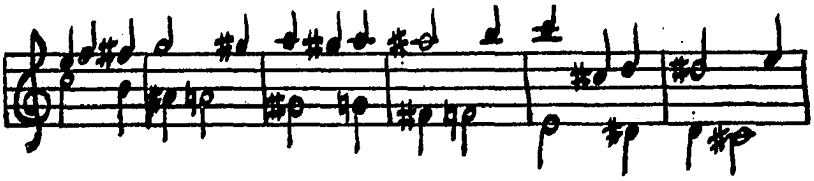
The other uni-intervallic scale used in the second movement is the chromatic scale. The most conspicuous presentation of this scale occurs in measures 144-49 where the descending form of the chromatic scale beginning on the note c is played by the second flute as shown in Figure 4.33a. Also shown in the same figure is the ascending form of the chromatic scale beginning on the note e played by the first flute in the same measures. The contrary motion of these two scales also produces a miniature symmetrical texture-set as illustrated in Figure 4.33b.

Another symmetrical scale found in the second movement is shown in Figure 4.34. This scale (the second mode of the acoustic scale, see pages 198-199) is present in its complete form in measures 28-34 where it is used as the basis for a melody stated in stretto canon by the chorus. The melody presents the symmetrical scale in almost straightforward form as shown in Figure 4.34a. The same melody is altered slightly in its final statement sung by the second tenors in measures 32-34 so that the symmetrical scale is presented in an entirely straightforward manner as shown in Figure 4.34b.

The dorian mode used as a scale basis for portions of the first movement reappears as a scale basis for three

Figure 4.33. <u>Cantata Profana</u>, II, 144-49, Flute

(a)



(b)

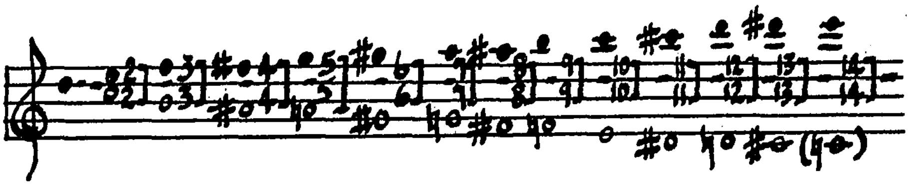


Figure 4.34. <u>Cantata Profana</u>, II, 28-34

(a)

(b)

sections of the second movement. In each of these three sections the dorian mode is utilized in combination with one of the three forms of the minor scale. The sections are further analogous in function, timbre, texture, harmony, rhythm and dynamics as follows: Each of the sections encompasses a phrase which introduces a subsequent tenor or baritone solo. Each is sung by the chorus which is divided according to male and female voices. Each section is introduced and punctuated by harmonic thirds played by the wind instruments. Each section is presented in a harmonic texture which consists mostly of major and minor thirds. Each section contains a common rhythmic motive and is sung at a forte dynamic level.

The alto melody of the first section (measures 38-41) is shown in Figure 4.35a with the soprano melody, which reproduces it a third higher, and with the accompanying bass melody played by the low strings, tuba and trombone. In this section both the soprano and alto melodies are simultaneously doubled at the octave by the tenors and basses. The scale basis of the three melodies shown in the figure is a composite of an E harmonic minor scale labeled "Scale I" in the figure and an E dorian mode labeled "Scale II" in the figure. The alto melody of the second section (measures 98-102) is shown in Figure 4.35b. In this section the alto melody is reproduced by the sopranos at the interval of a minor third, and both melodies are reproduced in canon at the octave by the tenors and basses. The scale

Figure 4.35. Cantata Profana, II, 38-41; 98-102; 163-66

(a)

(b)

(c)

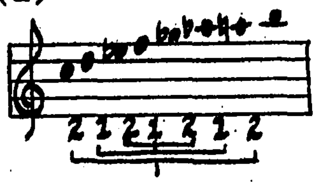
basis of the alto melody is a composite of an ascending E melodic minor scale labeled "Scale I" and an E dorian mode labeled "Scale II." The ascending motives of the melody are derived from the melodic minor scale while the descending motives are derived from the dorian mode. The alto melody of the third section (measures 163-66) is shown in Figure 4.35c. In this section the alto melody is accompanied by a soprano melody which parallels it in thirds, fourths and fifths and by tenor and bass melodies which together form harmonic seconds, thirds and fourths in parallel and oblique motion. The scale basis for the first part of the alto melody is a D pure minor scale labeled "Scale I" in the figure, while the scale basis for the second part of the alto melody is a D dorian mode labeled "Scale II" in the figure.

A symmetrical scale presented for the first time in the second movement is the alternating scale. This scale shown in Figure 4.36a is presented in motives of two, three or four notes in measures 174-84 by the upper woodwinds as shown in Figure 4.36b.

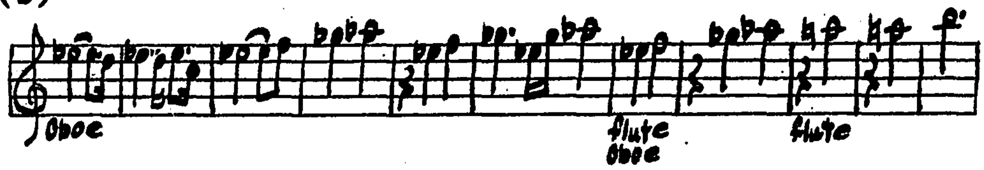
The alternating scale serves as the basis for another symmetrical scale produced by the technique of mirror. The opening melody of the second movement is played by the low strings in measures 1-4. Stated in Figure 4.37, this melody is shown to contain several small motives, the first of which is the neighbor-tone pattern designated by a curved line. The other motives are defined by changes in

Figure 4.36. Cantata Profana, II, 174-84, Derived Scale

(a)



(b)



melodic direction and are made up of alternating whole tones and semitones. These additional motives are shown in brackets with the descending motives labeled "I" and the ascending motives labeled "II." When the descending motives are arranged in scalar order, the partial alternating scale designated as "Scale I" results. Likewise when the ascending motives are arranged in scalar order, the partial alternating scale designated as "Scale II" results. These two scales reproduce each other in mirror as shown in Figure 4.37b and unite to form the complete symmetrical scale basis of the melody of measures 1-4 as shown in Figure 4.37c.

In the second movement, the technique of mirror is also used to produce symmetrical melodies. As illustrated in Figure 4.38a, the violoncello melody of measures 123-30 embodies six statements of the motive, tone-semitone. One descending and one ascending statement of the motive are joined by a common tone to produce three pairs of motives. In Figure 4.38b each pair is shown to create a symmetrical structure by the technique of mirror.

Additional symmetrical melodies are produced by the technique of retrogradation. The most important melody which exhibits this technique is sung by the tenor soloist in measures 78-83 with the trenchant words, "Naught but dust survive thee."[1] In addition to the dramatic emphasis

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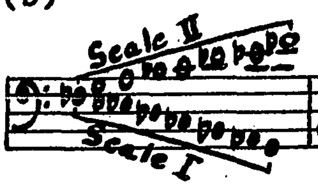
[1]Béla Bartók, Cantata Profana, English trans. by Robert Shaw (New York: Boosey & Hawkes, 1955), pp. 55-56.

Figure 4.37. <u>Cantata Profana</u>, II, 1-4, Vlc.

(a)

(b)



(c)

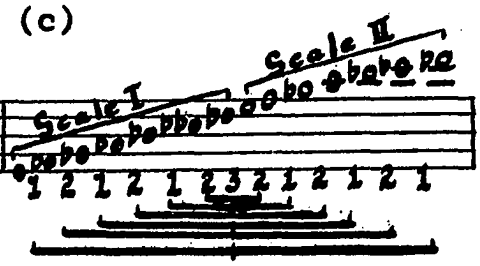


Figure 4.38. <u>Cantata Profana</u>, II, 123-30, Vlc.

(a)

(b)

supplied by these words, the melody is also emphasized by its placement in the uppermost range of the tenor voice and by its fortissimo dynamic level in contrast to the much softer accompaniment. Furthermore, the melody is emphasized by its reiteration in an imitative statement played by the piccolo (measures 80-83) in transposition three semitones higher. The former melody is shown to be symmetrical by retrogradation in Figure 4.39a. Here, the aural impact of symmetry is not eroded by the fact that the concluding note of melodic symmetry is elided with the beginning note of the five-measure tenor melody which follows. The second melody, also shown in Figure 4.39a, is asymmetrical in construction and utilizes the words, "Dearest Loving father."[1] The initial melody of measures 78-83 returns in measures 90-95 with the same words as before. This restatement shown in Figure 4.39b is rhythmically changed, but the notes themselves are an exact transposition of the original, three semitones lower. Once again the concluding note of melodic symmetry is elided with the beginning note of the following section. The final presentation of the symmetrical melody is heterophonically accompanied by the simultaneous presentation of the same notes trilled two at a time by the piccolo. In addition to melodic symmetry, the musical area encompassing measures 78-95 is shown to produce two other symmetrical structures as well. The structure shown in

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[1] Béla Bartók, pp. 56-57.

Figure 4.39. Cantata Profana, II, 78-96, Tenor Soloist

(a) (b)

(c)

Naught but dust survive thee. Dearest loving father. Naught but dust survive thee.

A B A

Symmetry Asymmetry Symmetry

(d)

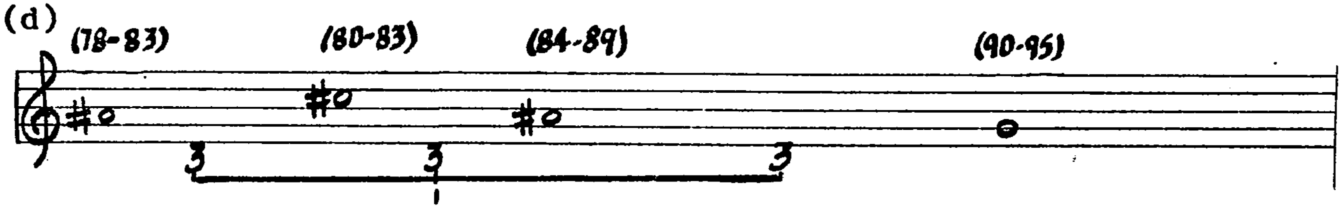


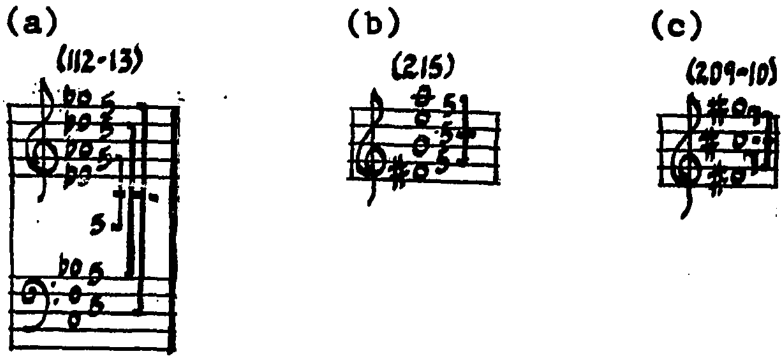
Figure 4.39d is produced by the uni-intervallic relationship inherent among the tonal centers of the four melodies previously discussed. The symmetrical melody of measures 78-83 begins on the note $\underline{a}^{\#}$ which is imitated in measures 80-83 in transposition three semitones higher beginning on the note $\underline{c}^{\#}$. The intervening asymmetrical melody once again begins with the note $\underline{a}^{\#}$ with the heterophonic statement of the initial melody in measures 90-95 in transposition three semitones lower beginning on the note $\underline{g}$.

Finally, a few isolated symmetrical melodies are produced by the correspondence of intervals about an axis interval. One striking instance of this variety of symmetrical melody is found in measures 64-68 as illustrated in Figure 4.40. The melody shown is played by the first flute and is used as an accompaniment pattern for a chromatically ascending tenor solo. The descending melody of the figure utilizes groups of two and three whole steps separated by single half steps which are distributed symmetrically about a semitonal axis.

Several different types of symmetrical harmonies appear in the second movement of the <u>Cantata Profana</u>. The first type is the uni-intervallic harmony which includes quartal and quintal chords as well as traditional tertian structures. The tallest quartal harmonic structure is the quartal heptad shown in Figure 4.41a. In measures 112-13 the chorus achieves the lower tetrad of this chord imitatively while the upper woodwinds and Horns I and III

Figure 4.40. Cantata Profana, II, 64-68, Fl.1.

Figure 4.41. Cantata Profana, II, Symmetrical Harmonies



provide the upper three notes of the chord. In the final measures of the second movement a quartal tetrad is produced in the upper woodwinds by a similar method. This chord shown in Figure 4.41b is achieved imitatively with the upper three notes reached successively by the bassoon, oboe and flute followed by the addition of the lowest note of the tetrad supplied by the clarinet. The clearest presentation of a quintal chord is the quintal triad played as an accompaniment to the tenor solo of measures 209-10. This triad is shown in Figure 4.41c.

The uni-intervallic tertian structures found in the second movement include the diminished triad, the diminished seventh chord, and the augmented triad which are shown in Figure 4.42a-c. In addition to these uni-intervallic structures, one other tertian harmony is shown to be symmetrical in Figure 4.43. The major-major seventh chord shown in Figure 4.43a is used in measure 53 as an accompaniment to the tenor solo. A more prominent appearance of the chord is the melodic statement sung in measures 129-34 and measures 151-59 by the bass soloist. In measures 129-34 the chord is outlined three times in unornamented and ornamented versions while in measures 151-59 the chord appears only in the unornamented melodic version shown in Figure 4.43b.

One additional symmetrical harmony found in the second movement is the structure shown in Figure 4.44. This chord is used as an accompaniment to the tenor solo and

Figure 4.42. Cantata Profana, II, Symmetrical Harmonies

(a) (b) (c)

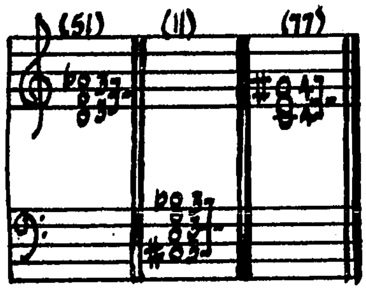


Figure 4.43. Cantata Profana, II, Major-Major Seventh Chord

(a) (b)

Figure 4.44. Cantata Profana, II, 174-76, Vlc., Fag.

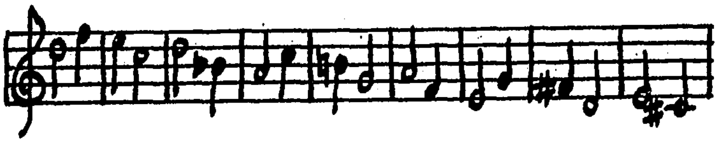
woodwind counter melody of measures 174-76. The harmonic structure embodies two whole steps separated by the interval of a perfect twelfth.

Movement III. Because the third movement of the Cantata Profana is essentially a recapitulation of portions of text and music from the preceding two movements, little new musical material is introduced here. The only new symmetrical scale heard in the third movement serves as the basis for the soprano melody of measures 65-73 shown in Figure 4.45a. The symmetrical scale shown in Figure 4.45b consists of a central chromatic hexatonic scale with an additional tone and semitone placed symmetrically in corresponding positions at either end of the scale.

Two symmetrical scales presented previously in the first and second movements are presented again in the third movement. The whole-tone scale shown in Figure 4.46 is used as the scale basis for the choral melody of measures 58-62. Here the complete whole-tone scale is achieved through four imitative ascending statements of a whole-tone tetrad with each successive statement transposed a whole step higher. The dorian mode shown in Figure 4.47 is used as the scale basis for the choral lines of measures 78-86 of Movement III. Here, the D tonal center is established by the pedal-tone d played by the contrabasses and horns. Although f♯ and g♯ are presented in the same measures in an ascending scale played by the strings, the choir insistently

Figure 4.45. <u>Cantata Profana</u>, III, 65-73, Soprano

(a)



(b)

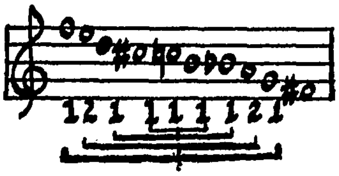


Figure 4.46. <u>Cantata Profana</u>, III, 58-62, Chorus

Figure 4.47. <u>Cantata Profana</u>, III, 78-86, Chorus

maintains an f♮ in four imitative statements of the descending line g-f-e. In measure 87, the tenors of Choir I reach an f♯ which results in a concluding D major harmony.

The techniques of mirror and retrogradation used to produce symmetrical melodies in Movements I and II are also used to produce melodic symmetry in the final movement of the cantata. Measures 11-34 of the third movement incorporate several symmetrical melodies into one lengthy melodic passage. The symmetrical motive of measures 15-16 is shown to be a product of the technique of mirror in Figure 4.48a. This motive is sung initially by the sopranos of Choir I and is imitated in successive statements sung by the altos of Choir I in measures 16-18 and by the basses of Choir I in measures 20-21. A second melody containing symmetry is sung by the altos in measures 20-22. The symmetry of its central motive is also produced by the technique of mirror as shown in Figure 4.48b. This second melody is imitated by the tenors in measures 21-23, by the basses in measures 22-24, and by the sopranos in measures 23-25. A third symmetrical melody produced by the technique of mirror is shown in Figure 4.48c. Here the melody of measures 26-30 is shown to be symmetrical in each half as well as in its entirety. Each half of the melody consists of a three-note motive and its mirror image. In addition, the second half of the entire melody is the retrograde-inversion of the first half resulting in both a symmetrical arrangement of intervals and a symmetrical wedge-shaped melodic pattern. The final symmetrical melody produced by the technique of mirror in the third movement immediately follows in measures 30-34 as shown in Figure 4.48d. Like the preceding melody of Figure 4.48c, this melody also produces symmetry in each half as well as in its entirety. However, unlike the preceding melody, the second half of the fourth melody is the simple mirror of its first half.

Additional symmetrical melodies found within measures 11-34 are produced by the technique of retrogradation. The motive shown in Figure 4.49a is sung by the basses in measures 11-14. In the same figure, this melody is shown to comprise both an initial motive and its retrogradation with two additional notes. In measures 12-15 (not shown in the figure) the melody is imitated at the interval of a perfect fifth by the tenors of Choir II. In measures 13-15 it is imitated by the tenors of Choir I with the omission of the final note of the original motive as shown in Figure 4.49b. In the statement of measures 14-16, the second added note is omitted from the melody leaving the purely symmetrical form of the motive as shown in Figure 4.49c. This final motive is imitated by the basses in measures 16-18, by the tenors of Choir I in measures 17-19, and by the tenors of Choir II in measures 18-20.

The third movement of the Cantata Profana contains particularly interesting examples of uni-intervallic harmonic structures as shown in Figures 4.50-4.53. The opening accompanimental harmony for the first four measures

Figure 4.48. Cantata Profana, III, Symmetrical Melodies

(a) (b)

(c) (d)

Figure 4.49. Cantata Profana, III, Symmetrical Melodies

(a) (b) (c)

of the third movement is the quintal hexad shown in Figure 4.50. This harmonic structure consists of two quintal triads. The lower triad is played by the strings and low horns while the upper triad is played by the upper horns and woodwinds. An unusual example of a quartal chord is illustrated in Figure 4.51a which diagrams by key note the imitative entries of the subject shown in Figure 4.51b as they appear in measures 35-55. Two individual features of this subject are responsible for the gradual accumulation of sound resulting in the harmonic structure thus diagrammed. First, regardless of individual variations, the opening subject and each subsequent entry of it comprise many repetitions of the initial note of the subject with any additional notes falling on either side of the beginning note to reinforce it. Second, each subject is repeated with minimal variation throughout the entrances of successive voices. These two features result in the accumulation of the sound of the interval of a perfect fourth which separates each entry culminating in the quartal tetrad diagrammed in Figure 4.51a. In a similar manner, the whole-tone chord shown in Figure 4.52a accumulates through successive entries of a whole-tone tetrad, each transposed a whole step higher. As shown in Figure 4.52b, the final note of each motive is sustained to produce the chord diagrammed. However, the sound of the original soprano motive is sustained by the ear which tends to include the three long

Figure 4.50. <u>Cantata Profana</u>, III, 1-4

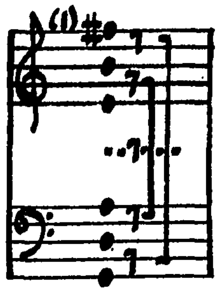
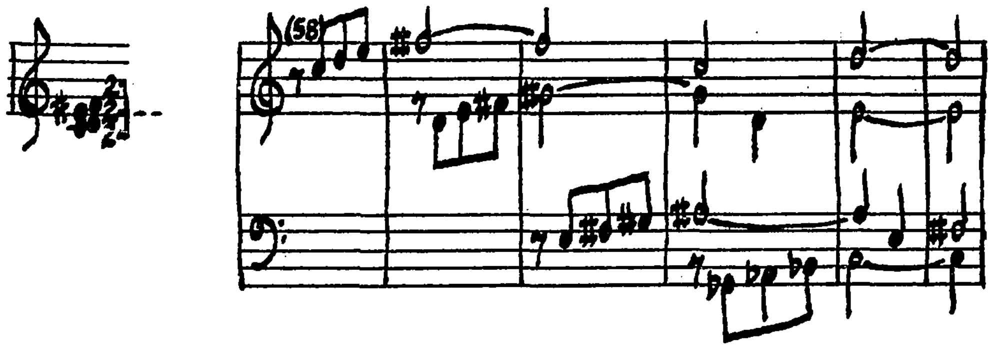


Figure 4.51. <u>Cantata Profana</u>, III, 35-41, Bass

(a) (b)

Figure 4.52. <u>Cantata Profana</u>, III, 58-63, Chorus

(a) (b)



notes of the successive entries to form a complete whole-tone chord.

In addition to these uni-intervallic harmonic structures, the third movement also contains a few isolated examples of symmetrical tertian structures. The first of these harmonies is the major-major seventh chord and is shown in Figure 4.53a. The second tertian structure, the major ninth chord, is outlined by the soprano melody of measures 27-29 and is shown in Figure 4.53b.

Movements I-III. Two asymmetrical scales combine to create a large symmetrical structure which encompasses all three movements of the Cantata Profana. The two scales are shown in Figure 4.54a where they are labeled "Scale I" and "Scale II." These two scales when combined in scalar order produce the symmetrical scale shown in Figure 4.54b. As illustrated in Figure 4.54a, Scale I and Scale II mirror each other, creating the symmetry of the structure diagrammed in Figure 4.54c. This symmetrical structure is created by the appearance of Scale I in the opening four measures of the first movement played in imitation by the strings and a similar presentation of Scale II in the closing measures of the third movement. Lendvai labels Scale I a "GS scale" because it contains the following intervals: a major second; a minor third; a perfect fourth and a minor sixth.[1] The semitonal content of each of these

[1] Lendvai, p. 72.

Figure 4.53. Cantata Profana, III, Symmetrical Harmonies

(a) (b)

Figure 4.54. Cantata Profana, I-III, Symmetrical Scale

(a) (b) (c)

intervals, respectively 2, 3, 5 and 8, represent the first four numbers of the Fibonacci Series in which each number is equal to the sum of the two preceding numbers, and each preceding number approximates the point at which the following number divides according to the principles of the Golden Section.[1] Lendvai refers to Scale II of Figure 4.54a as an "acoustic scale" because it is derived from the notes of the overtone series.[2] In the Cantata Profana, Scale I is used only in conjunction with the father as described in the text. In Movement I, Scale I is heard in the introduction (measures 1-4) to the opening words, "Once there was an old man" and is played by the clarinet in accompaniment to those words in measure 21. Scale I is not heard again until Movement II, measure 115, where the scale is used as the basis for the baritone solo in which the father asks his sons to return home. Measure 115 of this movement is the point at which the entire cantata divides according to the principles of the Golden Section. Scale I is heard again in measure 191 of the second movement where it is used as the basis for the baritone solo in which the father again pleads with his sons to return home. Measure 191 of the second movement is the point at which the combined measures of Momements II and III divide according to the principles of the Golden Section. Scale II is not presented until the

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[1]Lendvai, p. 27.

[2]Lendvai, p. 67.

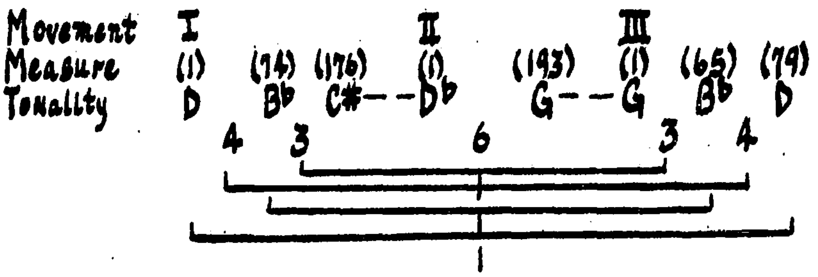
closing measures of Movement III where it is used as the basis for the tenor solo in which the tallest stag sings his final melody. This solo is the climax of the words, "Now their mouths no longer drink from crystal glasses, only cooling mountain springs."[1] As previously mentioned, Scale II is then presented by the strings in measures 79-87 in an imitative texture. As applied to the text of the Cantata Profana, Scale I represents the closed world of the father, while Scale II represents the open freedom of nature. Thus, these two scales philosophically oppose and complement each other in an ultimate symmetrical structure which pervades every other aspect of the music itself.

The tonal scheme of the Cantata Profana forms another large symmetrical structure which encompasses all three movements of the composition. This structure comprises the beginning and ending tonality of each movement and one other important tonal center from the first and third movements. Movement I begins with the tonal center D established by the presentation of Scale I (shown in Figure 4.54a, page 197) which begins and ends on the note d and by a seven-measure d pedal tone. The next important tonal center is B^b established as the tonality for the central fugal section by the subject of the fugue (shown in Figure 4.23a, page 164) which begins and ends on the note b^b. Movement I ends with the tonal center $C^\#$. This tonality is first established in measure 176 by the alternation of the

[1] Bartók, pp. 89-91.

notes $\underline{c}^{\#}$ and $\underline{d}^{\#}$ in the low strings and later confirmed by an eight-measure $\underline{c}^{\#}$ pedal tone played throughout measures 188-95. The second movement begins with the enharmonic equivalent tonal center $\underline{D}^{b}$ established by the statement of an introductory melody (partially shown in Figure 4.37a, page 182) which begins and ends on the note $\underline{d}^{b}$. In addition, a $\underline{c}^{\#}$ pedal tone is played by the contrabasses in measures 9-12 further reinforcing the enharmonic tonal center. The concluding tonality of Movement II is G established by the tenor solo of measures 193-203. This solo encompasses two phrases each beginning and ending on the note g and each including many repetitions of the note g as well. The final three-measure G major triad played by the low strings, harp and horns concludes the second movement. The same chord is continued through the first four measures of the third movement maintaining the G tonality. The second tonality of importance in the third movement is $\underline{B}^{b}$ established in measures 65 and 67 by a $\underline{B}^{b}$ major chord sounded in all the parts. The concluding tonal center D is established in the final fifteen measures of Movement III by a d pedal tone and by the presentation of Scale II (shown in Figure 4.54a, page 197) which also begins and ends on the note d. The final six measures of the cantata consist of a sustained D major triad and a single d punctuation note played by the timpani. The entire tonal scheme thus described is shown to be symmetrical in Figure 4.55 where the symmetry is created in visual

Figure 4.55. Cantata Profana, I-III, Tonality



abstraction by two factors. First, symmetry is created by the repetition of the tonal centers D and B^b in corresponding positions on either side of the tritone axis $C^{\#}$-G. Second, symmetry is created by the arrangement of intervals produced between each pair of tonal centers. These intervals are also repeated in corresponding positions about the tritone axis $C^{\#}$-G.

Duration

Movement I. Symmetrical rhythms are found in abundance in the first movement of the Cantata Profana. Most frequently found are the two rhythmic motives shown in Figure 4.56a. These two motives are in rhythmic opposition to one another, substituting long note values for short and short note values for long. Motive 1 comprises a quarter note and an eighth note symmetrically repeated in corresponding positions about the axis, while motive 2 comprises the antithetical rhythm pattern. These two symmetrical rhythmic motives gain importance through their many repetitions found throughout measures 27-53. In measures 29-30 of the first movement, the two motives are introduced in a complex rhythmic structure shown in Figure 4.56b. Measure 29 presents motive 1 and motive 2 in elision, while measure 30 presents the rhythm of measure 29 in retrograde form. This produces a complex set of symmetrical structures. First, each of the individual motives is symmetrical. Second, the order of motives is symmetrical. Third, the entire rhythmic pattern encompassed by the two measures is symmetrical. The rhythmic pattern of measures 29-30 is further enhanced and complicated by the accompanying rhythmic pattern which is again in rhythmic opposition to the original. Thus, the original rhythm and its accompanying rhythm produce the symmetrical structure shown in Figure 4.56c. Throughout measures 180-87 motives 1 and 2 are stated in augmentation as shown in Figure 4.56d.

In contrast to the triple metric subdivision produced by the symmetrical rhythms of Figure 4.56, the symmetrical rhythms shown in Figure 4.57 produce a strong duple metric subdivision. The first symmetrical rhythm of Figure 4.57a comprises the short-long-short pattern of a quarter note, a half note and a quarter note respectively. Also shown in Figure 4.57a are variations of the same short-long-short rhythmic pattern as they are presented within the central fugal section of the first movement. The rhythms shown in Figure 4.57b are also presented in the fugal section of Movement I and, like those of the preceding figure, reflect a duple metric subdivision. However, the rhythms of Figure 4.57b are variations of the antithesis of the short-long-short rhythm pattern illustrated in Figure 4.57a. These rhythms utilize the opposing rhythmic motive long-short-long with one or more repetitions of the central short note value between the outer two long note values. The symmetrical rhythms shown in Figure 4.58 are produced by combining one note value and one rest value in symmetrical arrangements about an axis.

Figure 4.56. <u>Cantata Profana</u>, I, Symmetrical Rhythms

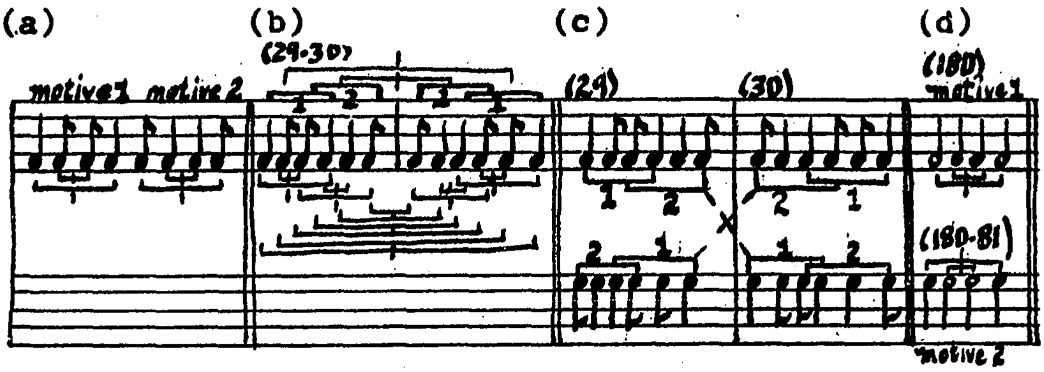


Figure 4.57. <u>Cantata Profana</u>, I, Symmetrical Rhythms

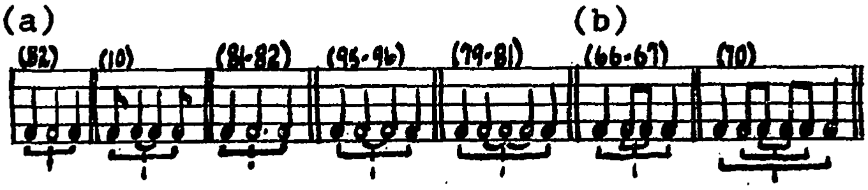


Figure 4.58. <u>Cantata Profana</u>, I, Symmetrical Rhythms

Although the pattern formed by changing meters in the first movement is asymmetrical, the patterns formed by changing meters in two sections within the first movement are symmetrical. The first section which encompasses a symmetrical pattern of meters is bounded by changes of tempo at measure 27 and measure 53. This meter pattern diagrammed in Figure 4.59a is as follows: Measures 27-30 are written in $\frac{9}{8}$ meter; measures 31-48 are written in $\frac{6}{8}$ meter; measures 49-52 are written in $\frac{9}{8}$ meter completing the symmetry of the structure. Also diagrammed in Figure 4.59a is the reinforcing symmetrical structure formed by the number of measures encompassed by each meter. The initial $\frac{9}{8}$ meter encompasses four measures; the $\frac{6}{8}$ meter encompasses eighteen measures; and the concluding $\frac{9}{8}$ meter encompasses four measures completing the symmetry of the structure.

The second section which produces a symmetrical pattern of meters encompasses the entire central fugal section of the first movement. This section is bounded by changes of beat note at measure 59 and measure 164. The meter changes within the middle section of the movement, diagrammed in Figure 4.59b, are as follows: Measures 59-119 are written in $\frac{2}{2}$ meter; measure 120 is written in $\frac{3}{2}$ meter; measures 121-130 are written in $\frac{2}{2}$ meter; measure 131 is written in $\frac{1}{2}$ meter; measures 132-50 are written in $\frac{2}{2}$ meter; measure 151 is written in $\frac{3}{4}$ meter; and measures 152-63 are written in $\frac{2}{2}$ meter. The pattern thus described is

Figure 4.59. <u>Cantata Profana</u>, I, 27-52; 59-163, Meter

(a)

Measure	(27)	(31)	(44-52)
Meter	$\frac{9}{8}$	$\frac{6}{8}$	$\frac{9}{8}$
Span	4	18	4

(b)

Measure	(59)	(120)	(121)	(131)	(132)	(151)	(152-63)
Meter	$\frac{2}{2}$	$\frac{3}{2}$	$\frac{2}{2}$	$\frac{1}{2}$	$\frac{2}{2}$	$\frac{3}{4}$	$\frac{2}{2}$
Division	DUPLE	TRIPLE	DUPLE	SINGLE	DUPLE	TRIPLE	DUPLE

symmetrical in its alternation of duple and triple meters about one measure of single meter.

The pattern formed by the tempo descriptions of each of the three formal sections of the first movement is symmetrical as shown in Figure 4.60. The symmetry of the structure is created by the fact that the tempos of the opening and closing sections are described similarly and show little difference in actual tempo. The tempo of the contrasting middle section, however, is much faster in comparison and is described as "Allegro" in contrast to the "Moderato" description which links the first and final sections.

Movement II. Fewer examples of rhythmic symmetry are evident in the second movement of the Cantata Profana than in the first movement. Rhythmic motives 1 and 2 from the first movement are heard in augmentation in the second movement as shown in Figure 4.61a. Shown in Figure 4.61b are rhythmic variations of these two motives. The first variation appears in measures 15-16 sung by the bass voices. This rhythmic structure utilizes two statements of rhythmic motive 1 in its original form symmetrically positioned on either side of an axis of two quarter notes with one additional quarter note placed at either end of the structure. The second variation of rhythmic motive 1 appears in measure 11 sung by the tenor voices. This rhythm pattern incorporates two additional eighth notes in a

Figure 4.60. Cantata Profana, I, Meter

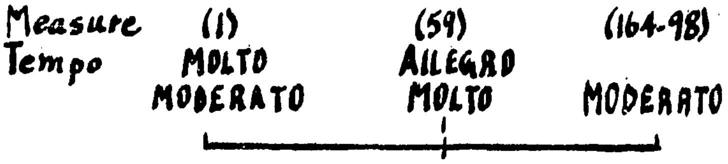
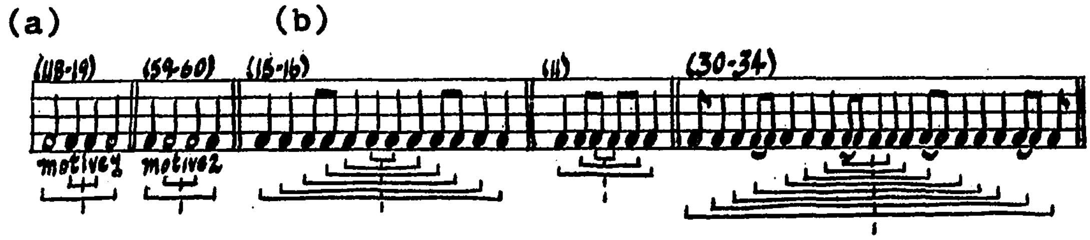


Figure 4.61. Cantata Profana, II, Symmetrical Rhythms



central position between the two outer quarter notes of the original motive. The third variation utilizes rhythmic motive 2 and appears in measures 30-34 played by the violins and violas. This rhythmic structure incorporates fourteen additional quarter notes centrally positioned between the two outer eighth notes of the original motive.

Another symmetrical rhythmic motive heard in the second movement is the short-long-short rhythm pattern previously heard in Movement I. This motive is shown in Figure 4.62a as it appears in measure 143 sung by the baritone soloist. Shown in Figure 4.62b are two variations of the motive. The first variation which appears in measure 16 played by the bassoons incorporates an additional quarter note placed at either end of the short-long-short rhythmic motive. The second variation also utilizes the short-long-short motive in a central position but with two eighth notes placed at either end of the structure. This latter variation appears in measure 164 sung by the sopranos and altos of Choir I.

Each of the two rhythm patterns of Figure 4.63 incorporates one note value and one rest value in a symmetrical structure. The first symmetrical rhythm appears in measures 53-55 played by the harp. The second symmetrical rhythm is sung by the sopranos and altos of Choir I in measure 163.

The form of the second movement is multi-sectional reflecting the many conflicts of mood and emotion inherent

Figure 4.62. Cantata Profana, II, Symmetrical Rhythms

(a) (b)

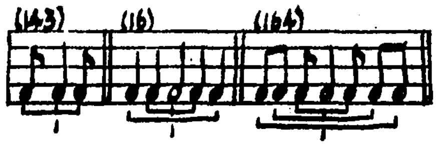
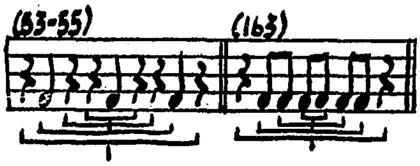


Figure 4.63. Cantata Profana, II, Symmetrical Rhythms

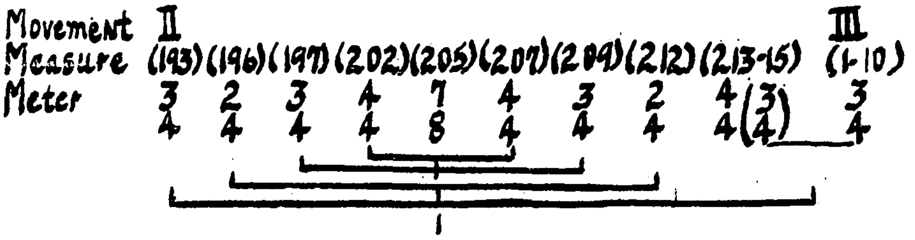


among the father, the stags and the choral commentator. This aggregate construction results in over sixty changes of meter within the second movement. These frequent meter changes in turn produce many small symmetrical structures in a simple alternating pattern in addition to the two larger symmetrical structures illustrated in Figure 4.64. The first structure shown in Figure 4.64a encompasses measures 55-95, a portion of the tenor solo which includes several repetitions of phrases from the original text. At measure 55 the frequent meter changes assume a simple alternating pattern of $\frac{3}{4}$ and $\frac{2}{4}$ meter with a single measure of $\frac{4}{4}$ meter serving as axis. The symmetrical structure diagrammed in Figure 4.64b encompasses measures 193-215 of Movement II and measures 1-10 of Movement III. This structure consists of two simple alternations of $\frac{3}{4}$ and $\frac{2}{4}$ meter placed in corresponding positions on either side of the axis pattern $\frac{4}{4}$-$\frac{7}{8}$-$\frac{4}{4}$. The aural impact of the alternating triple and duple meters established at the beginning of the symmetrical structure is so strong that it does not easily surrender to the $\frac{4}{4}$ meter of measures 213-15. This meter is written to accommodate the woodwind imitation of the final tenor motive. In contrast, the horns, tenor soloist and strings maintain sustained notes or rhythmic patterns which do not detract from the otherwise expected return to triple meter. The third movement follows the second without a pause, and its opening ten measures of $\frac{3}{4}$ meter conclude the symmetry of the structure.

Figure 4.64. Cantata Profana, II, Meter

(a)

(b)

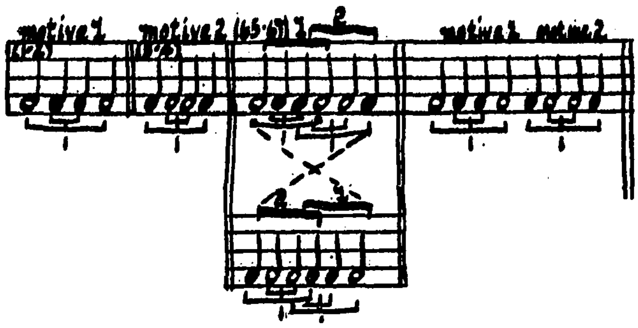


Movement III. Symmetrical structures produced by rhythm in the third movement of the Cantata Profana include many examples of rhythmic motives 1 and 2 heard previously in the first movement. These motives shown in Figure 4.65a appear throughout three musical areas of the third movement: measures 1-11; measures 26-29; and measures 65-73. Measures 1-11 and measures 65-73 encompass elided statements of motive 1 and motive 2 which form the symmetrical structure illustrated in the upper staff of Figure 4.65b. Measures 65-73 encompass three adjacent statements of this symmetrical structure accompanied by elided statements of the reverse order of the two motives. The rhythmic texture thus formed produces the symmetrical structure illustrated in both staffs of Figure 4.65b. In contrast, measures 26-29 contain separated statements of the two motives as illustrated in Figure 4.65c. The pattern thus formed by the elision or separation of rhythmic motives 1 and 2 in the third movement forms the additional symmetrical structure illustrated by visual abstraction in Figure 4.65d.

The only other symmetrical rhythm found in the third movement is the structure shown in Figure 4.65e which is sung by the altos in measures 20-22. This symmetrical rhythm is a variation of rhythmic motive 1 in that it incorporates a centrally positioned statement of the motive expanded by an additional statement of the two inner eighth notes and an additional statement of the quarter note at

Figure 4.65. Cantata Profana, III, Symmetrical Rhythms

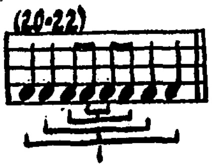
(a) (b) (c)



(d)

(1-11) Elision (26-29) Separation (65-73) Elision

(e)



either end of the rhythm pattern. This rhythm pattern is utilized in imitation throughout measures 20-26.

The pattern formed by the changing meters of the third movement is symmetrical as shown in Figure 4.66. The opening $\frac{3}{4}$ meter of measures 1-34 encompasses the first section of the third movement. The meter changes to $\frac{2}{4}$ in measure 35 and remains constant for the central fugal section of the movement. The concluding section of Movement III begins in $\frac{3}{4}$ meter once again. This meter is broken by a single measure of $\frac{2}{4}$ meter in measure 76, the formal point at which the third section of the movement divides according to the proportions of the Golden Section.

Figure 4.66. <u>Cantata Profana</u>, III, Meter

Section	I	II	III		
Measures	(1)	(35)	(65)	(76)	(77-93)
Meter	$\frac{3}{4}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{2}{4}$	$\frac{3}{4}$

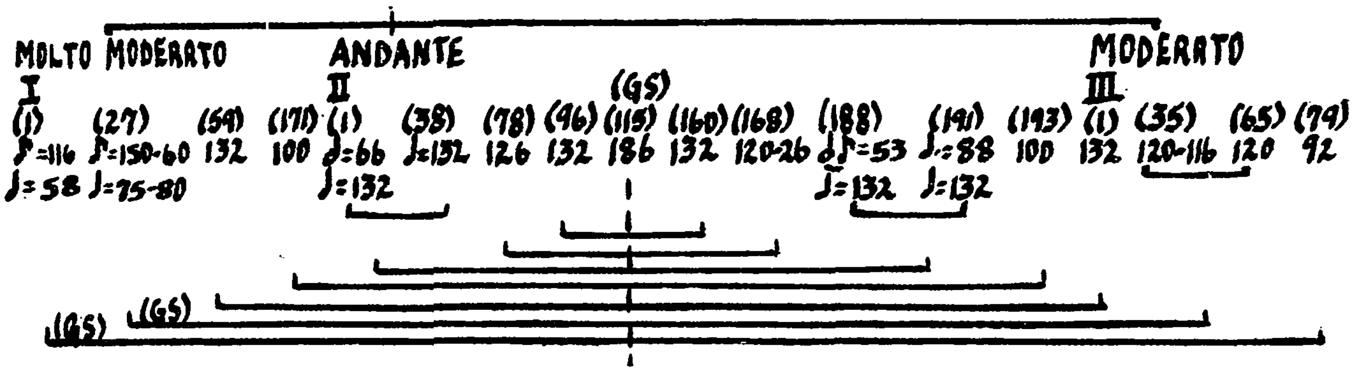
Movements I-III. The symmetrical rhythmic motives shown previously in Figure 4.65a (page 214) are presented in two musical areas of Movement I and in three musical areas of Movement III. These two motives are the exact antithesis of each other, substituting long note values for short and short note values for long. In both musical areas of Movement I, each rhythmic motive is accompanied by its antithesis producing the rhythmic texture illustrated in Figure 4.65b, page 214. In the first two musical areas of Movement III, that pattern is not in evidence, and each rhythmic motive is accompanied by another rhythm pattern or is presented by itself. In the third musical area of the final movement, each of the two rhythmic motives is once again accompanied by its antithesis. The presence or absence of the antithetical accompanying motive in these five sections of the Cantata Profana produces the symmetrical structure diagrammed in Figure 4.67.

Figure 4.67. Cantata Profana, I, III, Rhythmic Texture

Movement	I	III	
Measures	(27-50)(180-87)	(1-11)(26-29)	(65-73)
Accompaniment	Antithesis	Same	Antithesis

In Figure 4.68 the pattern formed by the major tempo markings of the entire Cantata Profana is shown to be symmetrical about the tempo marking of measure 115 of the second movement. This marking (♩=186) indicates the fastest tempo performed throughout the entire three-movement composition and occurs in the measure at which the composition divides itself into the proportions of the Golden Section. On either side of this axis-tempo are found corresponding tempo markings as they are located at various points of musical change or climax throughout the music encompassed by measure 59 of Movement I and measure 34 of Movement III. (See Figure 4.68.) On either side of this symmetrical structure formed by tempo are two additional tempo indications which are not balanced by repetition but rather by the proportions of the Golden Section. Movement I opens with the tempo marking ♪=116. Adjusted for the quarter-note value, the tempo becomes ♩=58. Fifty-eight is the approximate number at which the closing tempo marking of the third movement (♩=92) divides itself into the proportions of the Golden Section. The section of music bounded by measures 27-53 of the first movement is performed at the tempo ♪=150-60. Adjusted for the quarter-note value, the tempo becomes ♩=75-80. Seventy-five is the number at which the tempo marking of measures 65-75 of the third movement (♩=120) divides itself into the proportions of the Golden Section. The complete symmetrical structure thus formed is diagrammed in Figure 4.68.

Figure 4.68. <u>Cantata Profana</u>, I-III, Tempo



Timbre

Movement I. The pattern formed by the instrumentation of each of the three sections of Movement I is shown to be symmetrical in Figure 4.69. The first and final sections of the movement (measures 1-58 and measures 165-89 respectively) utilize woodwinds, horns, percussion, chorus and string instruments. The contrasting middle section (measures 59-164) utilizes the same instrumentation as the first and final sections with the addition of brass instruments. This addition forms the axis of symmetry between the two corresponding instrumentations of the first and final sections of the movement.

Additional symmetrical structures are formed by timbre within the first and final sections of the first movement as shown in Figure 4.70. The first symmetrical structure, shown in Figure 4.70a, encompasses the first section of the movement. Measures 1-26 and measures 34-49 are performed by the complete woodwind section, horns, timpani, and the complete string section. In contrast, measures 27-33 are performed in a strikingly different instrumentation which utilizes only the bassoons of the woodwind section, timpani, and the contrabasses, violoncellos and violas of the string section. This contrasting instrumentation forms the axis of symmetry between the corresponding outer two timbre groups.

A second symmetrical structure is formed in the first section of Movement I by the successive entrances and cessations of the string instruments in measures 1-33. As illustrated in Figure 4.70b, in the first three measures of the movement the string instruments enter successively at the distance of five or six eighth notes. After all five instruments have entered, the second violins and the violas rest in measures 5-14 forming the axis of the symmetrical structure. After the subsequent reentry of these two instruments in measure 15, each of the five string instruments successively ceases to play in the reverse order of its entry.

The final section of Movement I (measures 171-89) encompasses another symmetrical structure formed by timbre as shown in Figure 4.70c. Measures 171-77 utilize the woodwind section, horns, percussion, chorus and string instruments, In measures 178-81 the wind instruments are given rests leaving only the string section, chorus and percussion to play in measures 182-85. In measure 186 the wind instruments return for four measures completing the symmetry of the structure.

Movements II-III. The second movement of the Cantata Profana utilizes five vocal entities: tenor soloist; baritone soloist; eight-part chorus; four-part

Figure 4.69. Cantata Profana, I, Timbre

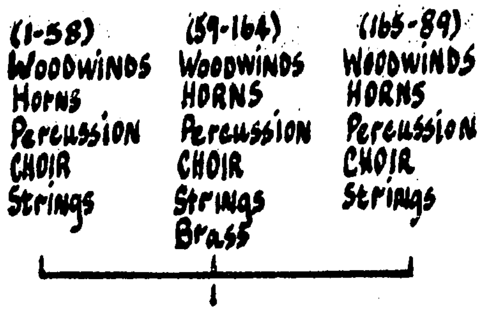
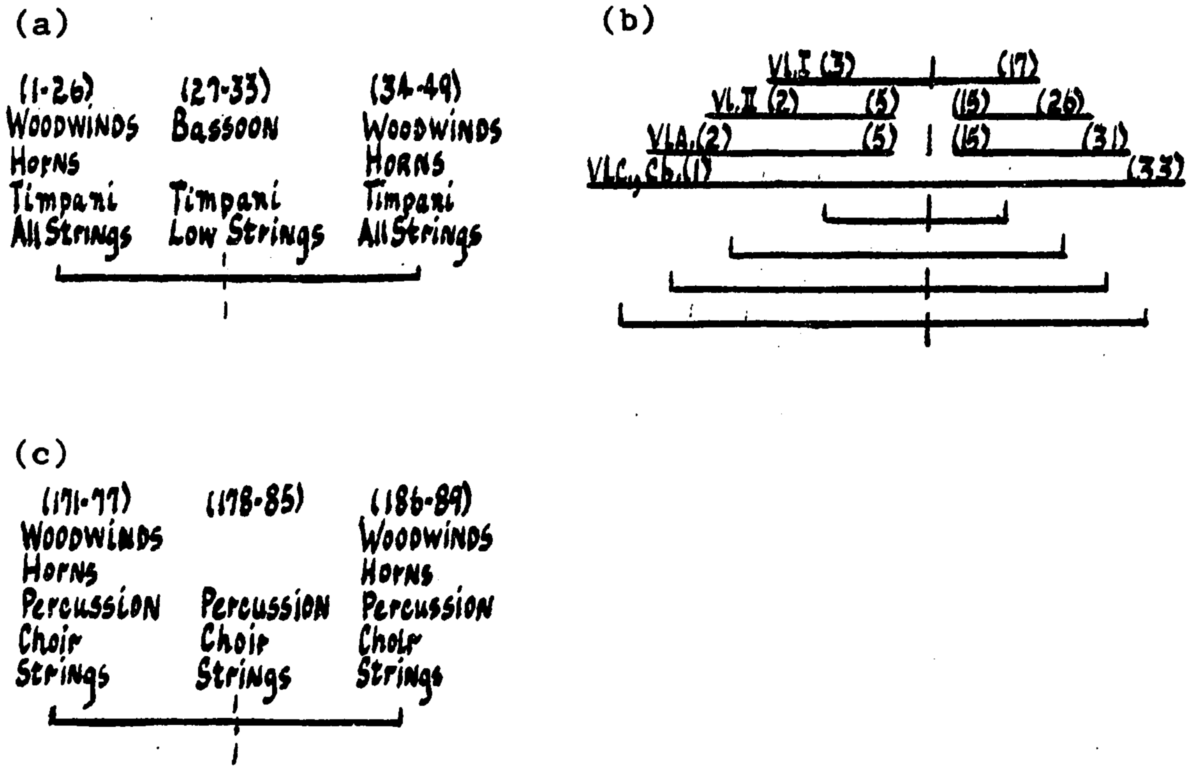


Figure 4.70. Cantata Profana, I, 1-49; 1-33; 171-89, Timbre



chorus; and two-part male chorus. The order in which these five vocal entities are presented produces the symmetrical structure diagrammed in Figure 4.71. The symmetry of this structure is reinforced by the consistent use of characteristic timbres in the accompaniments to the tenor and baritone solos. The tenor solos of measures 42-95 and measures 167-87 are introduced by a pair of harp glissandos and are accompanied by string tremolos and by flute or piccolo obbligatos. The baritone solos of measures 103-11 and measures 115-59 are accompanied by the sustained tones of the low strings and by the somber tones of the clarinet and bass clarinet played for the most part in the lower register. This symmetrical structure formed by timbre is also reinforced by a simultaneous presentation of a symmetrical structure formed by the number of parts encompassed by each vocal entity. This second symmetrical structure is diagrammed in Figure 4.72. Both symmetrical structures are produced about an axis positioned at measure 108 which represents the exact center of the entire second movement. No symmetrical structures are produced by timbre in the third movement of the <u>Cantata Profana</u>.

<u>Texture</u>

<u>Movement I</u>. The first movement of the <u>Cantata Profana</u> encompasses symmetrical structures formed by texture at three different architectonic levels. The first movement as a whole encompasses a large symmetrical

Figure 4.71. <u>Cantata Profana</u>, II, Vocal Entities

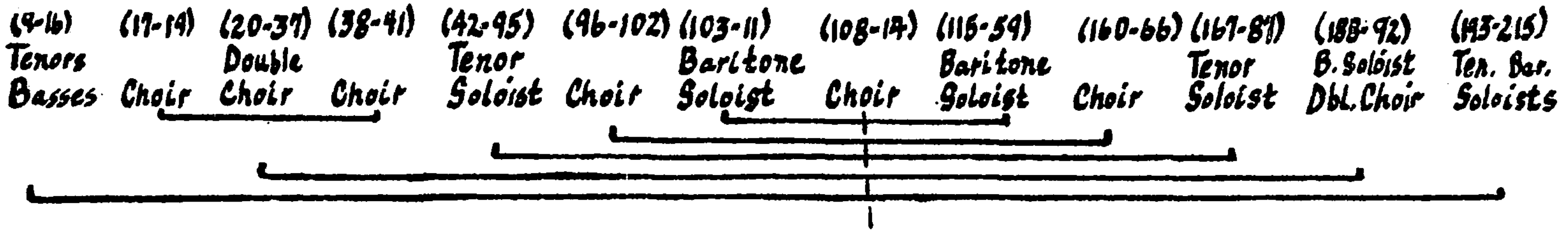
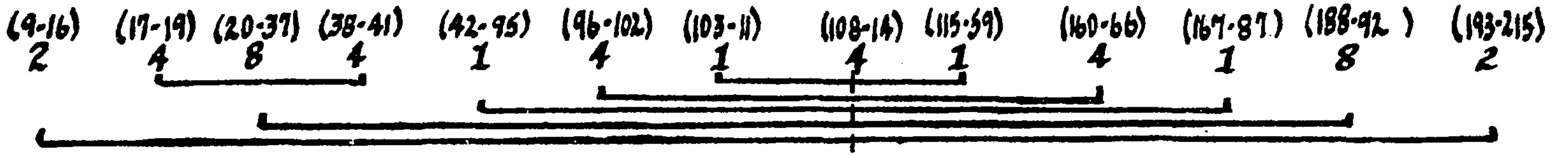


Figure 4.72. <u>Cantata Profana</u>, II, Number of Vocal Parts

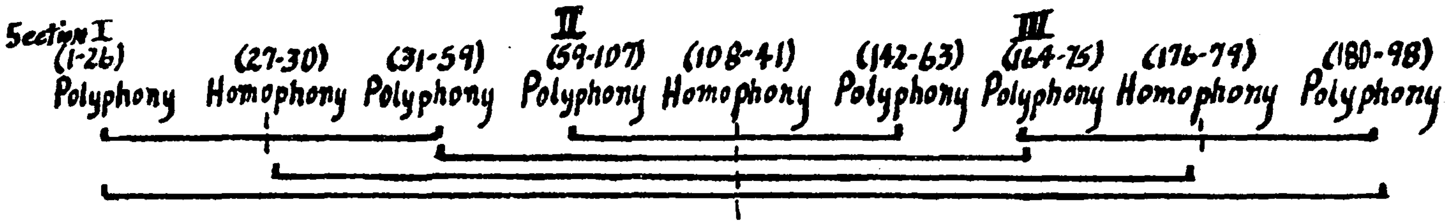


structure formed by texture organization as illustrated in Figure 4.73. As shown in the same figure, the first movement is divided into three sections each encompassing another symmetrical structure formed by texture organization. Finally, each of these three sections encompasses at least one symmetrical texture-set which appears within its opening polyphonic measures.

The first section of Movement I encompasses measures 1-59 and is further subdivided into three subsections according to texture organization. The first subsection (measures 1-26) encompasses an imitative orchestral introduction and two symmetrical texture-sets shown previously in Figures 4.8b and 4.8c, page 156. Measure 27 begins a four-measure subsection which encompasses a two-measure melody and a transposed variation of that melody in homophonic texture. The final subsection encompasses measures 31-59 and presents variations of two previously heard motives in imitative counterpoint completing the symmetry of the structure shown in the first part of Figure 4.73.

As shown in Figure 4.73, the initial subsection of Section II of the first movement is also written in polyphonic texture. Measures 59-73 of this section present an ostinato and a d pedal tone which serve as the accompaniment to the following fugato. The fugato itself encompasses measures 74-100 and is followed by seven measures of imitative counterpoint which utilize the two

Figure 4.73. Cantata Profana, I, Texture Organization



symmetrical texture-sets shown in Figure 4.47. The first texture-set, shown in Figure 4.74a, incorporates the contour of an ascending perfect fifth imitated in contrary motion by the contour of a descending perfect fourth in statements completed first by the upper two voices and subsequently by the lower two voices. The resultant symmetrical structure utilizes two symmetrical wedge-shaped texture-sets which reproduce each other in mirror. The second symmetrical texture-set, shown in Figure 4.74b, is similarly produced by two corresponding wedge-shaped texture-sets presented first by the two inner voices and then by the two outer voices. Shown in Figure 4.73, the axis of the centrally located symmetrical structure encompassing Section II is formed by the relatively homophonic texture of measures 108-41. The latter texture is a product of the following: a single symmetrical harmonic structure stated alternately by the chorus and orchestra; a choral harmonic progression punctuated by an orchestral motive; and a statement of a single harmonic progression stated by both chorus and orchestra. The middle section of Movement I closes with twenty-two measures of canon and imitative counterpoint completing the symmetry of the structure.

The closing section of Movement I begins with the symmetrical texture-set diagrammed in Figure 4.75. In measures 164-70 the chorus sings the symmetrical melody shown in Figure 4.17a, page 160, and a variation of the same melody presented in contrary motion. The melodic contours

Figure 4.74. Cantata Profana, I, 101-105, Chorus

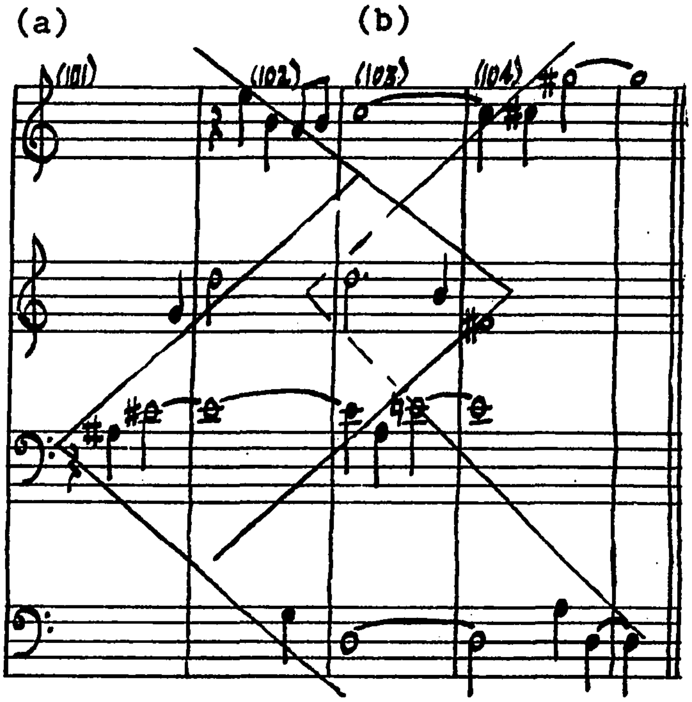
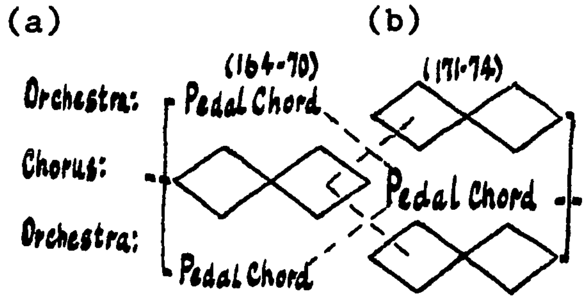


Figure 4.75. Cantata Profana, I, 164-74, Texture



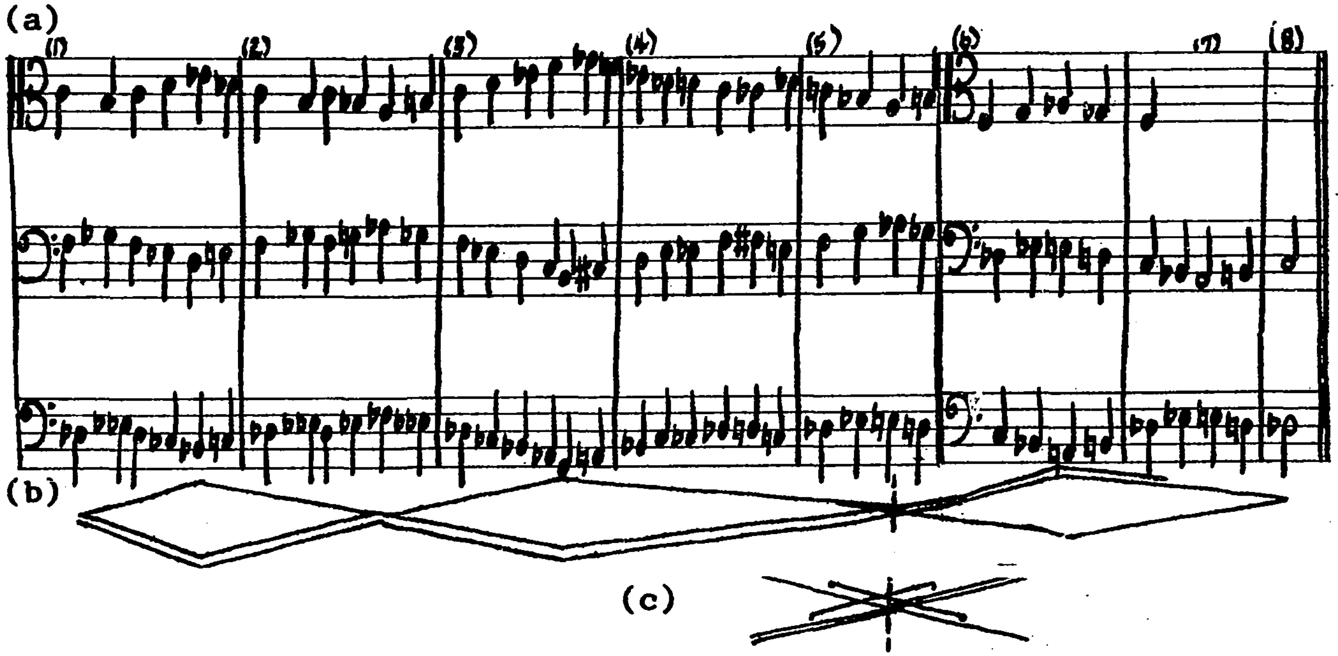
of these two melodies are illustrated graphically in Figure 4.75a. The range of the accompanying orchestral pedal chord of the same measures encompasses the range of the combined choral melodies and extends above and below it. In measures 171-74 the texture is inverted so that the chorus states a pedal chord while the orchestra plays variations of the two previous melodies. Once again the range of the orchestral parts encompasses the range of the choral parts and extends above and below it. Thus, each half of the complete texture-set is symmetrical as shown in Figure 4.75. In addition, the technique of texture inversion creates two more texture-sets which produce symmetry throughout the eleven measures diagrammed in the figure. The polyphonic texture of the first subsection of Section III is extended through measure 175. As shown in Figure 4.73, the axis of the symmetrical structure provided by texture organization in this section is formed by the homophonic texture of the four-measure subsection which follows in measures 176-79. Here the homophonic texture is a product of a choral melody and a chordal orchestral accompaniment. The concluding nineteen-measure subsection of Movement I is presented in imitative polyphonic texture completing the symmetry of the structure.

Movement II. The nine sections of Movement II of the Cantata Profana are written alternately in polyphonic and homophonic texture. This alternation of texture organization creates the symmetrical structure shown in Figure 4.76. The opening five measures of the second movement, shown in Figure 4.77, encompass three melodies: the first melody is played by the contrabasses and violoncellos; the second melody doubles the first melody a major third higher; the third melody reproduces the lower two melodies in mirror. The technique of mirror creates the symmetrical texture-set graphically diagrammed in Figure 4.77b. In measures 6-8, the first cellos cease to double the contrabass melody and begin mirroring it at the interval of a major third below the viola melody. The resultant texture inversion produces an additional aspect of symmetry which is graphically illustrated in Figure 4.77c. The following twenty-nine measures of the first section of Movement II are sung in canon and imitative counterpoint by the two choruses.

As shown in Figure 4.76, the opening polyphonic texture of Movement II is balanced by the polyphonic texture of the final two sections of the movement. Section VIII encompasses measures 188-92 and begins with the wedge-shaped texture-set shown in Figure 4.78. This symmetrical texture-set is similar in construction to the wedge-shaped texture-sets previously heard in measures 17-25 of Movement I (see page 156). The texture-set of measures 188-90 begins with a cluster chord comprising the notes <u>e</u>, <u>d</u> and <u>c</u> as sung by the altos of Choir II and the tenors of both choirs. In each of the three successive measures, two notes are added to the

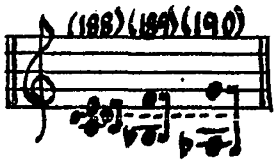
Figure 4.76. <u>Cantata Profana</u>, II, Texture Organization

Figure 4.77. <u>Cantata Profana</u>, II, 1-8, Texture



cluster chord, one above and one below the notes already sounding. Once a note has been added, it is sustained throughout the three measures. The polyphonic texture of Section VIII continues in Section IX of the second movement. This final section encompasses measures 183-215 and comprises a polyphonic duet sung by the tenor and baritone soloists.

Figure 4.78. Cantata Profana, II, 188-90, Chorus



As shown in Figure 4.76, Section II of the second movement reveals a change of texture organization from polyphony to homophony. This section consists of a choral melody sung for the most part in parallel thirds accompanied by the lower strings and punctuated by the violins and wind instruments. The homophonic texture is continued through Section III of the movement which comprises a tenor solo with instrumental accompaniment. The homophonic texture of Sections II and III is balanced by the homophonic texture of Section VII which also comprises a tenor solo with instrumental accompaniment.

Sections IV and VI of the second movement comprise similar phrases sung by the choruses in polyphonic texture (see pages 177-79). Section IV is sung in imitative counterpoint, while Section VI comprises a soprano melody doubled by the altos in parallel thirds and a contrasting tenor melody doubled by the basses in parallel thirds. Section V is divided into three subsections according to texture organization. Measures 103-07 and measures 115-59 of Section V are written in homophonic texture produced by a baritone solo with chordal accompaniment. Measures 108-14 of Section V serve as the axis of symmetry for the entire structure diagrammed in Figure 4.76 (see page 230). These measures written in polyphonic texture comprise a previously heard melody stated in imitative counterpoint by the choir.

Movement III. The final movement of the Cantata Profana produces a symmetrical structure formed by texture as shown in Figure 4.79. As shown in the same figure, the third movement is divided into three section. The first section of Movement III encompasses measures 1-34 and is further divided into three subsections according to texture organization. The first subsection (measures 1-10) encompasses a choral melody presented in homophonic texture. The second subsection (measures 11-25) encompasses two motives presented in imitative counterpoint. The third subsection (measures 26-34) presents two additional motives in homophonic texture completing the symmetry of the structure.

The second section of Movement III encompasses four symmetrical texture-sets in adjacent positions presented in measures 35-57. Each of the four texture-sets comprises a vocal melody and an accompanying melodic line played by the violoncellos and contrabasses. As shown in the example given in Figure 4.80a, the vocal melody repeats a single note several times before outlining the interval of a descending major second. The accompanying string melody reproduces the interval of a major second in mirror. The resultant symmetrical texture-set is diagrammed graphically in Figure 4.80b and is maintained, despite slight variations in the vocal melody, throughout the successive entries of the two melodies. Each of these entries is transposed a perfect fourth higher, and each vocal melody is repeated throughout the successive entries. The polyphonic texture of the second section of Movement III is continued through measure 64 with the presentation of still another motive in imitative counterpoint.

The final section of the third movement begins with a statement of the opening melody of the movement presented again in homophonic texture. In addition, the final section comprises a sixteen-measure codetta which alternates a D major triad with an A minor-minor seventh chord. The homophonic texture of this final section completes the symmetry of the structure shown in Figure 4.79.

Figure 4.79. Cantata Profana, III, Texture Organization

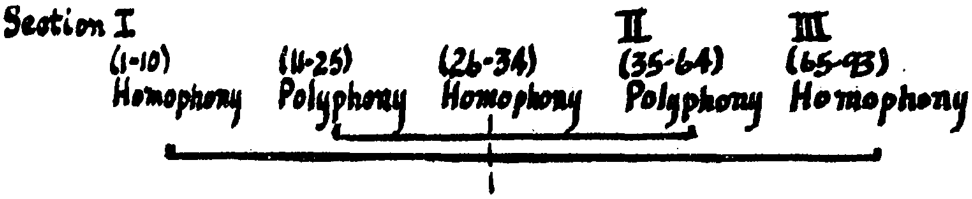


Figure 4.80. Cantata Profana, III, 35-40, Bass, Vlc.

(a)

(b)

Dynamics

Movement I. The first movement of the Cantata Profana is divided into three formal sections. The general dynamic levels of these three sections produce a simple alternating pattern shown to be symmetrical in Figure 4.81a. In addition, the pattern formed by the general dynamic indications of the first section of Movement I is shown to be symmetrical in Figure 4.81b. In this figure the initial "piano" indication is utilized for the instrumental introduction (measures 1-16) and for the following choral section (measures 17-26). Throughout measures 27-37, a "mezzo forte" indication is utilized followed by twelve measures performed at a "forte" dynamic level which serve as the climax of the first section. Measures 50-53 produce an effective decrescendo by thinning the texture as well as by changing the dynamic indication. The final four measures of the first section of Movement I return to the initial "piano" dynamic marking of the opening measures completing the symmetry of the structure.

Movement II. The general dynamic levels of the second movement create the pattern shown in Figure 4.82. This pattern contains an interior symmetrical structure encompassing measures 43-192. The symmetrical structure begins with the tenor solo of measures 43-89 which produces a crescendo from a "piano" dynamic level to the "fortissimo" dynamic level of measures 78-89. The final five measures of

Figure 4.81. Cantata Profana, I, Dynamics

(a)

(b)

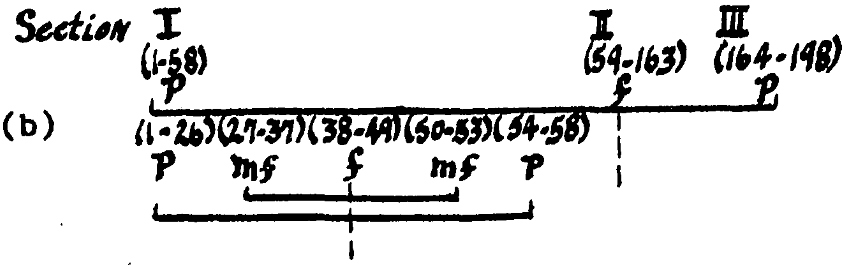
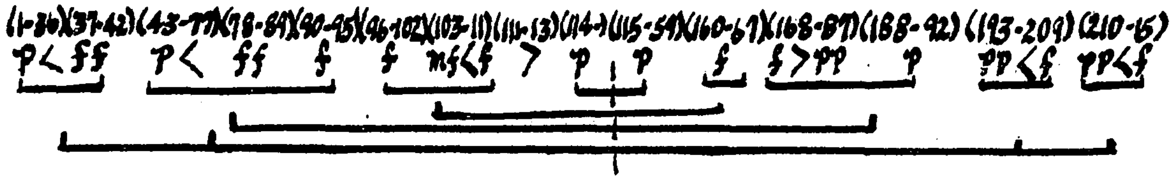


Figure 4.82. Cantata Profana, II, Dynamics



the solo return to the dynamic marking "forte" which remains fairly constant throughout the following choral section (measures 96-102) and the baritone solo (measures 103-11). Measures 111-14 present a diminuendo leading to the "piano" dynamic indication of the following baritone solo encompassing measures 115-59. In measures 160-92 the above pattern of dynamics reproduces itself in retrograde order beginning with the "forte" dynamic indication of the choral section of measures 160-67. This "forte" dynamic level corresponds to the same dynamic indication utilized for the previous choral section of measures 96-102. Likewise, the decrescendo of the tenor solo (measures 168-87) corresponds to the opposing crescendo of the previous tenor solo (measures 43-89). Measures 188-92 sung by the baritone soloist and chorus prolong the concluding "piano" dynamic indication which completes the symmetry of the interior structure. This entire symmetrical structure is framed by three dynamic crescendos from "pianissimo" to "forte" (or "piano" to "fortissimo"). The first such crescendo is located in the opening forty-two measures of the movement which are sung entirely by the chorus. The other two crescendo patterns are located in the final twenty-three measures of the movement and are sung by the tenor and baritone soloists in measures 193-209 and by the tenor soloist in measures 210-15. Even though the crescendo patterns do not reproduce each other in retrograde order, they nevertheless frame the symmetry of the structure.

Movement III. Like the first movement of the Cantata Profana, the third movement is divided into three formal sections. Sections I and II of this movement produce identical symmetrical patterns of dynamic levels as shown in Figure 4.83a. In both sections the initial dynamic level is "piano" followed by a crescendo to a "forte" dynamic marking and a subsequent decrescendo to "piano." The third section of the final movement produces a similar symmetrical pattern of dynamics. This section begins with an initial "piano" dynamic level which is maintained throughout the section by the choruses. In measures 72-83 the tenor soloist is added at a "forte" dynamic level which produces a symmetrical pattern of dynamics similar to the patterns established in the preceding two sections. The alternation of dynamic markings in each of the three sections produces an additional symmetrical structure formed by dynamics which encompasses the entire third movement as shown in Figure 4.83b.

Structure

Movement I. Each of the three sections of Movement I of the Cantata Profana encompasses a symmetrical pattern formed by structure as shown in Figure 4.84. Section I of the movement encompasses measures 1-59 and begins with the wedge-shaped symmetrical melody shown in Figure 4.16, page 160. This melody is followed by wedge-shaped texture-sets in measures 17-21 and measures 22-26.

Figure 4.83. Cantata Profana, III, Dynamics

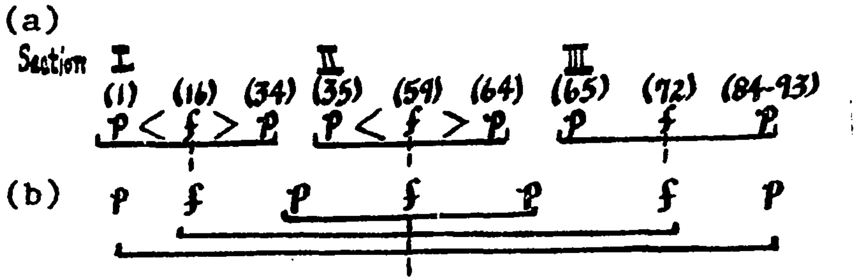
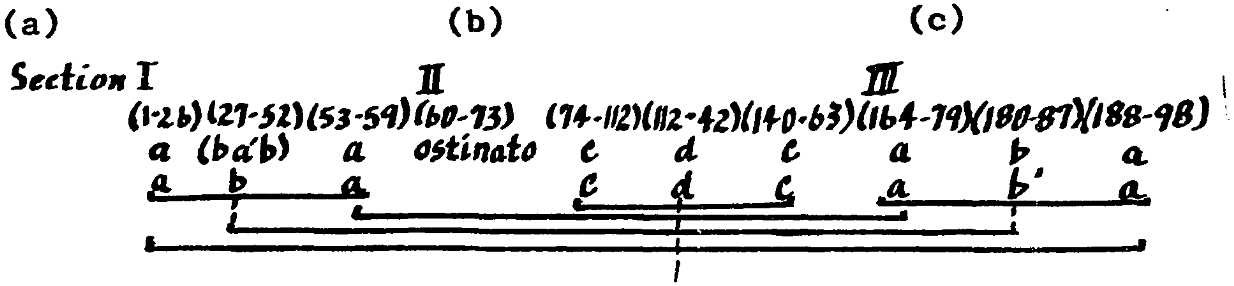


Figure 4.84. Cantata Profana, I, Structure



These two symmetrical structures and their component cells constitute the smaller subsection labeled "a" as shown in Figure 4.84a. The second subsection spans measures 27-52 and encompasses a simple alternation of a new melody (labeled "b" in the figure) and a shortened version of the wedge-shaped melody of measures 1-3 (labeled "a'" in the figure. The third subsection of Section I includes four imitative statements of motive "a" sung by the chorus in measures 53-59. The resulting symmetrical pattern formed by the structure of the first section of Movement I is diagrammed in the lower portion of Figure 4.84a.

The second section of Movement I is predominantly fugal in nature. This section begins in measure 60 with the ostinato pattern which accompanies the following fugue subject. The fugue subject itself is introduced in measures 74-78 as shown in Figure 4.23a, page 165. The subject (labeled "c" in Figure 4.84b) is stated in polyphonic texture throughout measures 74-111 with a new melodic idea presented in homophonic texture in measures 112-42. This second melodic idea (labeled "d" in Figure 4.84b) outlines a minor triad. The fugue subject returns in polyphonic texture in measures 140-63. The simple alternation of the fugue subject with the contrasting triadic melody produces the symmetrical pattern diagrammed in the lower portion of Figure 4.84b.

Section III of the first movement restates melodic ideas from Section I in still another alternating pattern shown in Figure 4.84c. The opening melodic idea of this section constitutes a variation of the wedge-shaped melody of measures 1-3 and is therefore labeled "a" in the figure. The melody labeled "b'" is an augmented version of the original rhythm pattern of motive "b." The final subsection of Movement I is labeled "a" in the figure and utilizes two motives from measures 1-26 of Section I. In measures 188-98 of Section III the motive of measures 5-9 (see Figure 4.10b, page 156) is repeated over a descending whole-tone motive taken from measures 16-17 (see Figure 4.13, page 158). The complete symmetrical pattern formed by the structure of Section III is diagrammed in the lower portion of Figure 4.84c.

The structure of the entire first movement also produces a symmetrical pattern as shown in the lower brackets of Figure 4.84. This pattern is produced by the simple alternation of two ideas in Sections I and II with the alternating pattern of Section I restated in the concluding third section.

Movement II. The nine sections of Movement II are paired by vocal arrangement and motivic derivation in such a way as to produce the symmetrical structure diagrammed in Figure 4.85. In this figure motives derived from Movement I are labeled with the same letter used to label the generating material in Figure 4.84. The opening section of the second movement encompasses measures 1-37 and includes two subsections. The first subsection presents motives from the fugue subject of Movement I in the instrumental introduction of measures 1-8 and in the melodies sung by the tenors and basses of Choir I in measures 9-16. Measures 17-37 encompass the second subsection of Section I and include additional statements of motives taken from the same fugue subject as they are sung by both choirs. Section I is complemented by Section IX, the final section of the movement, which also presents motives from the fugue subject in the tenor and baritone solos of measures 193-215. Sections II and VIII are similarly paired in that they both contain choral statements of motives drawn from measures 1-26 of the first movement. The motive of measures 38-41 outlines the wedge-shaped melody of the opening measures of Movement I. The motives of measures 188-92 reproduce the wedge-shaped texture-sets of measures 17-26 and the opening melody of the first movement as it is sung in variation by the baritone soloist. Sections III and VII are similar in that they both present motives from the fugue subject of Movement I which are sung by the tenor soloist. Sections IV and VI are shown to be similar in that they both encompass choral variations of the opening melody of Movement I. Section V serves as the axis of the symmetrical structure. This section comprises three subsections which form interior symmetry as shown in Figure 4.85. Subsection I encompasses a melody clearly derived from the fugue subject of Movement I as it is sung by the baritone soloist in

Figure 4.85. Cantata Profana, II, Structure

measures 103-11 of Movement II. In measures 108-14, the soloist is joined by the chorus which presents a shortened version of the same motive in imitation. In measures 115-59 the baritone soloist returns to complete the internal symmetry of Section V.

Movement III. The third movement of the Cantata Profana produces a symmetrical pattern formed by structure as shown in Figure 4.86. In this figure, motives derived from Movements I or II are labeled with the same letter used to label the generating material in the two preceding figures. As shown in Figure 4.86, the third movement is divided into three sections. The first and final sections are related in that Section I begins with the consecutive melodies labeled "b" and "a" which are presented in the same order in the final section of the movement. The similarity of the two outer sections is reinforced by the interpolation of two sections utilizing movive "c" between them. The first of the two interior sections encompasses measures 20-34 and comprises a simple alternation of motive "c" with motive "b." The second of the interior sections if fugal in nature and utilizes as its subject a motive derived from the final tenor solo of the second movement. Since the generating tenor solo is labeled "c" in the preceding figure (measures 193-215), the fugue subject of Section II of the final movement is similarly labeled "c" in Figure 4.86.

Figure 4.86. Cantata Profana, III, Structure

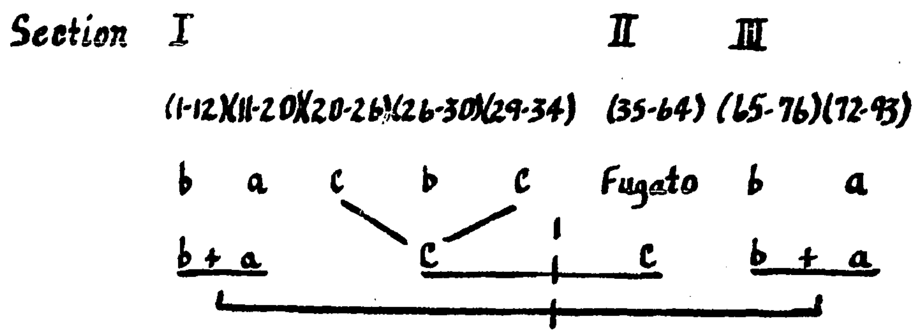
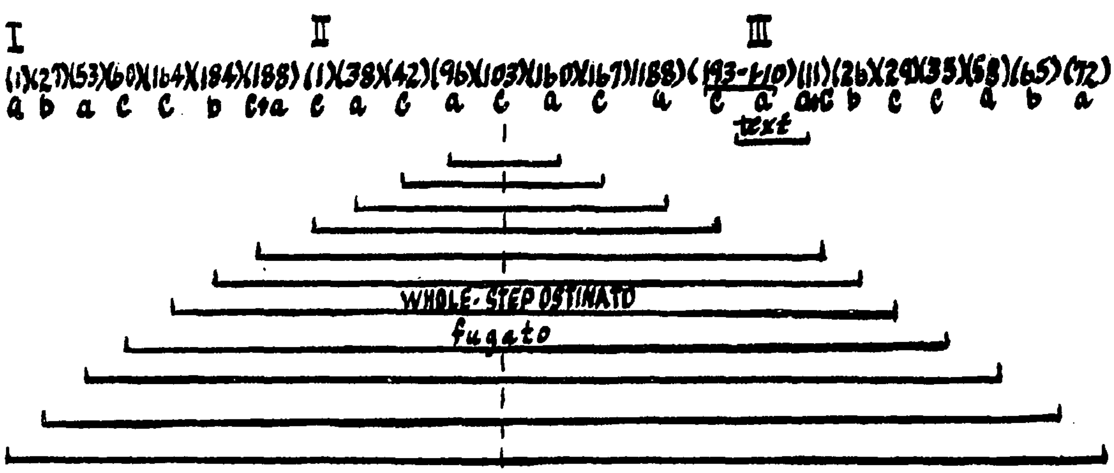


Figure 4.87. Cantata Profana, I-III, Structure



Movements I-III. The structure of the entire Cantata Profana forms the symmetrical pattern diagrammed in Figure 4.87. The subsections bounded by measures 1 and 26 in Movement I and by measures 72 and 93 in Movement III correspond in that they utilize the inversive scales shown in Figure 4.54a, page 197. Measures 27-52 of Movement I correspond to measures 65-76 of Movement III in that both subsections utilize similar ascending scalar motives. The fugato sections of Movements I and III correspond in motivic derivation as well as in texture and character. The accompaniments of measures 164-84 of Movement I and measures 29-34 of Movement III correspond in their utilization of a whole-step ostinato pattern. In addition, measures 176-84 of Movement I are related to measures 29-34 of Movement III in that both subsections utilize motive "c." The subsections bounded by measures 184-87 of Movement I and measures 26-30 of Movement III are related in their use of a common motive labeled "b." The subsections bounded by measures 188-98 of Movement I and measures 1-26 of Movement III utilize both motives "a" and "c." In measures 20-26 of Movement III, motive "c" is accompanied by the whole-tone pattern associated with motive "a" in measure 4 of Movement I. The identical whole-tone pattern is utilized in measures 188-98 of Movement I in the accompaniment of two motives also derived from the first few measures of Movement I. These motives are connected in such a way as to simulate the melodic contour of part of motive "c" found in measures 20-26 of Movement III. The presence of motives derived from motive "a" in measures 188-98 of Movement I and in measures 11-20 of Movement III, in addition to the presence of the original text of motive "a" in measures 1-10 of the third movement, further links the two musical areas.

The interior portion of the symmetrical structure shown in Figure 4.87 is formed by the structural symmetry of Movement II previously discussed on pages 242-44. The final section of the second movement (measures 193-215) is joined to the first ten measures of the third movement by three factors. First, the two movements are performed without a pause between them. Second, the tenor solo of the final six measures of Movement II continues through the first four measures of Movement III. Third, the symmetrical structure formed by the meter pattern of the final section of the second movement is completed in the first ten measures of the third movement as shown previously in Figure 4.64b, page 212.

An alternative analysis of the structure of the entire Cantata Profana is explained as follows: The "a" text of measures 1-10 of Movement III is stated in conjunction with motive "b." The singular sound of motive "b" is strong enough to cause a structural division between Movements II and III. Thus, measures 1-10 of the third movement function as the axis of a large symmetrical structure encompassing Movements I and III. The resultant symmetrical pattern formed by the structure of the entire composition actually comprises two independently symmetrical patterns: the first pattern encompasses Movements I and

III; the second structure encompasses Movement II and is interpolated between the two halves of the first pattern.

Coincidence of Symmetrical Structures with Architectonic Levels

In the Cantata Profana symmetrical structures are found which encompass areas of music ranging in length from a span less than one measure long to the length of the entire three-movement composition. Areas of music encompassed by symmetrical structures are grouped by length into six architectonic levels. Level I encompasses three or fewer measures and may include the following structural components: cell; figure; motive; semi-phrase. Level II encompasses three to seven measures and may include the structural component, phrase. Level III encompasses six to sixteen measures and may include the structural component, phrase group. Level IV encompasses sixteen or more measures with a maximum length equal to one less than the total number of measures contained in one movement. Level Va encompasses an entire movement, and Level Vb encompasses two consecutive movements. Level VI encompasses an entire multi-movement composition.

In Tables 4.1-4.7 (pages 256-68) each symmetrical structure is recorded by movement number and measure numbers for the architectonic level at which it appears. Instances of symmetry not discussed in the text are listed by measure numbers with those of a figure displaying a similar type of symmetry. In evaluating the data drawn from these tables, it is important to keep in mind the fact that the number of symmetrical structures possible within an architectonic level decreases as the number of measures encompassed by an architectonic level increases (see page 16). It is therefore impossible to draw conclusions between frequency tabulations made for different architectonic levels without reference to the fluctuating number of possible occurrences inherent in the definition of each level. Since the number of possible occurrences of symmetry cannot be estimated, the greatest frequency with which symmetry is produced by one parametric division of symmetrical structures within the architectonic level serves as a reference number.

Table 4.8 (page 269) presents the frequency tabulation for each parametric division and subdivision of symmetry at each architectonic level of structure. From this table additional information about the use of symmetrical structures in the Cantata Profana may be drawn. First, symmetrical structures formed by the parameter of pitch are the most important in terms of total frequency of occurrence. Symmetrical structures formed by pitch account for over half of the total instances of symmetry in the entire composition. In addition, at Architectonic Levels I, II and III symmetrical structures formed by pitch occur with a greater frequency than those formed by any other parametric division of symmetry. Of the symmetrical structures formed by parametric subdivisions of pitch, those formed by melody occur with greater frequency than those formed by any other subdivision of pitch. At Levels IV and VI, symmetrical structures formed by scale basis and tonality occur with greater frequency than those formed by melody or harmony. No symmetrical structures formed by the parameter of pitch encompass Architectonic Level V of the composition.

Symmetrical structures formed by the parameter of duration occur with the second greatest frequency. Compared to the frequency of occurrence of symmetrical structures formed by the other subdivisions of duration, structures formed by rhythm appear with greater frequency at Architectonic Levels I and II. At Levels IV and V, structures formed by meter appear with equal or greater frequency than those formed by any other subdivision of duration. At Levels V and VI, symmetrical structures formed by tempo appear with equal or greater frequency than those formed by any other subdivision of the parameter of duration. Next in decreasing order of total frequency tabulations after those of the symmetrical patterns formed by pitch and duration are those formed by texture, dynamics, text, structure and timbre.

Symmetrical patterns formed by pitch, duration and texture occur at five of the six architectonic levels of structure. Thus, symmetry formed by these parameters is considered to be more pervasive than symmetry formed by the other parameters of music. Next in decreasing order of total pervasiveness are symmetrical structures formed by dynamics, text and structure. Symmetrical patterns formed by timbre are the least pervasive of the seven parametric divisions of symmetry.

By comparing the actual frequency of occurrence of each parametric division of symmetry as tabulated for each of the six architectonic levels to the possible frequency of occurrence in each of the architectonic levels, some idea of the appropriateness of each division of symmetry to either the larger or the smaller architectonic levels may be gained. For instance, symmetrical patterns formed by texture, dynamics, text, timbre and structure occur with comparatively greater frequency at the larger architectonic levels of design (IV-VI) than at the smaller levels (I-III). In contrast, symmetrical structures formed by pitch and duration occur with comparatively greater frequency at the smaller architectonic levels of structure (I-III) than at the larger levels (IV-VI). Similarly, within the parameter of duration, symmetrical structures formed by the subdivisions of meter, tempo and temporal span occur with comparatively greater frequency at the larger architectonic levels of design (IV-VI).

Summary

The Cantata Profana exhibits profuse examples of symmetry formed by text, pitch, duration, timbre, texture, dynamics and structure. Symmetry is produced by the following elements of text: types of actions portrayed;

numbers of actions portrayed; internal structure. Symmetrical structures are produced by the following elements of the parameter of pitch: scale basis; melody; harmony; and tonality. Symmetrical scale bases include the dorian mode, the whole-tone scale, the chromatic scale, the second mode of the overtone scale, the alternating scale as well as various other scales formed by the retrogradation of an interval pattern or by the technique of mirror. Symmetry is also produced by the retrogradation of a pattern of modes and by the utilization of two scales in a mirror relationship to one another. Symmetrical melodies are created by the retrogradation of a pitch pattern or an interval pattern, the alternation of two intervals, the repetition of one interval, and the technique of mirror. Symmetrical melodies are also created by the simple alternation of symmetry with asymmetry. Individual symmetrical harmonies include uni-intervallic structures such as the quartal chord, the quintal chord, the diminished triad, the diminished seventh chord, the augmented triad and the whole-tone chord. Symmetrical tertian structures include the minor-minor seventh chord, the major-major seventh chord, the major ninth chord, the perfect eleventh chord, and the augmented eleventh chord. Additional symmetrical harmonies are produced by the retrogradation of an interval pattern or by the accumulation of sound through imitation. Symmetrical harmonic progressions are produced by the retrogradation of a pattern of chords or chord qualities. Symmetrical tonal patterns are produced by the techniques of mirror and retrogradation as well as by the correspondence of intervals between different tonal centers.

Symmetrical structures are produced by the following elements of the parameter of duration: rhythm; meter; tempo; and temporal span. Symmetrical structures formed by rhythm include the short-long-long-short pattern and the short-long-short pattern with their respective antithetical rhythm patterns as well as other rhythms produced by retrogradation. An additional symmetrical structure is produced by the alternation of elided rhythm patterns with separated rhythm patterns. Symmetrical metric structures are produced by the retrogradation of a pattern of macro-meters as well as by the alternation of simple micro-meters. Symmetrical structures formed by tempo are produced by the correspondence of tempo descriptions and by the retro-gradation of a pattern of actual tempo indications. Finally, symmetrical structures are formed by the correspondence of temporal spans.

Additional symmetry is formed by the parameters of timbre, texture, dynamics and structure. Symmetrical patterns formed by timbre are produced by the alternation of timbre groups, the correspondence of entrances and cessations of various instruments, and the correspondence of various vocal entities. Symmetrical patterns formed by texture are produced by the correspondence of the number of concurrently sounding constituents and by the correspondence of texture organization. Symmetrical texture-sets are produced primarily by the techniques of mirror and texture inversion. Symmetrical structures formed by dynamics are produced by patterns of crescendo and subsequent decrescendo, the alternation of two dynamic levels, and by the retrogradation of a pattern of dynamic levels. Symmetrical patterns formed by structure are produced by simple repetitive ternary patterns, by the alternation of ternary patterns, and by the alternation of two motivic ideas.

Symmetrical structures permeate the Cantata Profana at all six architectonic levels of design. Symmetrical structures formed by pitch are the most important in terms of total frequency of occurrence. Of the symmetrical structures formed by parametric subdivisions of pitch, those formed by melody occur with greater frequency than those formed by any other subdivision of pitch. At the larger levels of design, symmetrical structures formed by scale basis and tonality occur with greater frequency than those formed by melody or harmony. At the smaller levels, symmetrical structures formed by melody, harmony and scale basis appear with greater frequency. Symmetrical structures formed by the parameter of duration occur with the second greatest frequency tabulation. Compared to the other parametric subdivisions of duration, symmetrical structures formed by rhythm appear with greater frequency at the lower architectonic levels, while symmetrical structures formed by meter and tempo occur with greater frequency at the larger levels of design. Next in decreasing order of total frequency tabulations after those of symmetrical patterns formed by pitch and duration are tabulations of symmetry formed by texture, dynamics, text, structure and timbre. In decreasing order of total pervasiveness are symmetrical structures formed by pitch, duration and texture; dynamics; text and structure; and timbre.

Table 4.1a. Coincidence of Symmetrical Scale Bases with Architectonic Levels

Figure Numbers	Architectonic Levels: I	II	III	IV	V	VI
Mvt. I						
4.8	(9-11)(11)(28)(42-43)	(17-21)(22-26)(53-59)				
4.10	(6)					
4.11	(10-11)					
4.12	(186-87)					
4.13	(15-16)(16-17)					
4.14	(172-74)	(164-67)(168-71)				
4.15				(29-50)		
Mvt. II						
4.32	(134-36)		(9-16)(17-28)			
4.33	(213-15)	(144-49)	(168-75)(193-208)(43-57)			
4.34	(28-30)(29-31)(30-32)(31-33) (32-34)					
4.35		(38-41)(98-102)(160-66)				
4.36			(74-81)			
4.37			(1-8)			
4.8	(41-42)					
Mvt. III						
4.45			(65-73)			
4.46		(58-63)				
4.47			(78-86)			
Mvt. I-III						
4.54						I(1)-III(93)

Table 4.1b. Coincidence of Symmetrical Melodies with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
4.16	(1-3)(2-4)(2-5)					
4.17	(164-66)(171-72)(172-73) (173-74)(174-75)					
4.18	(1-4)(2-4)(3-4)					
4.19	(7-9)					
4.20			(188-97)			
4.21	(15-17)(65-66)(66-67)(68)(69) (70)(71)(72)(73)(74)(75)(74-76) (77)(78)(79)(80)(81)(82)(83)(85) (86)(87)(88)(89)(90)(91)(92)(93) (94)(95)(96)(97)(98)(99)(154-55) (156)(157)(158)(159)(160)(160-61) (161)(162)(162-63)(182)					
4.22	(32-33)(33-34)(47-48)(48-49)(49) (50)(51)(52)					
4.23	(89-90)(92-93)(95-96)(132-34) (141-42)(142-43)(143-44)(144-45) (145-46)(146-47)(147)(147-48)(148)	(74-78)(78-82)(82-86)(85-89)				
4.24	(178-79)(180-82)(182-84)(184-86) (185)(186)(187)(196-98)					
Mvt. II						
4.37	(1-2)(2-3)(3-4)(4)(5)(5-7)(7-8)					
4.38	(38-40)(40)(103)(104)(123-25) (125-27)(127-30)(183-85)(205-7) (210-11)	(84-89)(86-89)(92-95)				
4.39	(169)(170)	(78-84)(80-83)(90-96)	(78-95)			
4.40	(140-41)(144-46)(146-48)(148-49)	(64-70				
Mvt. III						
4.48	(15-16)(19-20)(20-21)(21-22)(22-23) (23-24)(24-25)(26-27)(28-29)(30-31) (31-32)(31)	(16-19)(26-30)(29-34)				
4.49	(14-16)(16-18)(17-19)(18-20)	(11-14)(12-15)(13-15) (47-52)				

Table 4.1c. Coincidence of Symmetrical Structures Formed by Harmony with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
4.25	(16)(30)(49)(50)(51)(87)(88)(89)(90)(91)(92)(93)((4)(96)(97)(98)(99)(100)(119)(120)(121)(122)(123)(124)(125)(131)(198)	(182-87)	(60-73)(74-86)(154-63)			
4.26	(52-53)(53)(54)(55)(124-26)	(158-64)				
4.27	(16)(188)(190)(192)(194)(196)					
4.28	(15)(27)(27)(28)(29)(30)(31)(35)(36)(40)(42)(44)(45)(49)(112-13)(115)(117-18)(118)(122)(123)(126-27)(128-29)(130)	(17-21)(22-26)	(104-12)			
4.29	(49)(57-58)(95)(97)(164)(165-66)(167-68)(168-70)(184)(185)(186)(187)					
4.30	(164-66)					
Mvt. II						
4.41	(12)(19-20)(112-14)(163)(164)(186)(209-10)(214-15)					
4.42	(11)(51)(66)(77)					
4.43	(53)(129-30)(132-33)(151-53)(154-56)(157-59)					
4.44	(174-76)(178)(180)					
Mvt. III						
4.50	(1-4)					
4.51	(26)		(41-55)			
4.52		(58-63)				
4.53	(5)(8)(12)(27-29)(32-34)					

Table 4.1d. Coincidence of Symmetrical Structures Formed by Tonality with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I 4.31				(1-59)(103-54)(165-98)		
Mvt. II 4.39			(78-95)			
Mvt. I-III 4.55						I-III

Table 4.2a. Coincidence of Symmetrical Rhythms with Architectonic Levels

Figure Numbers	Architectonic Levels: I	II	III	IV	V	VI
Mvt. I						
4.56	(27)(28)(29)(29-30)(30)(31)(32) (33)(33-34)(35)(36)(37)(38)(39) (40)(41)(42)(43)(44)(45)(46)(47) (48)(49)(50)(51)(52)(52-53)(180) (181)(182)(183)(184)(185)(186) (187)	(42-45)(44-47)				
4.57a	(9-11)(74-76)(77-79)(79-81)(80-81) (81-82)(82)(84-85)(85-86)(86-87) (87-88)(93-94)(95-96)(97-98)(98-99) (99-100)(105)(106)(107-8)(144-45) (146-48)(142-43)(164)(179)	(77-81)				
4.57b	(26)(70)(71)(72)(73)(74)(75)(76) (77)(78)(77)(79)(80)(81)(81)(82) (83)(84)(85)(85)(86)(86)(87)(88) (88-89)(89)(90)(91)(92)(93)(94) (95)(96)(97)(97)(98)(98)(99)(99) (99-100)(100)(113-14)(116)(116-17) (119)(119-20)(120)(147)(148)(148) (149)(149)(150)(150)(150-51)(152) (152)(152-53)(153)(153-54)(154) (155)(156)(157)(158)(159)(171)(172) (172)(172-73)(173)(174)(174-75)					
4.58	(71)(72)(73)(76-78)(78-80)(80-82) (84-86)(86-88)(167)(167-68)(177)	(78-82)				
Mvt. II						
4.61	(11)(15-16)(17)(18)(19)(20)(21) (22)(23)(24)(25)(27-28)(28)(28-29) (59-60)(71-72)(103)(104)(105)(106) (108)(109)(110)(111)(118-19)(144-45) (146-47)(148-49)	(30-34)				
4.62	(16)(143)(164)					
4.63	(53-55)(154-55)(157-58)(163)					
Mvt. III						
4.65	(1-2)(3-4)(4-5)(6-7)(7-8)(8-9)(10-11) (20-22)(21-23)(22-24)(23-25)(24-26) (26-27)(28-29)(29-31)(65-66)(66-67) (68-69)(69-70)(71-72)(72-73)			(1-73)		
4.67						I(27)-III(73)

Table 4.2b. Coincidence of Symmetrical Structures Formed by Meter with Architectonic Levels

Figure Numbers	Architectonic Levels					
	I	II	III	IV	V	VI
Mvt. I						
4.59a				(27-52)		
4.59b				(59-163)		
Mvt. II						
4.64a				(55-95)		
4.64b				(193-215)		
Mvt. III						
4.66					(1-93)	

Table 4.2c. Coincidence of Symmetrical Structures Formed by Tempo with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I 4.60					(1-198)	
Mvt. I-III 4.68						I-III

Table 4.2d. Coincidence of Symmetrical Structures Formed by Temporal Span with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
4.59a				(27-52)		

Table 4.3. Coincidence of Symmetrical Structures Formed by Timbre with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
4.69				(1-189)		
4.70a				(1-49)		
4.70b				(1-33)		
4.70c				(171-89)		
Mvt. II						
4.71				(9-215)		

Table 4.4. Coincidence of Symmetrical Structures Formed by Texture with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I						
4.69				(1-189)		
4.70				(1-58)(1-33)(171-89)		
4.73			(178-89)	(1-59)(59-163)(164-98)	(1-198)	
4.74	(5-7)(19-21)(22-25)(101-03) (103-04)(104)(175)	(17-22)(22-26)(126-31)(171-74)	(164-71)			
4.75			(164-74)			
Mvt. II						
4.72				(9-215)		
4.76					(1-215)	
4.77	(17-18)(123-24)(124-25)(125-26) (126-27)(127-28)(128-29)(144-45) (146-47)(148-49)(140-41)	(19-25)	(1-8)			
4.78	(188-90)					
Mvt. III						
4.79				(1-34)	(1-93)	
4.80		(35-40)(41-46)(47-51)(52-56)				

Table 4.5. Coincidence of Symmetrical Structures Formed by Dynamics with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I 4.81			(1-17)	(1-59)(17-59)	(1-198)	
Mvt. II 4.82		(188-92)		(43-192)(43-114)(115-192) (1-114)(115-87)	(1-215)	
Mvt. III 4.83				(1-34)(35-64)(65-93)	(1-93)	

Table 4.6. Coincidence of Symmetrical Patterns Formed by Structure with Architectonic Levels

Figure Numbers	Architectonic Levels I	II	III	IV	V	VI
Mvt. I 4.84				(1-59)(60-163)(164-98)	(1-98)	
Mvt. II 4.85					(1-215)	
Mvt. III 4.86					(1-93)	
Mvt. I-III 4.87						(I-III

Table 4.7. Coincidence of Symmetrical Structures Formed by Text with Architectonic Levels

Figure Numbers	I	II	III	IV	Va	Vb	VI
4.2a					III	I-II	
4.2b							I-III
4.3				II(1-95)		I-II(1-95)	
4.4				II(96-215) II(193-215)			
4.5						I-II	
4.6							I-III
4.7a							I-III
4.7b					II		

Table 4.8. Frequency Tabulations for Parametric Divisions of Symmetrical Structures and Architectonic Levels at which They Appear

	Architectonic Levels							
	I	II	III	IV	Va	b	VI	Total
Pitch								
Scale Basis	18	10	9	1	0	0	1	
Melody	125	18	2	0	0	0	0	
Harmony	103	4	5	0	0	0	0	
Tonality	0	0	1	3	0	0	1	
Total	246	32	17	4	0	0	2	301
Duration								
Rhythm	201	5	0	1	0	0	1	
Meter	0	0	0	4	1	0	0	
Tempo	0	0	0	0	1	0	1	
Span	0	0	0	1	0	0	0	
Total	201	5	0	6	2	0	2	216
Texture	19	9	4	9	3	0	0	44
Dynamics	0	1	1	10	3	0	0	15
Text	0	0	0	3	2	3	3	11
Structure	0	0	0	3	3	0	1	7
Timbre	0	0	0	5	0	0	0	5
								599

Chapter V

SUMMARY AND CONCLUSIONS

Summary

It has been the purpose of the preceding analyses and discussion to ascertain the types of symmetrical structures present in the two compositions by Béla Bartók and to observe the various relationships existing among the parametric divisions and subdivisions of symmetry and the architectonic levels at which they appear. During the course of the analysis process, symmetrical structures were identified by measure numbers and were listed according to the parametric division and subdivision of symmetry represented and according to the architectonic level at which the structure occurred. There now remains the necessity for a final compilation of the information derived in the previous chapters. This information is given in subsequent sections of the present chapter (Types of Symmetrical Structures Present in the Two Compositions; Compositional Techniques Utilized in the Production of Symmetrical Structures; and Coincidence of Symmetrical Structures with Architectonic Levels). The compilation of information serves as the basis for conclusions concerning the composer's utilization of symmetrical structures.

Based on these conclusions, the final section of this chapter presents recommendations relevant to the continued study of symmetry.

Types of Symmetrical Structures Present in the Two Compositions

Text

Bartók's English version of the text of the <u>Cantata Profana</u> offers an opportunity to observe the composer's utilization of symmetry in an extramusical form. That symmetry is produced by the correspondence of major and detailed actions and events described in the text and by the correspondence of various numbers associated with the text. Symmetry created by the events of the text is produced by the correspondence of similar and contrasting events described in the text, by the correspondence of actions and reverse-actions described in the text, and by the correspondence of positive and negative responses described in the text. Symmetry created by the various numbers associated with the text is produced by the correspondence of numbers associated with the construction of the text in paragraphs, sentences and lines and by the correspondence of numbers of actions and responses described in the text. Symmetrical structures formed in the former instance reveal the composer's utilization of the principles of the Golden Section to produce symmetry. Those principles, which provide for the division of a distance in such a way that the proportion of the whole to the larger part corresponds geometrically to the proportion of the larger to the smaller part, are apparent in the relationships present among the numbers of lines associated with the construction of the text. The text of the Cantata Profana is so designed that the larger portions and the smaller portions produced in accordance with the law of the Golden Section correspond by size in position about an axis producing symmetry (larger-smaller-smaller-larger).

Pitch

Scale basis. The analyses of the two compositions reveal many varied symmetrical scale bases. Uni-intervallic scale bases include the chromatic scale and the whole-tone scale. Symmetrical scales comprised of only two intervals include the dorian mode, the second mode of the overtone scale, the alternating scale, the Neapolitan Major scale, and the fifth mode of the diatonic pentatonic scale. Additional symmetrical scale bases include scales which incorporate a series of consecutive semitones centrally located between two corresponding statements of a contrasting interval or interval pattern. Symmetrical structures also include multi-octave scales and scales which encompass an interval smaller than an octave. Finally, symmetrical scale bases include various artificial scales produced by the technique of mirror. In addition to symmetrical structures formed by individual scale bases, symmetrical structures are also formed by the correspondence of like scale bases about an axis.

Melody. Symmetrical melodies utilized in the two compositions are produced by the retrogradation of pitch patterns or interval patterns. Such retrogradation results in numerous uni-intervallic melodies and melodies which utilize two intervals in alternation. In addition symmetrical melodies are produced by the technique of mirror. An additional symmetrical structure is created by the simple alternation of symmetry with asymmetry in a single melody. Symmetrical melodies are utilized as prominent themes as well as ostinato accompaniment patterns in the two compositions.

Harmony. Many individually symmetrical harmonic structures utilized in the two compositions are uni-intervallic in nature. These include the quartal chord, the quintal chord, the diminished triad, the diminished seventh chord, the augmented triad, the whole-tone chord and the chromatic chord. Symmetrical tertian structures are illustrated by the following chords: $\underline{c}$-$\underline{e}^{b}$-$\underline{g}$-$\underline{b}^{b}$; $\underline{c}$-$\underline{e}$-$\underline{g}$-$\underline{b}$; $\underline{c}$-$\underline{e}$-$\underline{g}$-$\underline{b}^{b}$-$\underline{d}$; $\underline{c}$-$\underline{e}^{b}$-$\underline{g}$-$\underline{b}^{b}$-$\underline{d}$-$\underline{f}$; $\underline{c}$-$\underline{e}$-$\underline{g}$-$\underline{b}$-$\underline{d}$-$\underline{f}^{\#}$. Additional symmetrical harmonies are produced by the vertical correspondence of varying sizes of intervals about an axis. Symmetrical harmonic structures frequently serve as pedal chords or punctuating harmonies or as penultimate chords in a cadential progression. Symmetrical harmonic progressions are produced by the horizontal correspondence of chords or chord qualities about an axis. Additional symmetrical harmonic progressions are produced by the horizontal correspondence of harmonies by interval-class content about an axis.

Tonality. Symmetrical structures created by tonality in the two compositions are produced less frequently by the retrogradation of a tonal pattern than by the retrogradation of an interval pattern derived from a series of tonal centers. Additional symmetrical tonal patterns found in the two compositions are produced by the technique of mirror.

Duration

Rhythm. Symmetrical rhythmic motives commonly found in both compositions include the short-long-short rhythm pattern and the short-long-long-short rhythm pattern with their corresponding antithetical rhythmic motives. Other symmetrical structures are produced by the retrogradation of more complex rhythm patterns or by the elision of two symmetrical rhythms. Additional symmetrical structures are produced by the alternate elision and separation of two rhythmic motives and by the correspondence of accompanimental rhythm patterns about an axis.

Meter. Symmetrical meter patterns are produced in the two compositions by the correspondence of macro-meters or micro-meters about an axis and by the overlapping of two or more symmetrical meter patterns. Additional symmetrical structures are a product of the alternation of triple and duple meters about an axis.

Tempo. Symmetrical structures formed by tempo in the two compositions include those produced by the correspondence of tempo descriptions or tempo indications about an axis. Additional symmetrical structures are a product of the correspondence of an accelerando with a subsequent rallentando on either side of an axis.

Temporal span. A few symmetrical structures are produced in the two compositions by the correspondence of temporal spans about an axis. As is to be expected, these structures are found more frequently at the higher architectonic levels of design.

Texture

Symmetrical structures produced by aspects of texture in the two compositions are as varied as the many facets of the parameter itself. Symmetrical structures are the product of spatial texture resulting from the symmetrical physical arrangement of instruments within an orchestral setting. Symmetrical texture is also created by the correspondence of texture organization about an axis. Additional symmetrical structures are created by the technique of texture inversion. Individually symmetrical texture-sets in the two compositions are the product of the techniques of strict mirror, imitative mirror, or contrary motion. Additional symmetrical wedge-shaped texture-sets are the product of the simultaneous addition of two voices, one above and one below the previously sounding constituents. Still other structures are a product of the correspondence of motives stated simultaneously with their heterophonic reproductions about an axis.

Timbre

Symmetrical structures formed by timbre in the two compositions are likewise varied in nature. Some are the product of the simple alternation of two timbre groups. Others are the product of the correspondence of entrances and cessations of instruments within an imitative texture or of a register pattern reproduced in mirror. Additional symmetrical structures are the product of timbre inversion or the physical arrangement of instruments within the orchestral setting.

Dynamics

Symmetrical structures formed by dynamics in the two compositions are produced by the correspondence of a crescendo with a subsequent decrescendo placed on either side of an axis. Additional symmetrical structures formed by dynamics are produced by the correspondence of various dynamic levels about an axis or by the alternation of two dynamic levels. An additional symmetrical structure is created by the technique of inverting dynamic levels.

Structure

Symmetrical patterns formed by structure in the two compositions studied create various arrangements of abstract symbols representing similar and contrasting melodic and rhythmic materials. Such symmetrical arrangements include the simple alternating ternary pattern (A-B-A); the arch pattern (A-B-C-B-A); the expansion and subsequent contraction of tonality, dynamics and dissonance in a movement utilizing a single motive; and the alternation of two motives as they are expanded through development and variation throughout a section, movement or composition.

Compositional Techniques Utilized in the Production of Symmetrical Structures

In the two compositions analyzed, symmetrical structures are produced by five compositional techniques: retrogradation; mirror; inversion; repetition; alternation. The retrogradation of various patterns produces symmetrical structures formed by the following elements of the parameter of pitch: scale basis; melody; harmony; tonality. Similar retrogradation produces symmetrical structures formed by the following elements of the parameter of duration: rhythm; meter; tempo. The retrogradation of various patterns produces additional symmetrical structures formed by other parameters of music: timbre; texture (number of concurrently sounding constituents); dynamics; structure; text.

The technique of mirror produces symmetrical structures formed by the following elements of the parameter of pitch: scale basis; melody; tonality. The technique of mirror produces additional symmetrical structures formed by the parameters of texture and register.

The technique of inversion produces symmetrical structures formed by texture, timbre and dynamics. The technique of repetition produces symmetrical structures formed by the following elements of the parameter of pitch: scale basis; melody; harmony; tonality.

The technique of alternation produces symmetrical structures formed by the following elements of the parameter of pitch: scale basis; melody; harmony; tonality. The technique of alternation produces additional symmetrical structures formed by the following elements of the parameter of duration: rhythm; meter; tempo description; temporal span. Alternation produces further examples of symmetry formed by texture organization, timbre, dynamics, structure and text.

Coincidence of Symmetrical Structures with Architectonic Levels

In each of the compositions analyzed, symmetrical structures were found which encompass areas of music ranging in length from a span less than one measure long to the length of the entire multi-movement composition. Areas of music encompassed by symmetrical structures were grouped by length into six architectonic levels as follows: Level I encompasses three or fewer measures; Level II encompasses three to seven measures; Level III encompasses six to sixteen measures; Level IV encompasses sixteen or more measures; Level V encompasses an entire movement or two consecutive movements; Level VI encompasses an entire multi-movement composition.

Table 5.1 (page 286) presents the total frequency tabulations computed for parametric divisions and subdivisions of symmetrical structures found in the two compositions as well as the total frequency tabulations computed for each architectonic level at which those divisions and subdivisions of symmetry occur. The unreliability of basing conclusions on frequency tabulations derived for different architectonic levels without reference to the fluctuating number of possible occurrences inherent in the boundaries of those levels has been noted previously. (See page 16.) Therefore, the greatest frequency tabulation computed for a parametric division of symmetrical structures within each architectonic level serves as a reference number. By comparing the total frequency with which a parametric division of symmetry occurs at each of the six architectonic levels to this reference number, some idea of the appropriateness of each division of symmetry to individual architectonic levels may be gained. The comparisons thus described have been translated into statistical percentages by dividing each frequency tabulation computed for a parametric division of symmetry at each architectonic level by the reference number. The resulting comparative percentages are given in Table 5.2 (see page 287). From Table 5.1 and Table 5.2 additional information concerning the use of symmetrical structures in the two compositions by Béla Bartók is gained.

In the two compositions analyzed, symmetrical structures formed by the parameter of pitch are the most important in terms of total frequency of occurrence, for they account for nearly half of the total instances of symmetry found in both compositions. In addition, at Architectonic Levels I, II, III and VI, symmetrical structures formed by pitch occur with greater frequency than those formed by any other parametric division of symmetry. Symmetrical structures formed by pitch occur with substantial frequency throughout all six architectonic levels, although they are comparatively less in evidence at Architectonic Levels IV and V. Perhaps the apparent pervasiveness of symmetrical structures formed by pitch is due to the fact that the subdivisions of the parameter are so diversified in nature. Of the symmetrical structures formed by parametric subdivisions of pitch, those formed by melody occur with greater frequency at Architectonic Level I than those formed by any other subdivision of the parameter of pitch. At Levels II and III, symmetrical structures formed by scale basis occur with greater frequency than those formed by any other subdivision of the parameter of pitch. It is interesting to note the comparatively high frequency with which symmetry formed by scale basis appears at all six architectonic levels. No other subdivision of symmetrical structures recurs with such regularity. Symmetrical structures formed by melody and harmony are found only at the upper four architectonic levels.

In the two compositions analyzed, symmetrical structures formed by the parameter of duration occur with the second greatest total frequency. Of the symmetrical structures formed by parametric subdivisions of duration, those formed by rhythm appear with greater frequency at Architectonic Levels I, II and III than those formed by any other subdivision of the parameter of duration. Symmetrical structures formed by meter, tempo and temporal span appear with comparatively increasing frequency at Levels III, IV, V and VI. It is interesting to note that symmetrical structures formed by rhythm and scale basis which are frequently found at the lowest architectonic level of structure in both compositions are also found at the highest level of structure in the Cantata Profana. This seems to be a result of the composer's treatment of the cantata as a single entity with three major subdivisions in contrast to his treatment of the Music for String Instruments, Percussion, and Celesta as a four-movement composition.

In the two compositions analyzed, symmetrical structures formed by pitch and duration are the most important in terms of total frequency of occurrence. In decreasing order of total frequency tabulations after those of symmetrical structures formed by pitch and duration are those formed by texture, dynamics, timbre and structure. (Symmetrical structures formed by text are present only in the Cantata Profana and therefore are not comparable in terms of frequency of occurrence to the other divisions of symmetrical structures.)

Symmetrical patterns formed by pitch and duration occur at all six architectonic levels of structure and thus are considered to be more pervasive than the structures formed by the other parameters of music. (The singular pervasiveness of symmetrical structures formed by scale basis has already been noted.) In decreasing order of total pervasiveness after symmetrical structures formed by pitch and duration are symmetrical structures formed by texture (five of six levels); dynamics and timbre (four of six levels); structure and text (three of six levels).

Conclusions

In the two compositions analyzed, symmetrical structures were found to occur a total of 1,315 times. Compared to the total number of measures (1,481), there are instances of symmetry enough to provide one symmetrical structure for each of 89% of the measures within these compositions. The frequency with which symmetry occurs in the two compositions confirms the hypothesis that the symmetrical structure is a recurring and therefore important feature of the Cantata Profana and Music for String Instruments, Percussion, and Celesta. If it is true, as Stevens suggests, that "with Bartók there were frequent additions to his creative equipment, but seldom subtractions,"[1] then the analyses of the two compositions as illustrative of Bartók's mature vocal and instrumental compositional style, lead one to hypothesize further that symmetry is a recurring and therefore important feature of the other compositions of Bartók's second creative period.

In addition to being a recurring feature of the compositions analyzed, symmetry was also found to be a pervasive feature as confirmed by two facts. First, symmetrical structures were found to occur in both compositions at all six architectonic levels of design. Second, symmetrical structures were found to be a product of every one of the six parameters of music and of the extramusical elements as well.

In the two compositions, symmetrical structures were found to be produced by five compositional techniques: retrogradation; mirror; inversion; alternation; and repetition. Symmetrical patterns were more frequently found to be a product of the parameters of pitch and duration

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[1]Halsey Stevens, The Life and Music of Béla Bartók (rev. ed.; New York: Oxford University Press, 1964), p. 306.

than of texture, timbre, dynamics or structure. Symmetrical structures formed by pitch were most frequently found to be a product of scale basis or melody than of harmony or tonality. Symmetrical structures formed by scale basis were found to be the most pervasive of the symmetrical structures formed by pitch. Symmetrical structures formed by duration were more frequently found to be a product of rhythm than of meter, tempo or temporal span. Symmetrical structures formed by rhythm and meter were found to be more pervasive than symmetrical structures formed by tempo or temporal span.

Recommendations

Since time did not permit the analysis of symmetrical structures in all the major compositions by Béla Bartók, it is recommended that a similar investigation be conducted toward the identification of symmetrical structures as they occur in Bartók's other major compositions, particularly the dramatic works, the chamber music and the concertos.

Through the present study, the writer has discovered that there is little information available concerning the production and utilization of symmetry as a compositional technique. It is therefore recommended that the compositions of composers other than Bartók be investigated toward the further identification of symmetrical structures. It is specifically recommended that compositions by Charles

Ives, Claude Debussy, Maurice Ravel and Karlheinz Stockhausen be analyzed for the production of symmetry.

The analysis of scale bases in the two compositions of the present study has revealed a wealth of synthetic scale material which has not yet been identified or classified. It is therefore recommended that there be an investigation of the derivation and utilization of scale materials in the music of the twentieth century.

The analysis of symmetrical structures in two compositions by Béla Bartók has led the writer to suspect the presence of an underlying current of numerical mysticism in Bartók's music. It is therefore recommended that the composer's utilization of numerical mysticism, parcicularly in the dramatic works, be investigated.

With these recommendations, the present study is brought to a close. The study has proved successful in the illumination of axis-based symmetrical structures as a predominating feature in two major compositions by Béla Bartók. It is the hope of the writer that through the completion of the present study a deeper understanding of the compositional craft of this great composer has been realized.

Table 5.1. Total Frequency Tabulations for Parametric Divisions of Symmetrical Structures and Architectonic Levels at which They Appear

	Architectonic Levels						
	I	II	III	IV	V	VI	Total
Pitch							
Scale Basis	144	63	21	5	1	1	235
Melody	199	31	2	0	0	0	232
Harmony	161	10	7	0	0	0	178
Tonality	0	0	1	6	1	2	10
Total	504*	104*	31*	11	2	3*	655
Duration							
Rhythm	459	17	5	1	0	1	483
Meter	6	1	4	5	1	0	17
Tempo	0	0	1	5	2	1	9
Span	0	0	0	3	1	0	4
Total	465	18	10	14	4	2	513
Texture	39	20	10	12	4	0	85
Dynamics	0	1	3	16*	5*	0	25
Timbre	0	0	2	9	1	1	13
Structure	0	0	0	7	5	1	13
Text	0	0	0	3	5	3	11
							1315

*Reference number.

Table 5.2. Percentages of Greatest Frequency Tabulations Computed for Parametric Divisions of Symmetrical Structures at Architectonic Levels

	Architectonic Levels I	II	III	IV	V	VI
Pitch	100%	100%	100%	69%	40%	100%
Duration	92%	17%	32%	88%	80%	67%
Texture	8%	19%	32%	75%	80%	-
Dynamics	-	1%	10%	100%	100%	-
Timbre	-	-	6%	56%	20%	33%
Structure	-	-	-	44%	100%	33%

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