Dódeca

Leonardo de Arrizabalaga y Prado

Opus 14,

for String Quintet

Dódeca: Leonardo de Arrizabalaga y Prado, Opus 14, for String Quintet

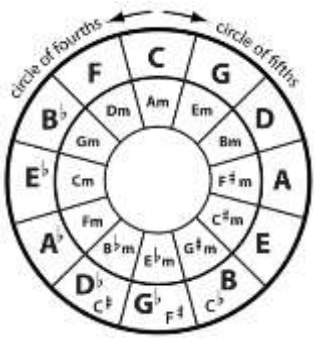
As its name suggests, *Dódeca* is dodecaphonic, or twelve tone music. This does not, however, necessarily mean that it is dissonant. That depends on how its twelve tones, or notes, are arranged. They can be arranged to make harmonic music. *Dódeca* does so, thus fusing dodecaphonic music with traditional Western harmony, against which it is usually contrasted. It does so by arranging its twelve tones into series generated by a well-tempered version of the natural harmonic series, and by overlaying those series in various ways with each other. Each of these characteristics, constituting *Dódeca*'s compositional method, may, for some, need further explanation.

Dodecaphonic or twelve tone music in relation to traditional Western Classical music

'Dodecaphonic or twelve tone music' can be variously defined. The classic definition is that of its inventor, Schoenberg, as music which uses all 12 notes of the chromatic scale, and avoids being in a key. For this last reason it is often called atonal. Such atonality is exemplified by his later music, and that of his colleagues in the Second Vienna School, Berg, Webern and Eisler. A separate school of dodecaphonic music is that of Hauer. Later composers such as Babbitt, Berio, Boulez, Dallapiccola, Krenek and Malipiero continue to develop dodecaphonic serialism, as it comes to be called, throughout the twentieth century. *Dódeca* develops it further, keeping the principle of using all 12 notes of the well-tempered scale, but embracing keys and their harmonies. *Dódeca* is thus both dodecaphonic and tonal.

Most dodecaphonic music is what most people who like Western Classical music would call dissonant. Its dissonance often involves the coincident sounding, or clash, of two or more immediately adjacent notes, separated only by minor seconds (such as B and C, or E and F) or of the same two notes in different octaves. Such dissonance is promoted by dodecaphonic compositional method, which ignores, or even deliberately transgresses, traditional Western harmony. In contrast, varying kinds, degrees and frequencies of dissonance have been incorporated into Western Classical music, during the twentieth century, by tonal composers such as Debussy, Ravel, Scriabin, Stravinsky, Bartók and Gershwin, thus extending tolerance of dissonance *within* the harmonic conventions of Western Classical music.

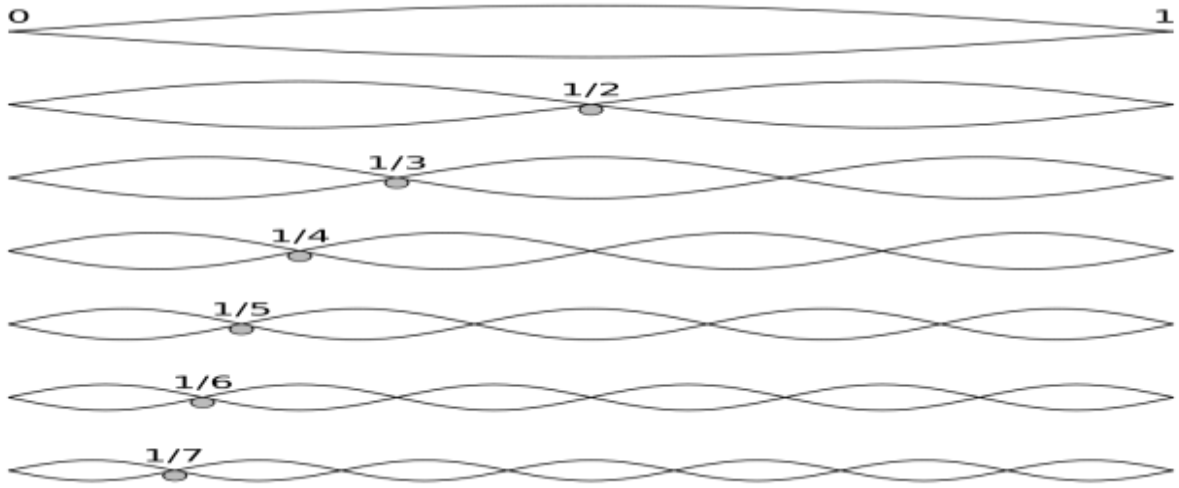
Traditional Western harmony is based on even temperament, a tuning method developed in the late Baroque, of which Bach's *Wohltemperiertes Klavier* is the great canonical example. It was invented to ease passage, previously difficult, from one key to another, in keyboard instruments, and, eventually, to enable use in a single composition of the whole range of possible keys, known as the circle of fifths or fourths. As such, it is the foundation of Western Classical music, which is based on keys and their harmonies. Dodecaphonic music, however, usually eschews both keys and harmony, though, as Dódeca shows, it need not necessarily do so.



(https://www.hearandplay.com/main/a-lesson-on-the-application-of-the-circle-of-fourths-and-fifths)

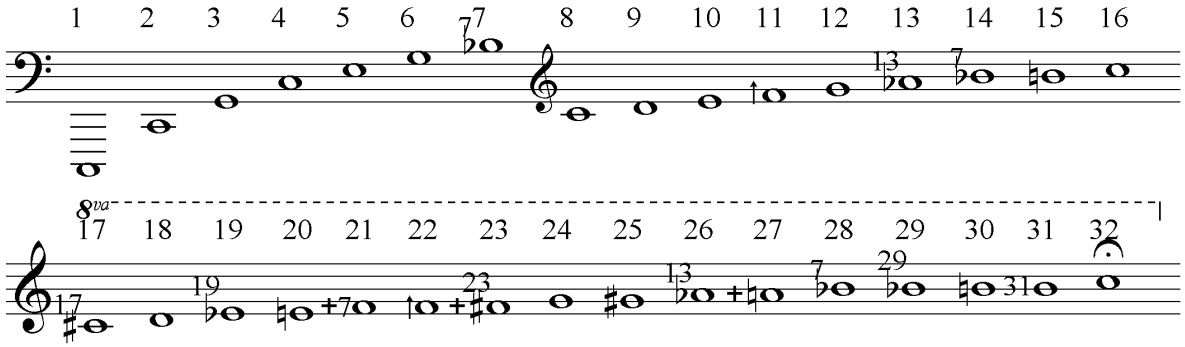
Keys and harmony are so deeply interrelated as to constitute aspects of each other. A key is the series of notes generated through natural harmony, by sounding a note of any pitch. Pitch is determined by the number of cycles or vibrations per second of a note. A low pitched note, say C1, vibrates slowly. A middle pitched note, say C4, also known as 'middle C', vibrates faster. A high pitched note, say C8, vibrates much faster. Generation of a series of notes by sounding a note of any given pitch depends on the natural phenomenon of overtones, or harmonics. Harmonics are sound waves generated by a note bouncing off a surface, then another, vibrating at speeds related to the original note. The series of such sound waves constitutes a key, called by the name of its original tonic note. The tonic is the lowest note in such a series. The harmonics sound 'over' it, in proportional ratios, and thus are called overtones.

A note bouncing off a hollow sounding board or echo chamber, like that inside a piano, violin or tuba, generates overtones, in a certain order of appearance. The first overtone generated, the octave, vibrates at twice the speed, or half the wavelength, of the basic, or tonic note. The next vibrates at a third of the tonic's wavelength, the next at a quarter, then a fifth, sixth and seventh, and so on, till and beyond 1/32.



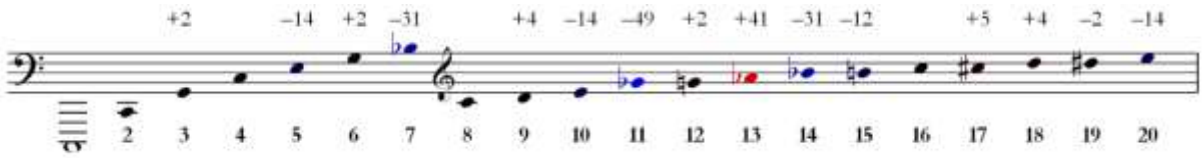
(Description English: Illustration of harmonic overtones on the wave set up along a string when it is held steady in certain places, as when a guitar string is plucked while lightly held exactly half way along its length. Date 8 July 2008. Source Own work by uploader, based on design of bitmap image Image: Overtone.jpg. Author Qef. https://commons.wikimedia.org/wiki/File:Harmonic_partials_on_strings.svg)

Through a complex series of such proportional relationships spanning several octaves, the notes of a given key are generated. The example below shows 32 notes generated by C1 (note 1) or low C:



(Description English: Harmonics on C: 1-32. Ben Johnston's just intonation notation. Date 1 April 2015. Source Own work. Author Hyacinth. https://commons.wikimedia.org/wiki/File:Harmonics_to_32.png)

This proportional arrangement, and the order in which it occurs in nature, is the natural harmonic series. It differs slightly from even temperament, the tuning convention of Western Classical music. Even temperament was invented to allow easy movement between keys, because natural harmony is not even. The notes in a series generated by a given tonic do not naturally sound at exactly the same frequency as those correspondingly generated by another tonic. Although the relationship of, say, C to G is the same as that of F to C, both being a perfect fifth, (corresponding to the interval between notes 2 and 3, C and G, in the example below) the perfect fifth generated by sounding F as the tonic in natural harmony will not vibrate at exactly the same frequency as the original C. It will deviate slightly, by +2 cents.



"An illustration of the harmonic series in musical notation. The numbers above the harmonic indicate the number of cents' difference from equal temperament (rounded to the nearest cent)."

(Description English: Harmonic series Date 27 January 2007 (original upload date) Source Own work (Original caption: "Self-made on Sibelius.") Author User: MusicMaker5376 at English Wikipedia. https://commons.wikimedia.org/wiki/File:Harmonic_Series.png.)

With other intervals, as in the example given, the deviation is greater, generating audible dissonance. Thus arose the notion of 'even temperament', or tuning all notes evenly, in a continuous series, rather than, as before, having to retune one's instrument if one wished to play something in a different key. This was achieved by adjusting tuning so that each note is separated evenly from its immediately adjacent neighbour by exactly the same interval, a minor second. When minor seconds sound together in the same octave, dissonance occurs. If they sound in different octaves, some dissonance remains, but it can be rendered 'harmonious' by combining it with other notes, thus forming complex harmonies.

This happens in the late nineteenth and early twentieth century, as minor seconds and various other forms of dissonance are gradually re-incorporated into Western Classical music. ***Re***-incorporated, because such dissonances are to be found, though sparingly used, in the works of Bach and earlier composers. They are usually avoided in the Classical and Romantic styles, developed by Haydn, Mozart, Beethoven, Schubert, Chopin and others, but are re-introduced by 'Impressionists' such as Debussy, and Post-Romantics such as Mahler. They are often used, albeit within the broader context of tonal music, based on 'tonalities', or keys, more or less within the Western Classical harmonic tradition, by Debussy, Ravel, Scriabin, Stravinsky, Bartók, Gershwin, and others, as mentioned above.

Still, the gap between dodecaphonic and tonal music remains. It does so because it was intended to by Schoenberg and his co-revolutionaries. They revelled in dissonance, wishing to renounce and abandon traditional musical sensibility, as it had developed until then, replacing it with something completely different. But musical audiences did not embrace their revolution. Thus opened up a gap between devotees of 'serial' music, as atonal dodecaphonic music came to be called, and the audience at large. Audiences prefer tonal music, based on keys. Such is the gap that very little serial music is played in public, because most audiences, who ultimately pay for musical performances, do not want to hear it.

Dódeca

Dódeca aims to bridge that gap. It aims to show that one may use a twelve tone series, more or less strictly defined and deployed, to generate harmonic tonal music, recognisable as such to an ear attuned to Western Classical music, as it has developed throughout the twentieth century.

It does so, as said above, 'by arranging its twelve tones into series generated by a well-tempered version of the natural harmonic series, and by overlaying those series in various ways with each other.' As also said above, ' "twelve tone music" can be variously defined'. The definition used here for *Dódeca* is 'a series of the twelve musical notes of an even-tempered chromatic scale, so arranged that each sounds only once in each statement, restatement, iteration, or permutation of the series, with no repetition'. A 'statement' of the series is the series itself, played for the first time in a given piece. A 'restatement' is the same notes played at the same pitch, or an octave or more above or below. An 'iteration' is a statement or restatement of the relative structure of the series, but at a different pitch. A 'permutation' rearranges the twelve notes of the series in a different order, thus arguably constituting a new series.

Differences in note duration do not count for this definition; only the order of notes. The duration of individual notes varies according to the rhythm of the piece in question. By this definition, there are eleven possible iterations, and 479,001,600 possible permutations of any given such series (according both to Robin Milner, MA, of Churchill College, Cambridge, and Adrian Mathias, PhD, of Trinity College, Cambridge). Permutations may be wholly or partially different from the original statement, depending on how many of the notes in any given permutation remain in same place as in the original statement, and how many elsewhere. On this depends whether one calls it a new series or not.

A 'theme' is the statement that inaugurates a given piece of music *Dódeca* is based on this theme:

The natural harmonic series, cited above, is this theme's source. Its notes are arranged roughly in the order, but not in the octave, in which they occur in the natural series. They are collapsed into one octave. In this theme's development, *Dódeca* manifests many permutations. All, because chosen in the interests of harmony, differ only partly from this original statement of the theme. They remain to be counted.

This order of notes was chosen because it readily generates harmonies. The first three notes, C, G, and E, if sounded together, form a major triad; the first four, C, G, E, B♭, a dominant seventh chord; the first five, C, G, E, B♭, D, a dominant ninth; the first six, C, G, E, B♭, D, F♯, a dominant eleventh. Moreover, notes 5, 6, and 7, D, F♯ and A, form the major triad of D, while notes 8, 9 and 10, A♭, F and D♭, form that of D♭ (or C♯). And notes 11 and 12, E♭ (or D♯), and B form the major third of B. This allows for a very harmonious progression of chords: C^7, D, D♭, B, leading back up to C, or down to B♭. Other chords also emerge from varying the order of notes in the theme, to produce, for instance, minor keys.

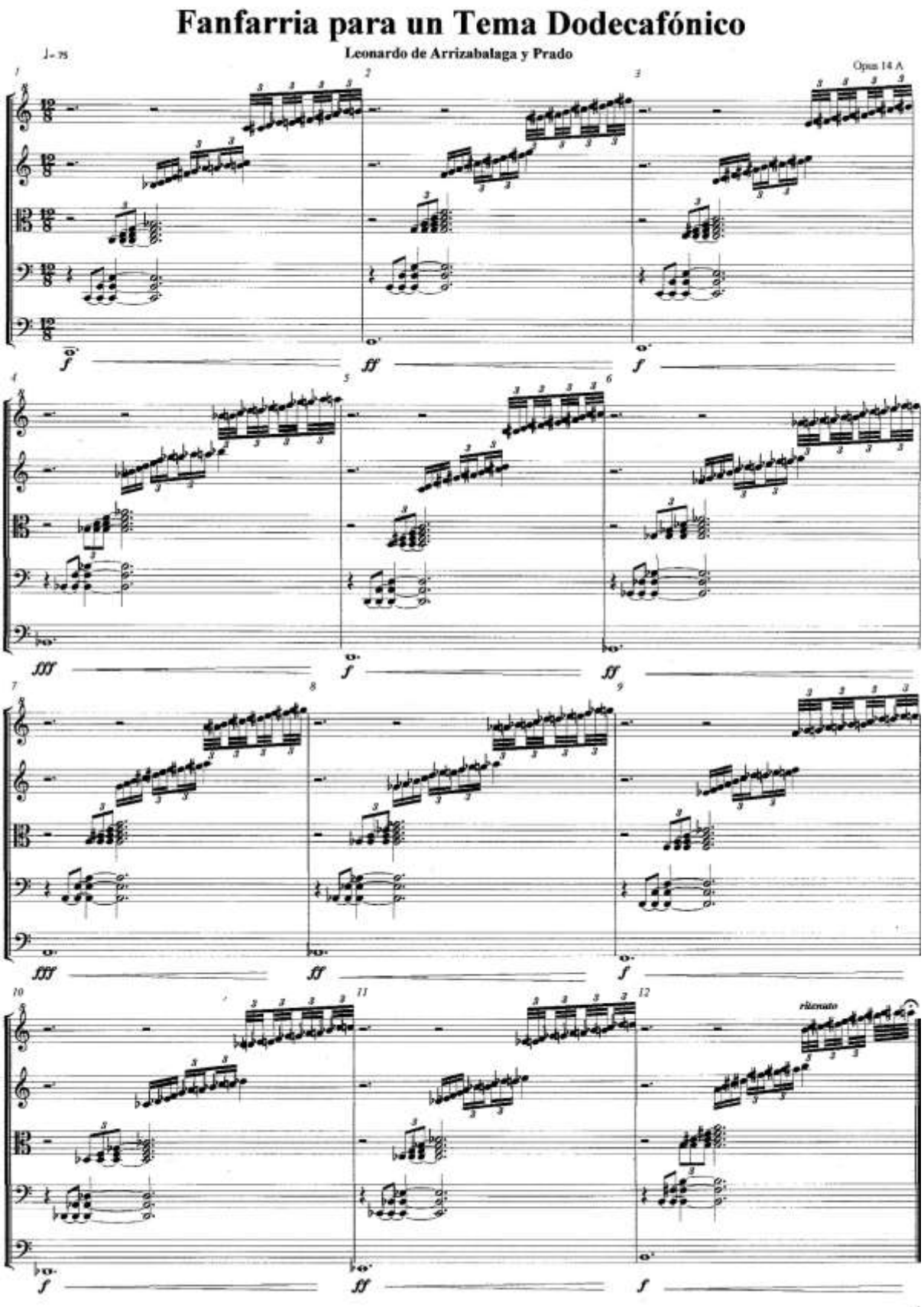
In the original statement of the theme, following natural harmony (albeit an even tempered version thereof), note 3 is E♮. But, further adjusting nature in order to cultivate musical art, thus following the procedure of culture of any sort, it can be swapped with E♭ to render C minor. Likewise swapping note 6, F♯, with F♮, generates D minor. Swapping must occur in order to respect the rule of non-repetition of any note within a given statement, restatement, iteration or permutation of the theme. Any note swapped for another takes the other's place. Another way of saying this is that the notes trade places, in a game of 'musical chairs' in which none, however, is left unseated when the music stops.

A basic principle is observed in *Dodeca's* choice of permutations. While it moves freely over the whole chromatic range, it chooses, for the first three or four notes of any permutation, those that, in any order among themselves, generate a major or minor harmonic triad, or the dominant seventh chord of a major key. This establishes a key in which the permutations can develop, generating complex harmonies.

Complex harmonies emerge from combining the remaining notes in the series with the first three or four fixing the key. Since there are only five instruments, and they are only asked to play chords, thus more than one note at once, at the beginning of a bar, when stating tonal harmonies with the first three or four notes in the series, the maximum number of notes that sound at once in later development is five. This means that ninth and eleventh chords, among other complex harmonies, can readily be played.

The theme is therefore generated by a tamed musical nature. It consists of the first three or four notes of an even-tempered natural harmonic series, generated by a tonic note, constituting the harmonic structure of a key, followed by the rest of the notes. The same relative set of three or four notes, *mutatis mutandis*, is preserved in all permutations. Their order can, however, be reversed, inverted, or otherwise adjusted, within their part of the bar, so long as the basic harmony is preserved. The remaining eight or nine notes in the theme, generated later on in the harmonic series created by sounding a tonic note, stand in various proportional relations of speed of vibration to the first three or four notes in the series, and to each other. They can therefore be used to pass from one key to another. As a result of this versatility, their order in composition varies, depending on the music's harmonic, melodic and rhythmic evolution.

Dódeca's devotion to the number twelve extends beyond harmony and melody to rhythm and structure. Not only are its harmonies dodecaphonic, but its bars (*measures* in American English) are in 12/8 time. A 12/8 time signature divides into two, three, four or six sections of a bar, allowing varied rhythms. It allows subdivision of the bar into two units of six beats, four units of three, three of four, six of two. This adds variety, and lessens tedium. Moreover, each part of *Dódeca* consists of either 12 bars, as does its first piece, a fanfare, or 144 (12 x 12), as do each of its two subsequent movements, a dance suite and a fugue. The fanfare lasts about one minute; the dance suite and fugue about ten minutes each.


Fanfarria para un Tema Dodecafónico
Leonardo de Arrizabalaga y Prado
♩= 75
Opus 14 A
ritenuto

Although the name 'fanfare' denotes music for brass instruments, it is adopted here for a string quintet: Double Bass, Cello, Viola, Second and First Violin. The instruments in the performance which these notes explain are from the Garritan Orchestra in Finale. Finale is a digital music composition software package using recordings of individual notes played by real musical instruments. While difficult to program to sound like natural music, it does at least never hit wrong notes, and keeps time exactly. The first part of *Dódeca* to be composed, the dance suite, was premiered live at Madrid Conservatory. It would have pleased Algernon Moncrieff, in Oscar Wilde's *The Importance of Being Earnest*, Act 1, Sc. 1: 'I don't play accurately—any one can play accurately—but I play with wonderful expression.' For the purpose of introduction to *Dódeca*, here the colder but more accurate Finale version is used.

Fanfarria para un Tema Dodecafónico, the fanfare, announces the dodecaphonic theme, cited above. It does so in twelve bars of dotted semibreves (*whole notes*) each entirely filling the bar, played by the Double Bass, three octaves below the cited example, beginning on C1. In each bar, the natural harmonies of each base note emerge in order above it throughout the musical register, played by the Cello, Viola, Second and First Violins. This is one of the occasions on which some instruments are asked to play two notes at once: the parts of chords that constitute and establish the key of each bar.

Having run the gamut of twelve iterations of the theme, the fanfare ends, the Double Bass lingering on B1, the First Violin quivering on B6. B is the 'leading note' of C, and leads, in the next piece or movement, the dance suite, back to C1, which is the initial base note of both dance suite and fugue.

Doce Danzas Dodecafónicas, the dance suite, may be considered a prelude, or series of preludes, to the fugue. The dances, mostly Baroque, though some more recent in inspiration, are all basically in ternary rhythms, but their tempo, disposition and subdivision vary. Each is twelve bars long.

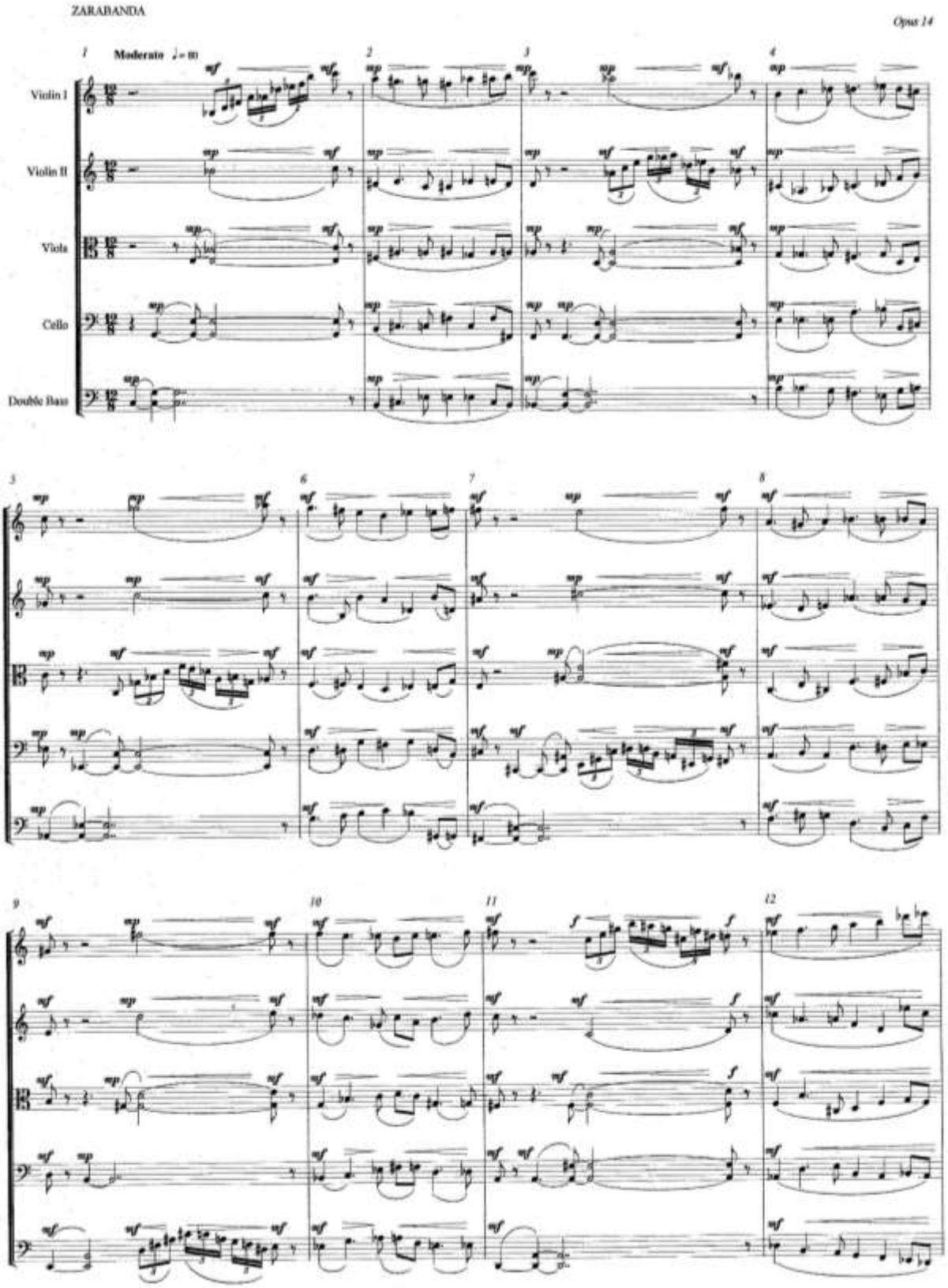
Zarabanda, the Spanish word for Sarabande, is slow and stately. It begins (in the performance score) at 70 bpm, and gradually speeds up to 80. Each bar consists of two units of 3 crotchets (*quarter notes*) each. It alternates between melodic statements of the theme and some of its permutations, in odd numbered bars, and consonant or columnar development of harmonies, in even numbered bars.

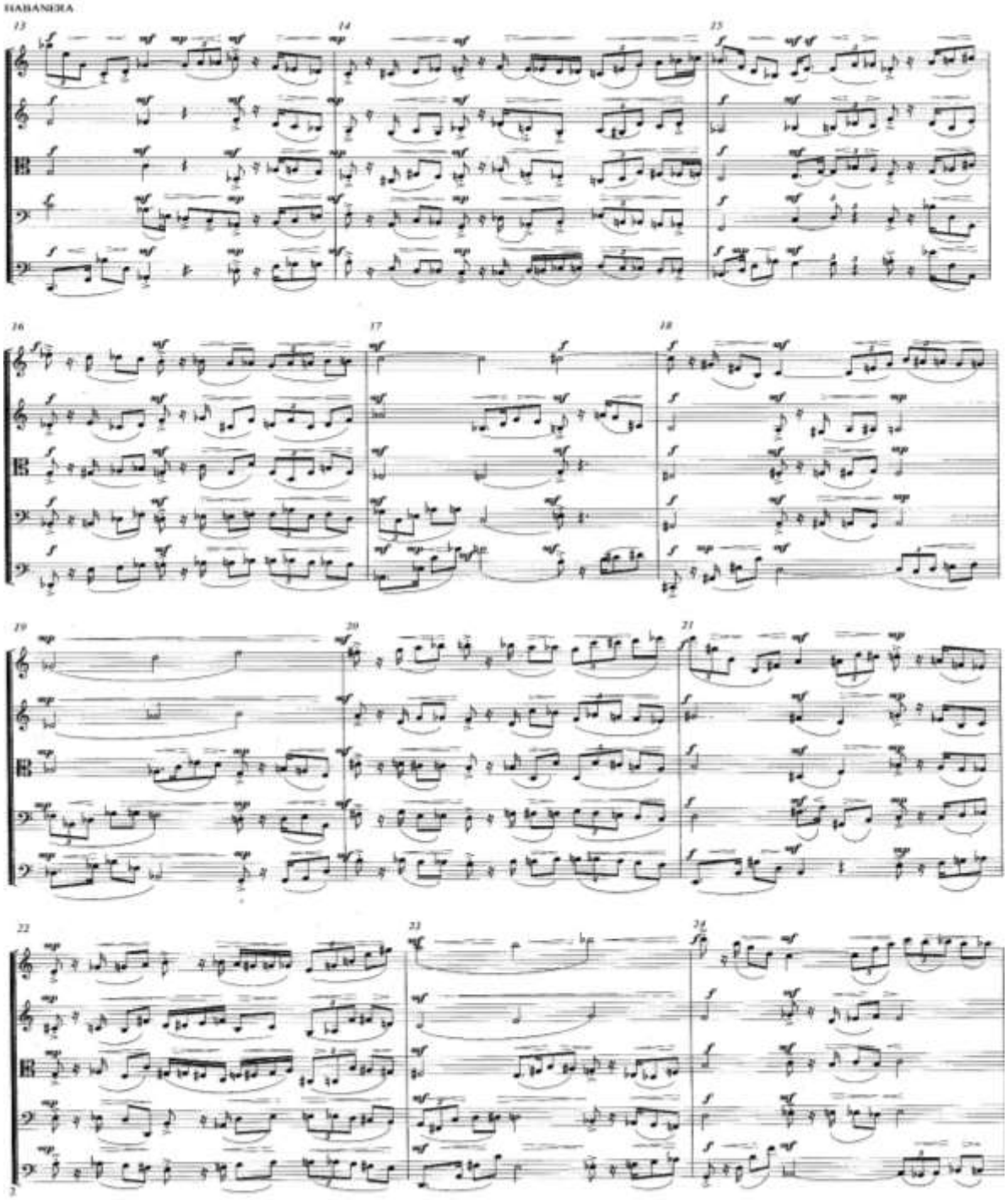
The first half of the odd bars builds consonances or columns of held notes stating the key, implicit in the first three notes of the theme. Again, some instruments are asked to play and hold chords. The second half of the bar, beginning with the minor seventh note of the key thus established, plays out the rest of its notes, melodic permutations of the theme, in one triplet of quavers (*eighth notes*), corresponding to the first crotchet of the second half, and two of semiquavers (*sixteenth notes*), corresponding to the second.

Then, in apparent transgression of the rule of non-repetition within a single statement of the theme, this statement ends with a quaver on the tonic note, several octaves above its base note. This is followed by a quaver's pause, ending the bar. This apparent transgression is not really such. It indicates that the statement is over. The statement precedes repetition of the tonic note. The repeated tonic note is, as it were, mere punctuation, corresponding to a full stop (*period*) or perhaps an exclamation mark, ending that statement. This indicates that a bar is not necessarily to be understood as coterminous with a statement. It is followed by a pause, leading to a new statement in the next, even numbered bar.

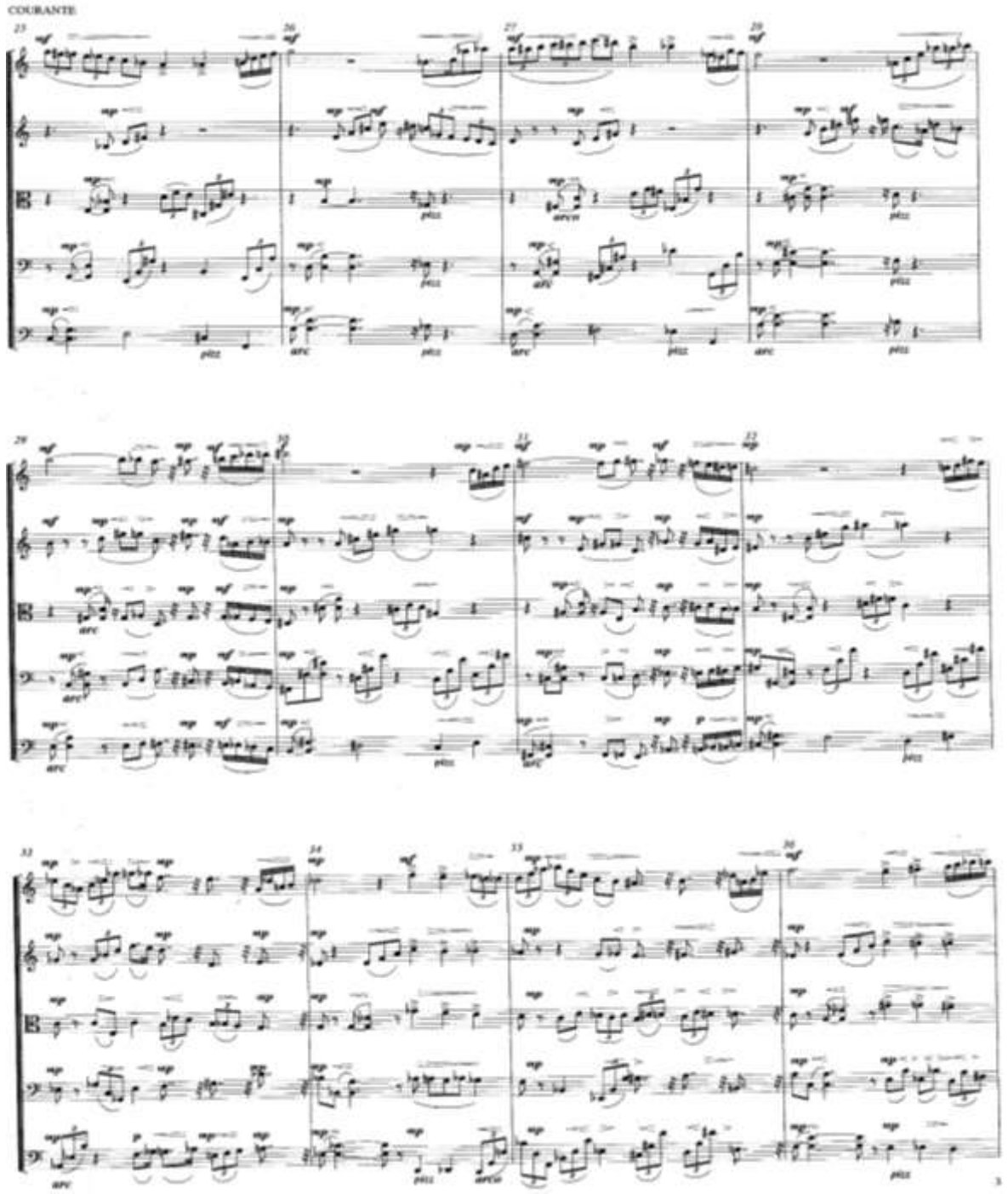
Even bars in *Zarabanda* are a half tone lower than preceding odd bars. So as bar 1 is in C, bar 2 is in B, and so forth all the way down the chromatic scale. Each even bar consists of consonant notes, all of the same duration, producing a hymnic effect. They work out, albeit in another key, some of the harmonies implicit in the statement of the theme in the preceding odd bar. They do so in varying rhythmic patterns, consisting of dotted crotchets, crotchets, and quavers, differently arranged, resulting in differing subdivisions of the bar. Thus, unlike odd bars, which are all rhythmically alike, even bars differ.

Dódeca: Leonardo de Arrizabalaga y Prado, Opus 14, for String Quintet

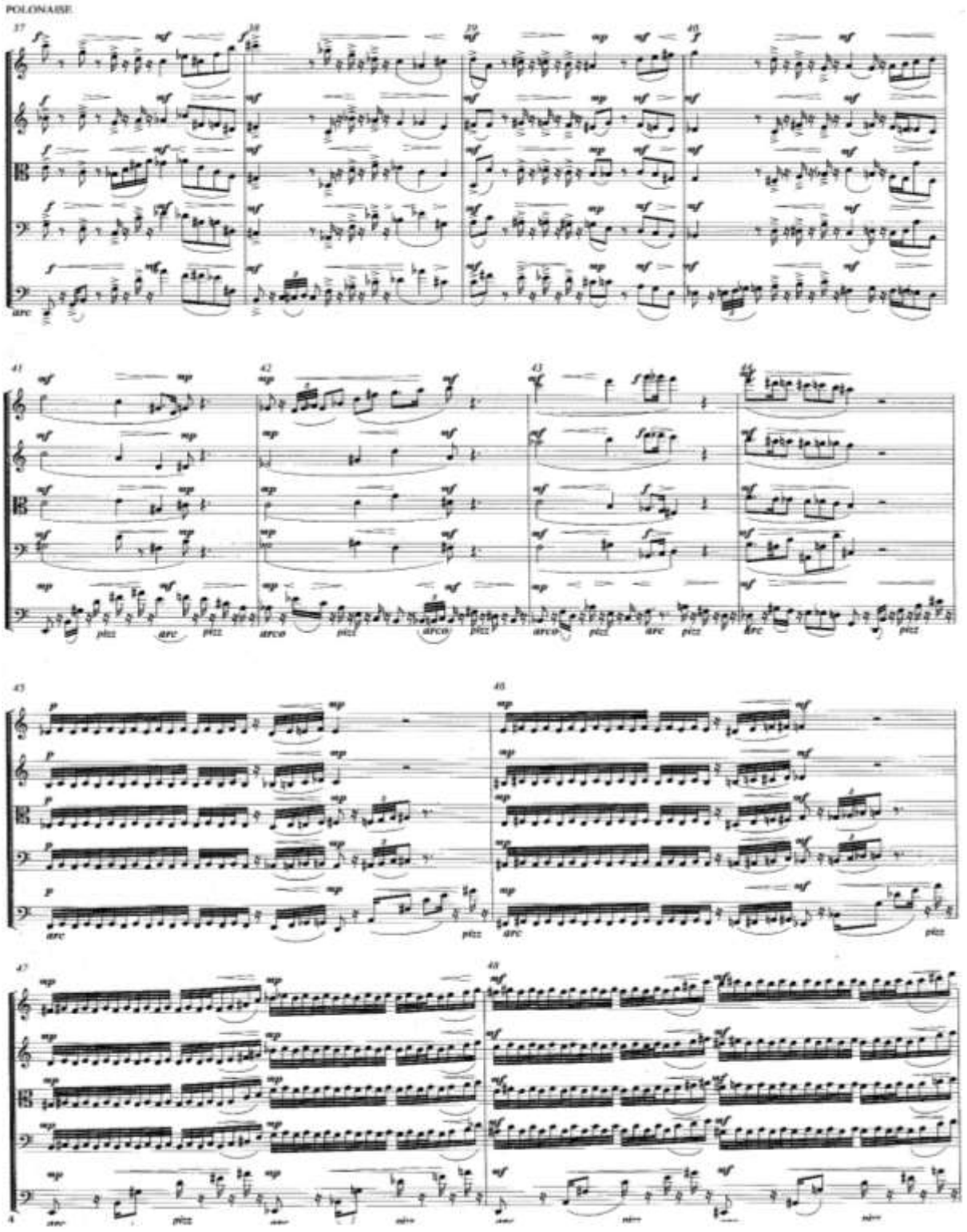




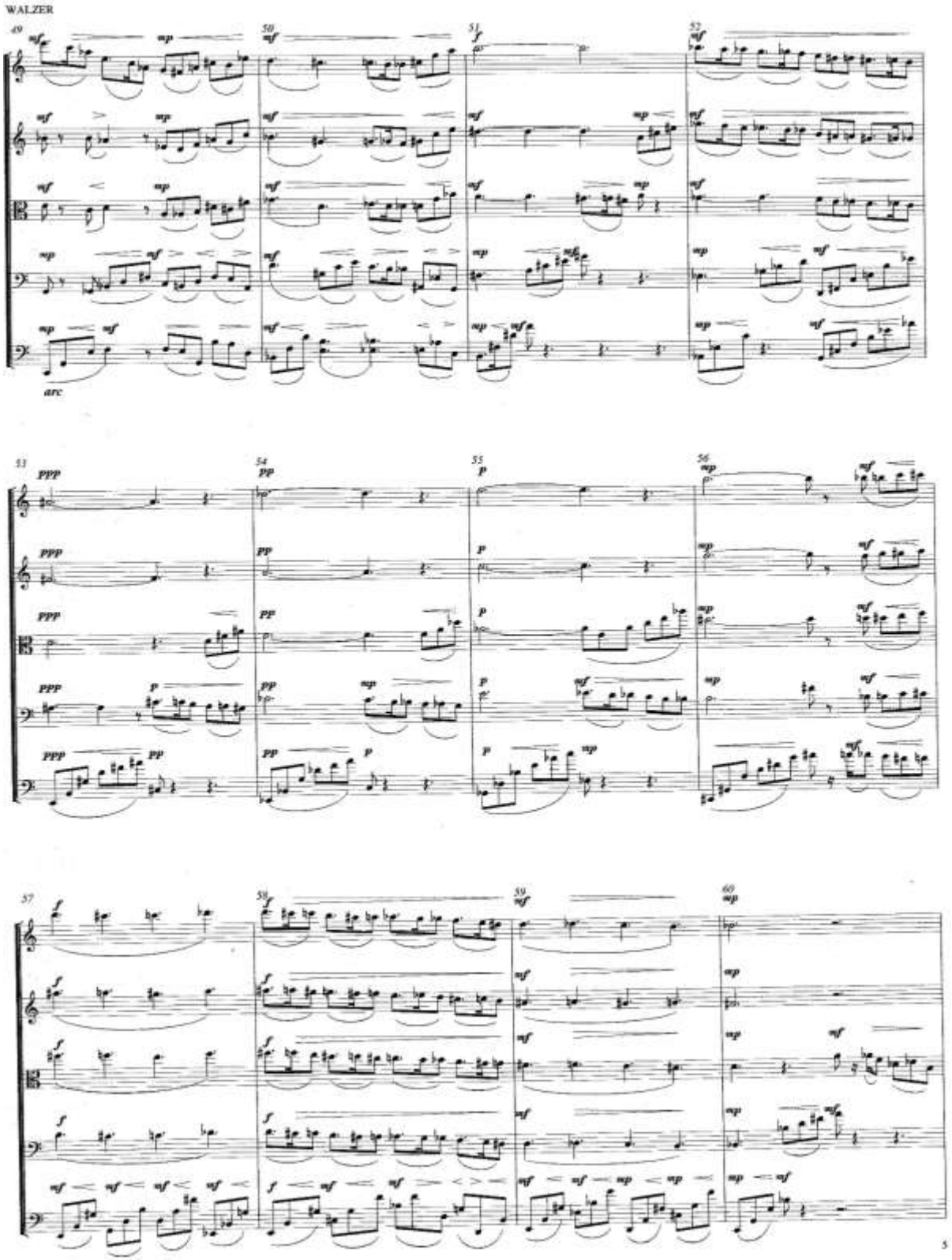
Habanera begins and remains at 82 bpm. Harmonically, it follows on from *Zarabanda*, which ends in D flat, so it begins in C. But unlike *Zarabanda*, which follows a straight downward chromatic course, *Habanera* follows the circle of fourths downward, from C to F to B♭, and so forth, all the way to G. A different permutation of the theme is stated melodically in every odd bar by the Double Bass and one other instrument, beginning with the First Violin. Even bars develop harmonies and rhythms in consonances, not always with all notes of the same duration, producing variation between the diverse voices. Rhythmically, each bar is divided into three minims (*half notes*) and each of their two constituent crotchets can be subdivided into two quavers, or into a quaver triplet in the same space. Moreover, stress within each bar may fall on the second or third as well as on the first minim, producing a lilting effect, typical of that Spanish Colonial dance. It was famously used by Bizet, in his opera *Carmen*. The alert listener will find an echo of *Carmen's* Habanera here, as well as of others by Albéniz and Lecuona.



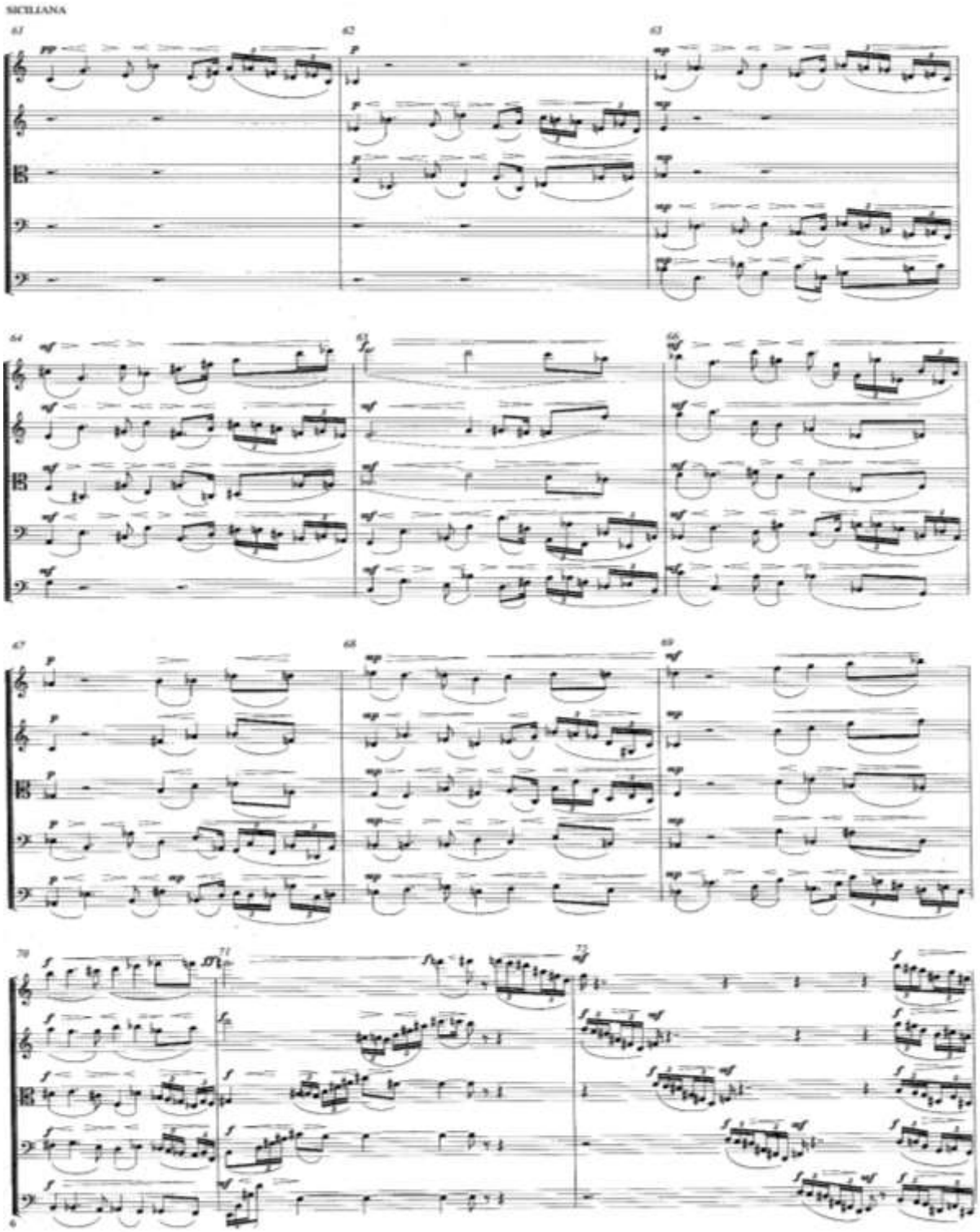
Courante is a dance found in Baroque suites, including Bach's. This one starts at 84 bpm, and remains there. Harmonically, beginning in C, as is expected, following on from *Habanera's* circle of fourths ending in G, it takes the opposite course, following the circle of fifths upward, C, G, D, etc., ending in F (and eventually leading back to C in the next piece). Rhythmically, *Courante* reverts to *Zarabanda's* division of the bar into two halves of three crotchets or six quavers each, but because it is considerably faster, and because the first two crotchets are in turn subdivided into two triplets of quavers followed by a slightly stressed third crotchet with two quavers, or, in the second half of the bar, with four semiquavers, the effect is very different: one indeed of 'running' and perhaps, as in steeplechase, jumping over an obstacle, as the word *courante* implies. Melodically, permutations of the theme are stated in the first four bars, and in four of the remaining eight. The instruments share among them different parts of the melody, generally beginning with the Double Bass and ending with the Violins.



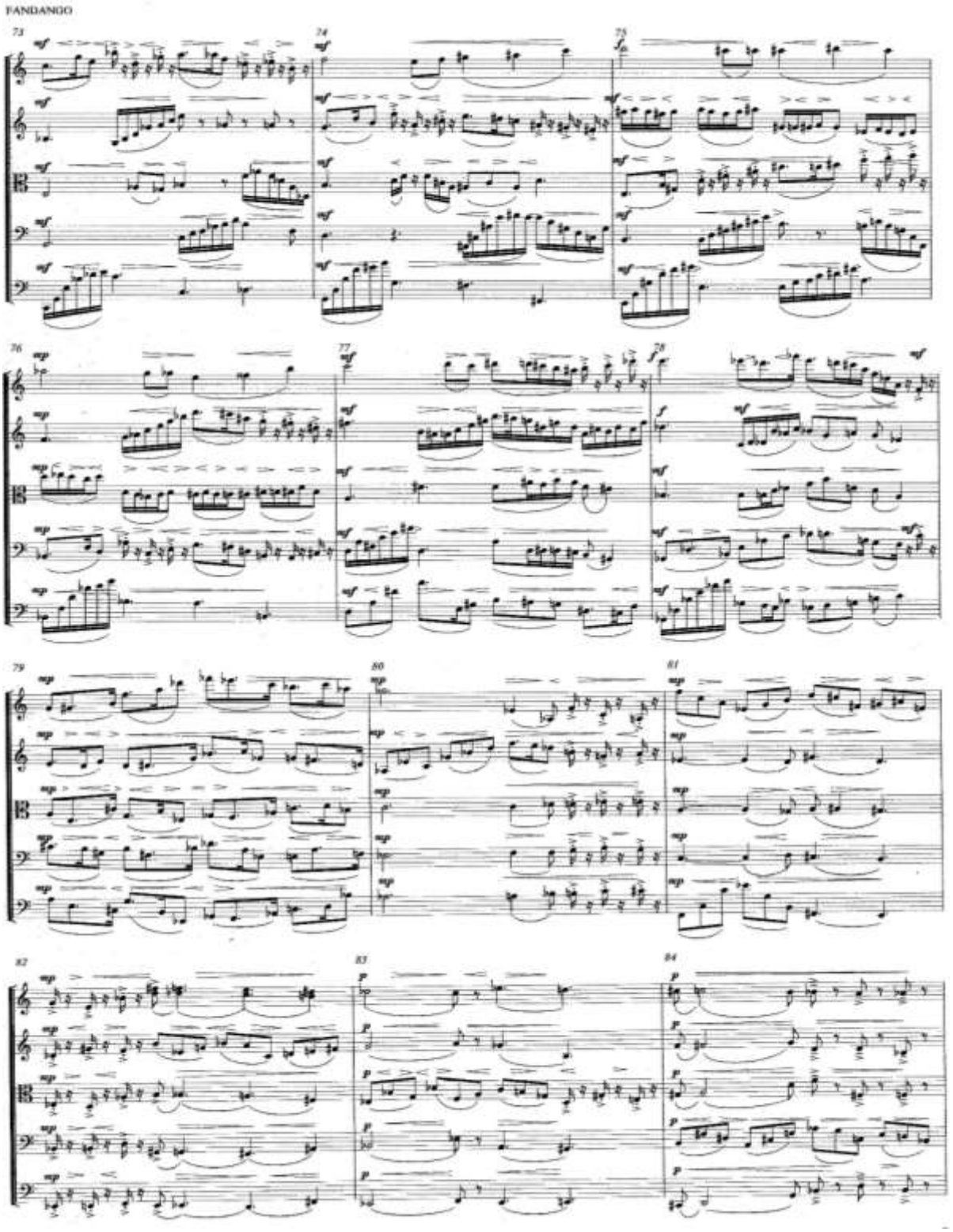
Polonaise is, as its name proclaims, a Polish dance. This one begins with a slight relaxation of tempo, to 78 bpm, only to speed up to 87 by its end. The rhythm is strongly marked, with the bar divided into two halves of three crotchets each. The theme is stated only in the first bar. All the rest develop harmonies. The harmonic progression, unlike that of the preceding dances, is free. Though it begins on C, because that is where the previous piece has led to, it does not follow any fixed harmonic pattern, nor is it harmonically exhaustive. Its course is determined purely by the evolution of the melodies in the development, and includes both major and minor keys, as well as consonances of minor thirds. Again, the alert listener will hear echoes of Polonaises by Chopin and Tchaikovsky.



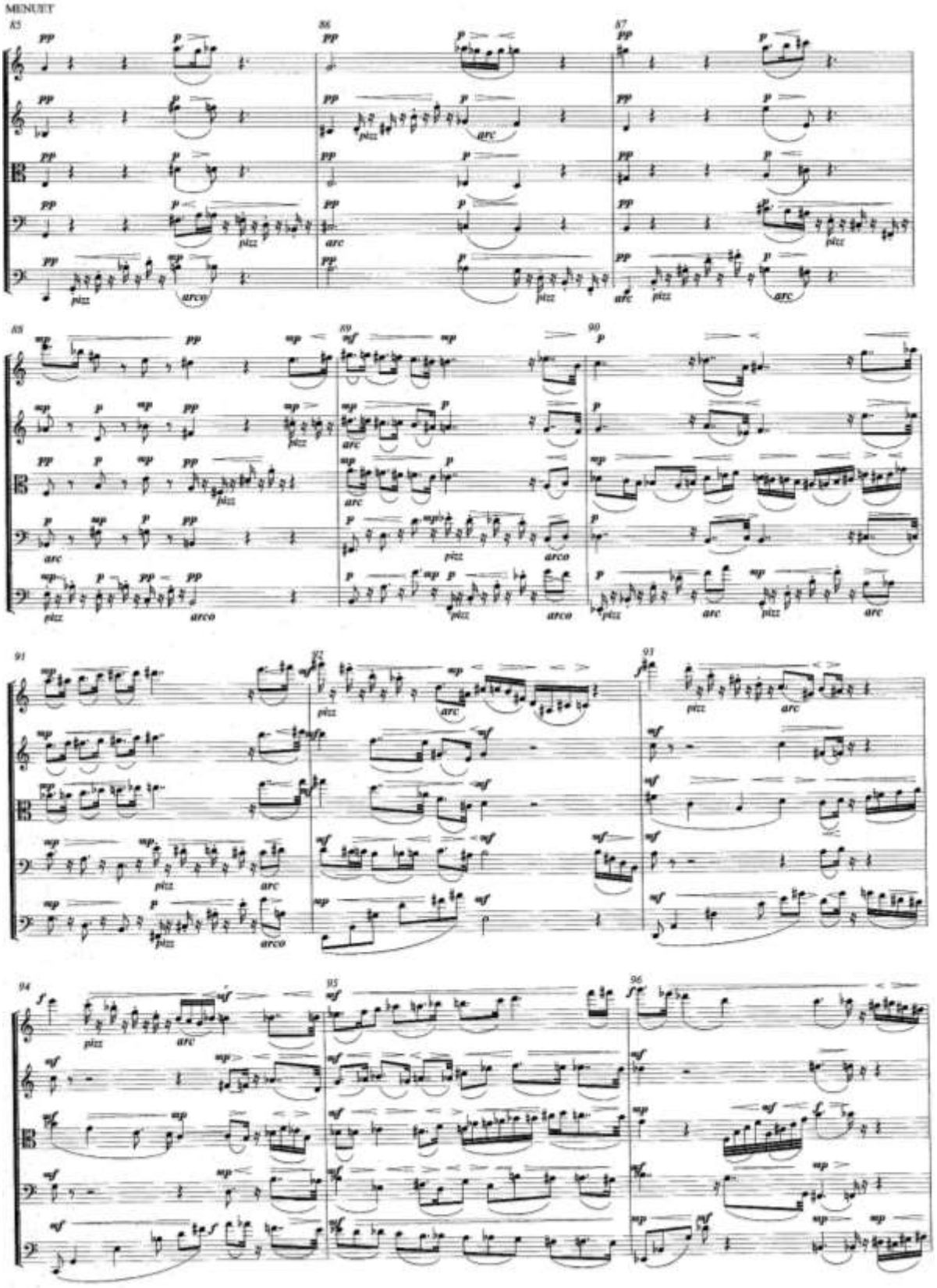
Walzer is the German word for Waltz. This one, following on a slight *ritenuto* in the previous dance's 87 bpm, begins at 90. Its rhythmic structure divides the bar into four units of three quavers each. The most audible melody begins in the First Violin with dotted quaver, semiquaver, quaver, the same again, three quavers, the same again, and two dotted crotchets, producing a lilting effect. At the same time, the theme is stated by the Double Bass, Cello and Viola. The harmonic development is relatively simple, as is the melodic, producing a feeling of lightness and gaiety. The theme is restated in the final bar.



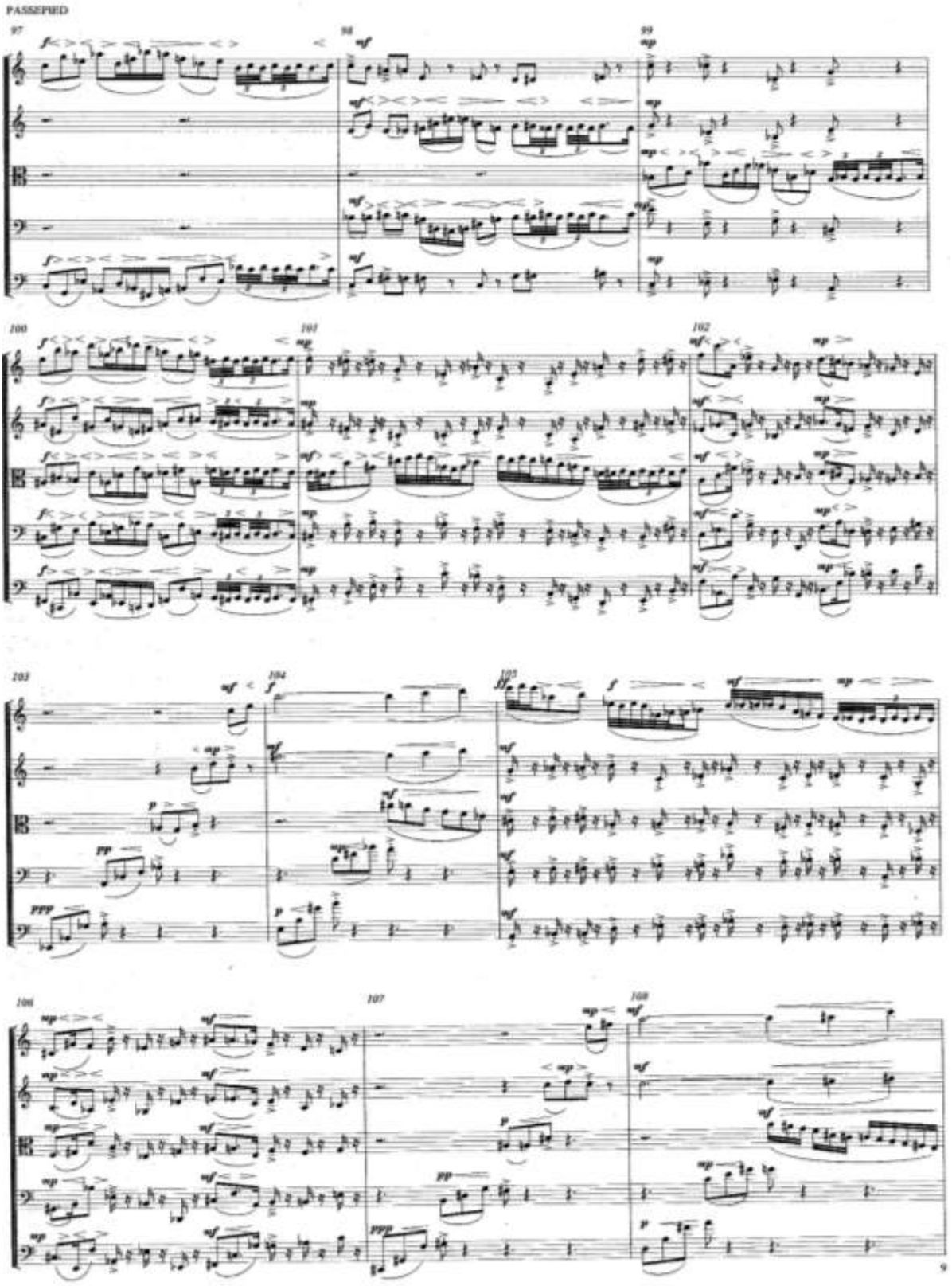
Siciliana, modelled on a Baroque dance of that name, slows down to 80 bpm. Rhythmically, its bars consist of six crotchets, with the stresses and melodies so arranged that it divides into 2 units of 3. It states the theme in a rhythmic form which will be used as the basis, with slight modification, for that of the fugue: crotchet, dotted crotchet, quaver, crotchet, dotted quaver, semiquaver, two triplets of semiquavers. While not itself strictly contrapuntal, it suggests counterpoint in the way it develops the theme, with some instruments playing inversions of it, while others play iterations in various keys. It does not aim at harmonic comprehensiveness, but does include a fair number of minor keys, minor thirds, and ninth chords. In the tenth and eleventh bars, it introduces a flourish of semiquaver triplets, played in turn by each instrument, from First Violin to Double Bass, leading into the *Fandango*.



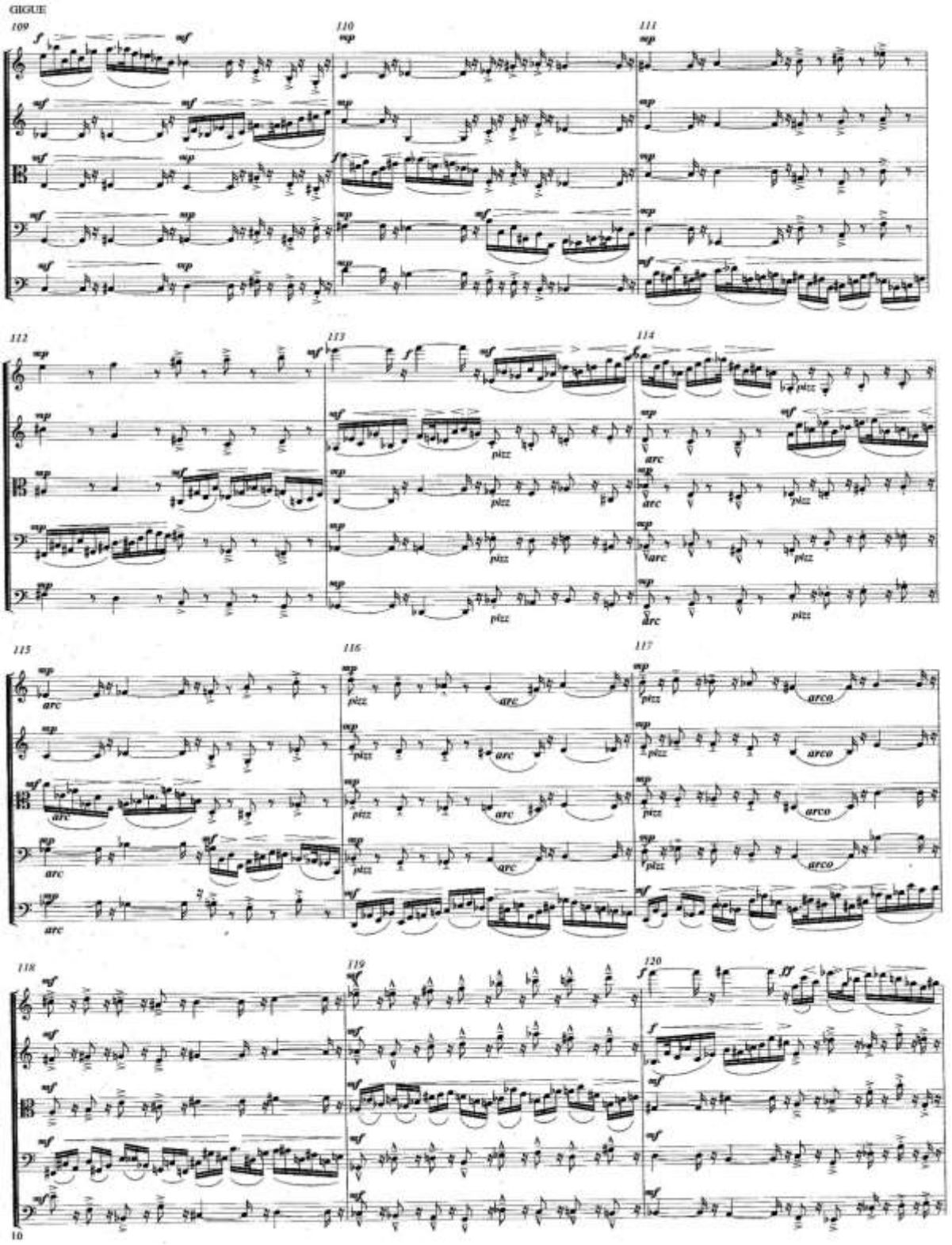
Fandango is a Spanish dance, of which Soler's, here alluded to in counterpoint, may be best known. This fandango, at 86 bpm, is not as fast as some, but not as slow as others. Its bars divide into four units of three quavers each. The rhythm is dotted, and complex. The melodic texture is contrapuntal. Its harmonic spectrum is wide ranging but not programmatically arranged. Each of the different voices plays some permutation of the theme in turn, throughout the twelve bars. At one point, in its seventh bar (bar 79 of the whole of *Danzas*) it imitates the alternate hand-clapping proper to Flamenco.



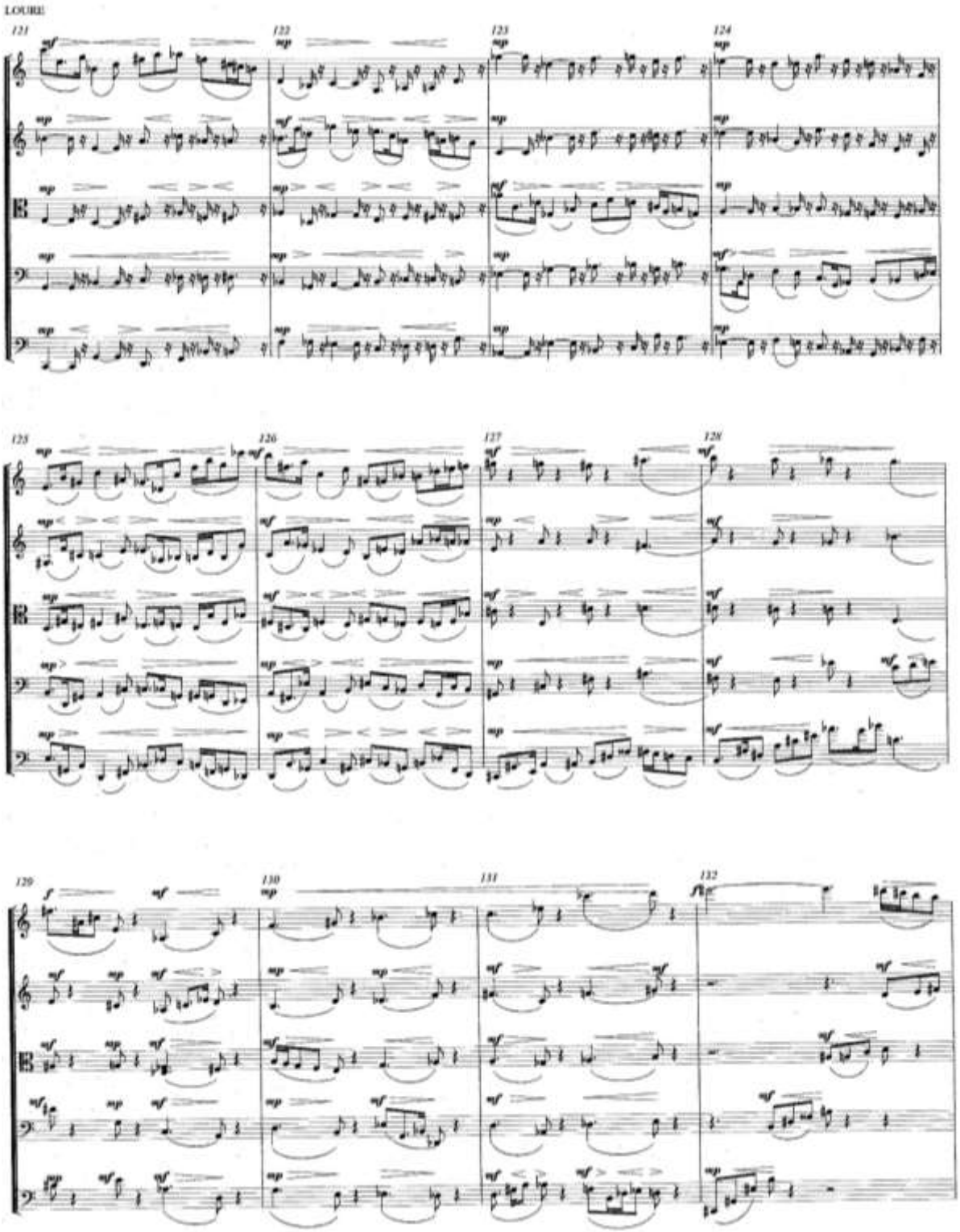
Menuet, the French word for Minuet, slows down to 80 bpm. After the intensity of the Fandango, it brings light relief. Its bars are divided into two units of three crotchets each. Its harmonic range is broad, and not programmatic. It is more melodic than contrapuntal. Permutations of the theme are present, but not obvious. The alert listener will hear allusions to minuets by Mozart, Beethoven and Boccherini.



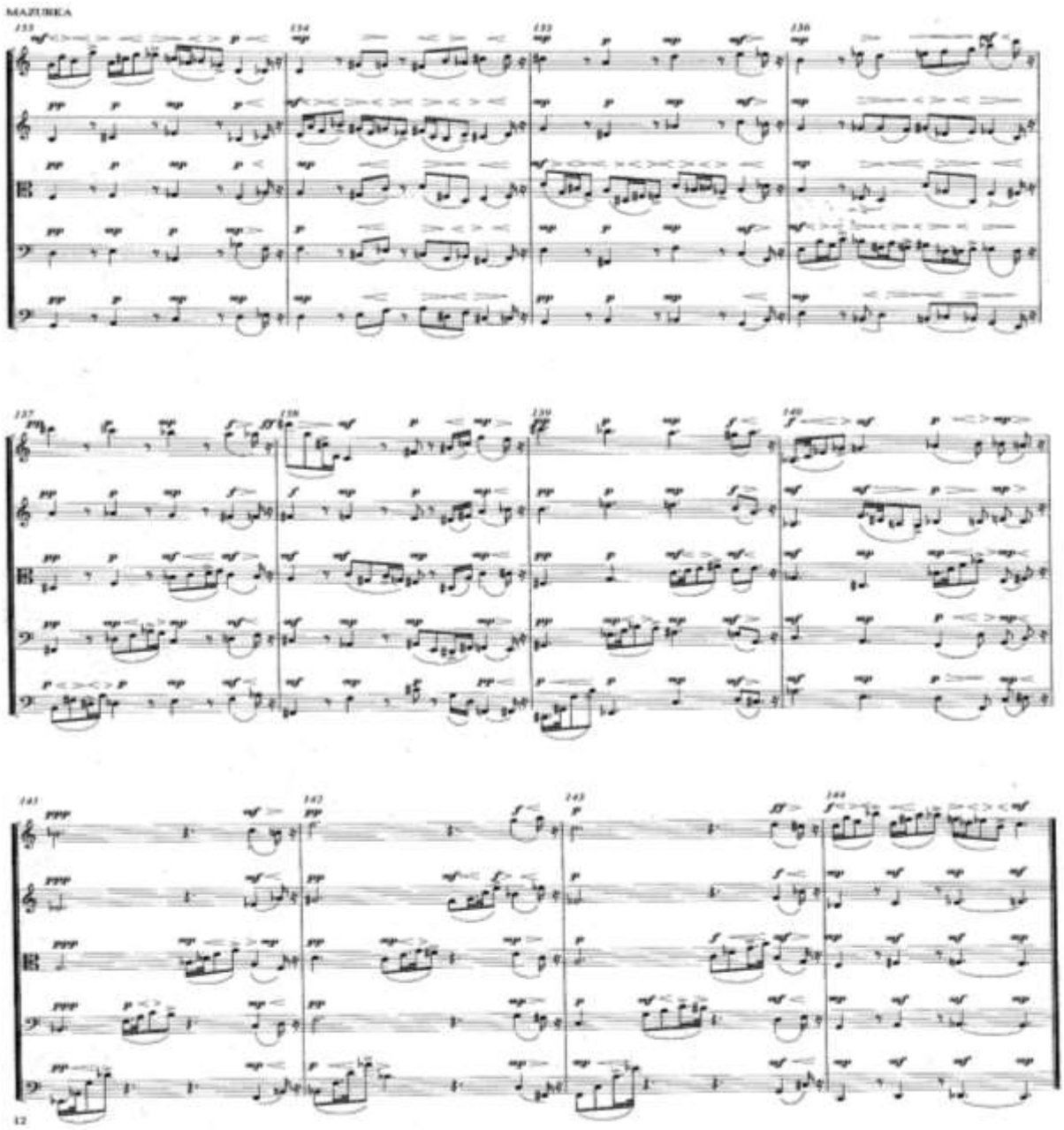
Passepied, as its name suggests, goes for a walk. It is a slow, leisurely walk, beginning at the 70 bpm of *Zarabanda*. Its bars divide into four units of three quavers each. Stating the theme, it pauses, trilling on the last, leading note, as if to consider something seen along the way, before moving on to the next bar. It speeds up, then slows down, then picks up pace again, on its apparently random course through permutations of the theme in various keys, ending at 78 bpm with a *ritenuto*, leading into the *Gigue*.



Gigue, at 96 bpm, is the quickest of these dances. Its bar, like that of the preceding *Passepied*, divides into four units of three quavers each. The theme is stated, then goes through 23 permutations, played in turn by each instrument, alternating, as it were, in a relay, or reel, with semiquavers, often dotted, followed by hemi semiquavers (*thirty-second notes*), in groups of six, four, or three. Its harmonic progression, ascending, to begin with, chromatically from C to G, then roaming freely, eventually touches every key, explores every form of minor third, and plays some complex harmonies.

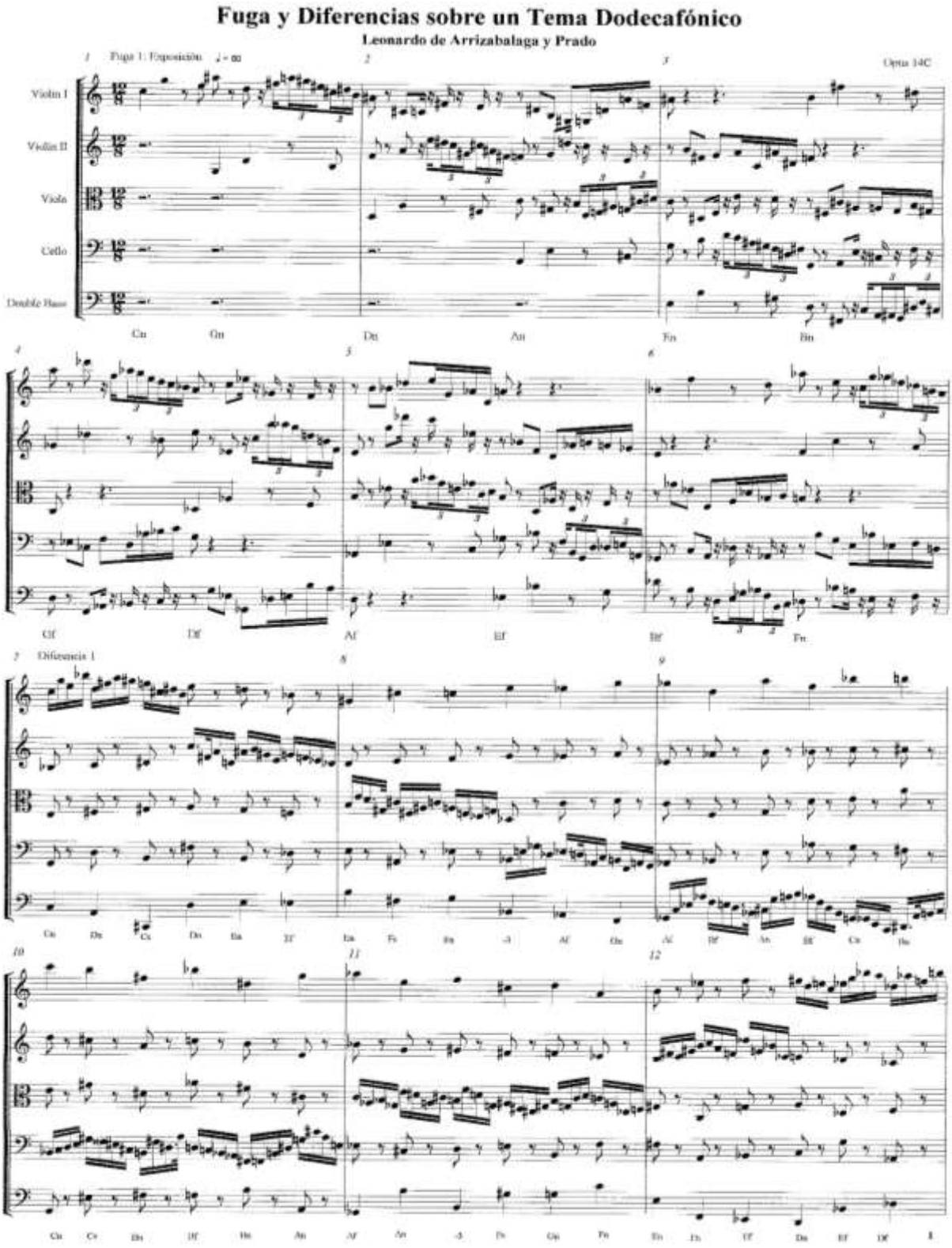


Loure, at 76 bpm, provides a much slower pace for dancers to wind down with. Again its bar subdivides into four units of three quavers each. It is remarkable how the same structural subdivision of beats can sound so different at different speeds with different values of notes. Those of *Loure* are mainly quavers, dotted quavers, and crotchets, with occasional semiquaver duplets. It also incorporates, towards the end, crotchet value rests. Permutations of the theme are played in every bar, sometimes by one instrument or other, sometimes shared among three or four. It covers a fairly full harmonic gamut, with major and minor keys, minor thirds, and complex harmonies, but not in any predetermined order.



Mazurka, a Polish ternary dance stressed on the third beat, played at 80 bpm, borrows the semiquaver duplets of *Loure* to establish its basic rhythm: semiquaver duplet, quaver, stressed quaver, all repeated three times, followed by a crotchet slurring to a semiquaver and a semiquaver rest. This pattern allows for statement and permutations of the theme, present in every bar, with the last two notes and a rest to spare. Again, as in *Zarabanda*, the bar is more extensive than the theme. The harmonic progression at the beginning of bars, beginning with G, follows the circle of fifths, upward, then of fourths, downward, so that all the major keys are covered. There are transitional complex harmonies in the middle of bars. The alert listener will hear allusions to various works of Chopin, the master of the Mazurka. This concludes the dance suite *Doce Danzas Dodecafónicas* in C, the key of its beginning, and of the fugue.

Doce Danzas Dodecafónicas, the second part of *Dódeca*, thus concluded, distinguishes between the main theme or melody, and its harmonic accompaniment. In these dances, while the theme is stated, iterated and permutated in various melodic and rhythmic forms, some of them contrapuntal, the harmonic accompaniment remains subordinate to the melody. In this respect, *Doce Danzas* follows the pattern of Classical, rather than Baroque music. It uses counterpoint, but is not shaped by it.



Fuga y Diferencias sobre un Tema Dodecafónico, the third part of *Dódeca*, is shaped by counterpoint. Comprising 144 bars of music lasting about ten minutes, it is not, however, all strict fugue throughout. To enhance variety and quicken interest, it alternates sections of strict fugue and free counterpoint. Its sections of free counterpoint are called *Diferencias*: Renaissance Spanish for contrapuntal variations. *Fuga y Diferencias* has six sections of strict fugue, and twelve *Diferencias*. All develop the same theme. The theme is taken from *Siciliana* in *Doce Danzas*. Rests are introduced into that theme to let the music breathe. Thus the theme of *Siciliana* becomes the subject of the fugue in *Fuga y Diferencias.*

Dódeca: Leonardo de Arrizabalaga y Prado, Opus 14, for String Quintet

Composing a dodecaphonic fugue involves developing a novel theory of fugal composition. Theory is developed through practical experiment, testing and deployment of a new compositional method. This method adopts standard fugal theory, but adapts it to dodecaphony. It adopts the basic micro-structure of standard fugal theory, including subject, answer, and countersubject, as well as its macro-structure of Exposition, Episodes, Development, Counter Exposition and Final Entry. It adapts both sets of theory as opportune, in response to challenges encountered in applying those standard rules to dodecaphony.

This does not relax, but straitens such rules. At the level of macro-structure, with regard to key progression, each fugal section runs at least one lap of the whole circle of fourths or fifths. At the level of micro-structure, meshing the dodecaphonic rule that a theme must have twelve notes, repeating none, with standard rules of fugal composition means that *Fuga y Diferencias* must invent its own rules.

Standard rules demand that any voice entering a fugue 'answer' the subject, imitating it in a closely related key, usually dominant or subdominant. If, moreover, it does so with an exact copy of the subject, albeit transposed, its answer may be called a 'real' answer. If it differs, it is called a 'tonal' answer.

Fuga y Diferencias observes this distinction by dividing the subject into two parts, treated differently. Those two parts are the first three notes of the subject, which are fixed, both in choice and in order, and its remaining nine, which are fixed in choice, but not in order. Choice obeys the rule of using each of twelve notes only once. The first three notes thus give a 'real' answer; the second nine a 'tonal' answer.

This rule, peculiar to *Fuga y Diferencias*, emerges from seeking to harmonise voices dodecaphonically. It follows the discovery, based on experiment, that if one distributes one's twelve notes so that at least three of the longer held, in this case two crotchets and a quaver after a quaver rest, occupy half of the bar, and form a harmonic sequence, thus establishing a key, the remaining nine notes, quavers, semiquavers, semiquaver duplets and triplets, can be so arranged as to harmonise with the first three notes, when played simultaneously with them in another voice, transposed above or below them.

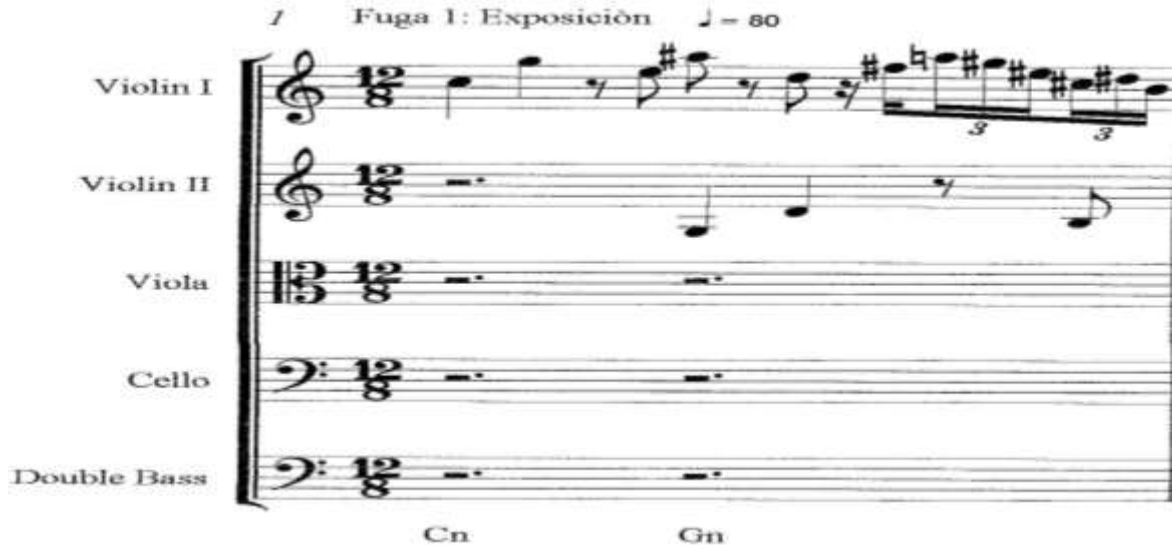
Thus *Fuga y Diferencias* is governed, in its choice of notes, and in their order, by its own rules. These are based on standard rules, adapted for its own purposes. These rules hold that the first three notes in any voice must state the major triad of a given key, in a fixed order: tonic, dominant, major or minor third. The other nine notes are left to be ordered after stating the triad. Their order depends on context. If the triad is major, the fourth note is the tonic's minor seventh; if minor, its minor sixth. Once more than two voices enter, it becomes opportune to let the order of the remaining eight notes range freely, while keeping their rhythmic patterns intact, in order to avoid dissonance and generate harmony.

These rules were developed while composing *Exposition*. They were relevant, at first, only to that part, though they were later adapted and deployed in development, both of fugal parts and *Diferencias*. It was only much later, after the *Episode*, *Development*, and *Counter Exposition* had been composed, that a formula was found whereby one could provide a 'real answer' to the whole of the subject; one that works in every iteration, both in major and minor keys, and does so in combination with the countersubject. That formula, only slightly different from those tried out in *Exposition*, (just as these are only slightly different from the theme in *Siciliana*) is deployed in the last two iterations of strict fugue in *Fuga y Diferencias*: *Penultimate* and *Final Entry*. These may constitute its fullest realisation.

Composing this fugue was an experiment. It was by no means obvious to its author that it would work. Early attempts, such as that with *Exposition*, were hit and miss, trying something, seeing if it worked, adopting it if it did, only to alter it when the next voice or variation of the subject was added to the mix. Thus *Fuga y Diferencias* is the record of a successful experiment, in which music develops organically. It follows a compositional method resembling that of horticulture or animal husbandry, till it produces a stable variety that could, theoretically, propagate itself unchanged in its own form indefinitely.

What follows is therefore an explanation of *Fuga y Diferencias'* compositional method, on which its theory is built. It was developed – or made up - as its composer went along, generating theory from practice, not *vice-versa*. So let me now describe the first two bars in some detail, to show how it works.

The theme is stated in Bar 1 by the First Violin, and occupies the whole of its bar. The bar is rhythmically divided into two halves.



The First Violin plays a C major triad in melodic sequence, C5 G5, E5, in the bar's first half. The key thus ruling that half of the bar is noted under the pentagram as Cn, for 'C natural' The First Violin begins the second half of the bar leaping up to the minor seventh of C5, normally written as B♭5, thus completing melodic statement of a dominant seventh chord on C5. B♭5 is written here as A♯5, because at this point, the Second Violin enters beneath the First with the 'real answer': G3 D4, B3. This iterates the subject in a key, G, normally written with sharps. This makes G rule the second half of the bar. It was decided, for the sake of ease in reading the score, to let the key ruling any given part of the bar dictate its orthography throughout that part of it.

The major triad of G thus fills the second half of the Second Violin's first bar. Its crotchet G3, and the First Violin's quaver B♭/A♯5, theoretically form a minor third, suggesting G minor, albeit at over two octaves' distance. Though G3 stops sounding in the next crotchet beat, the key of G, lingering in the mind's ear, is reinforced by the First Violin's quaver D5 over the Second's crotchet D4. The upper voice leaps over a semiquaver rest within that crotchet beat to F♯5, above D4 still sounding, then to A5, sounding alone. Coming after D5 and F♯5, this progression to A5 suggests a D major triad ascending.

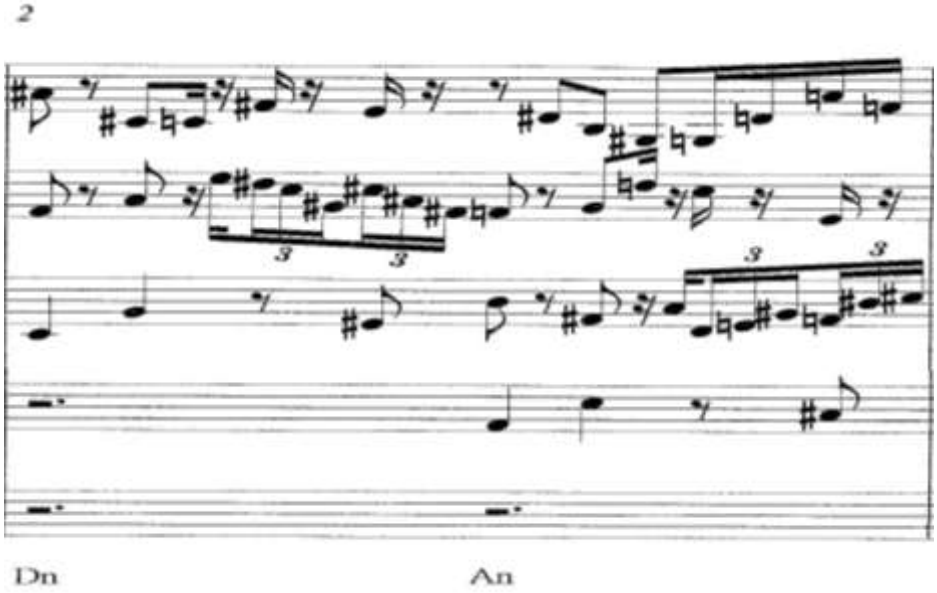
As the Second Violin enjoys a quaver's rest, the First plays a semiquaver triplet, A5 G♯5 E♯5, reaching C♯5, forming a C♯ major triad descending. The First Violin's C♯5, a triplet semiquaver sounding above the Second Violin's quaver B3, spans a major ninth interval. That B3, however, coming in the wake of the descending semiquaver triplet, also suggests a dominant seventh chord in fourth position on C♯5.

Next, the First Violin's D♯5 spans a major tenth interval on the Second Violin's B3, thus suggesting the key of B major. The First Violin's last note, B4, is an octave above the Second's B3.

Thus the first bar provides the model for a harmonic sequence that can be developed in the rest of the fugue: C major triad, dominant seventh of C, G minor third, D major triad, C♯ major triad, B major ninth, dominant seventh of C♯, B major tenth suggesting a B major triad, unison B in two octaves. The two notes which sound in unison in different octaves are D and B, the dominant and major third of G.

B4 is also, of course, the leading note of C5. It could lead to a repetition of the theme at the same pitch, thus setting up a perpetual recurrence. Instead, it leads to B♭/A♯4 in bar 2, beginning to state the countersubject. This is a new dodecaphonic series. It grows out of the search for notes harmonising with the theme or subject, which continues to travel through the circle of fifths, entered upon in Bar 1.

Bar 2 begins with the Viola iterating the subject in D major, which thus rules the first half of that bar. Above the Viola's first note, D3, the Second Violin plays F♮4, which would suggest D minor, were the First Violin not playing B♭/ A♯4. This means that the chord produced is actually B♭ major. B♭ is written as A♯, because D, ruling here, is a key written with sharps. This A♯ is the first note of the countersubject.



The countersubject is stated by the First Violin, and occupies its whole second bar. Its notes are chosen to harmonise with those of the Second Violin, Viola and Cello. So, before analysing the countersubject's compositional method, we must first consider that of the voices beneath it in the pentagram (though not necessarily below it in pitch). Those voices need, to begin with, only harmonise with one another. The countersubject must then adapt to whatever harmonic structure emerges from their interaction.

So, considering, to begin with, only iterations of the subject by the Second Violin, Viola and Cello, without statement, by the First Violin, or iteration by the Second, of the countersubject, we see that the last eight notes of the Second Violin's iteration of the subject differ in order, but not in relative choice, from the First's in Bar 1. This gives a 'tonal' rather than 'real' answer in that part of its iteration. The reason for this procedure will emerge in analysis of the harmonies produced or suggested in this bar.

The first harmony suggested by the Second Violin and Viola with their first notes, D3 and F4, in Bar 2, is, as noted, D minor. So far, therefore, the Second Violin follows the example of the First in Bar 1. The second two notes shared by the Viola and Second Violin are A3 and A4. Thus both voices coincide. So doing, they also follow the pattern of the First and Second Violins at the same point in Bar 1. Where the music begins to differ is with the Second Violin's leap over the semiquaver rest to E5.

The First Violin's corresponding leap in Bar 1 is from D5 to F♯5, a major third. This is from A4 to E5, a perfect fifth. The First Violin in Bar 1 reaches the corresponding perfect fifth in its next note, A5, the first of a semiquaver triplet descending the major triad of C♯5. It does not reach C♯5 till the beginning of the next semiquaver triplet. Here, the Second Violin, having reached its perfect fifth sooner, begins its descent sooner. This allows it to reach its destination, G♯4, sooner, and embark sooner on its next semiquaver triplet, descending the major triad of F♯4, while F♯3 sounds an octave lower in the Viola.

The Second Violin has 'swapped' the note it lands on after leaping over the semiquaver rest for another of those available to it, so that it can now produce two descending triads in succession, both on beat. This simplifies the rhythmic and harmonic structure of its iteration of the second part of the subject, since the note it lands on after the leap, a note of passage, given its position and brevity, now stands outside those two triads' beats, and shifts a dissonant minor second to before the first note of the first.

Thus is harmony preserved, but at the cost of the ninth and tenth chords produced at this point in Bar 1. Since the mix is about to be complicated by the entry of the Cello, such simplification is opportune.

Before considering the Cello's entry, and its effect on the development, let us now address the influence of the countersubject, introduced by the First Violin with A♯4. It was noted above that its effect is to turn the chord suggested by the Second Violin and Viola alone as D minor into B♭ major. The second countersubject note, C♯4, sounding between a crotchet A3 and quaver A4, suggests A major, which, in the second quaver of that crotchet beat, turns, as the countersubject's C♯4 falls to C♮4, into A minor. The Second Violin's leap, during the first half of that quaver beat, over its semiquaver rest, from A4 to E5, sounding in its second half, reaffirms the key of A either way, major or minor.

The countersubject's semiquaver F♯4 turns the Second Violin's first semiquaver triplet, D♯5 C5 (or B♯4) G♯4, which on its own forms a G♯/A♭ major triad, into a dominant seventh chord in fourth position on G♯/A♭. (C is written here as C, for two reasons: because the ruling key is D, which has C, not B♯, in that role; and because there is no such key as G♯ major, which is always written as A♭.) Likewise, the countersubject's semiquaver E4 sounds under the next descending semiquaver triplet in the Second Violin, C♯5, A♯4, F♯4. This triplet, sounding with an F♯3 quaver in the Viola, forms an F♯ major triad. The countersubject's E4 thus enriches that chord, turning it into a dominant seventh chord on F♯3.

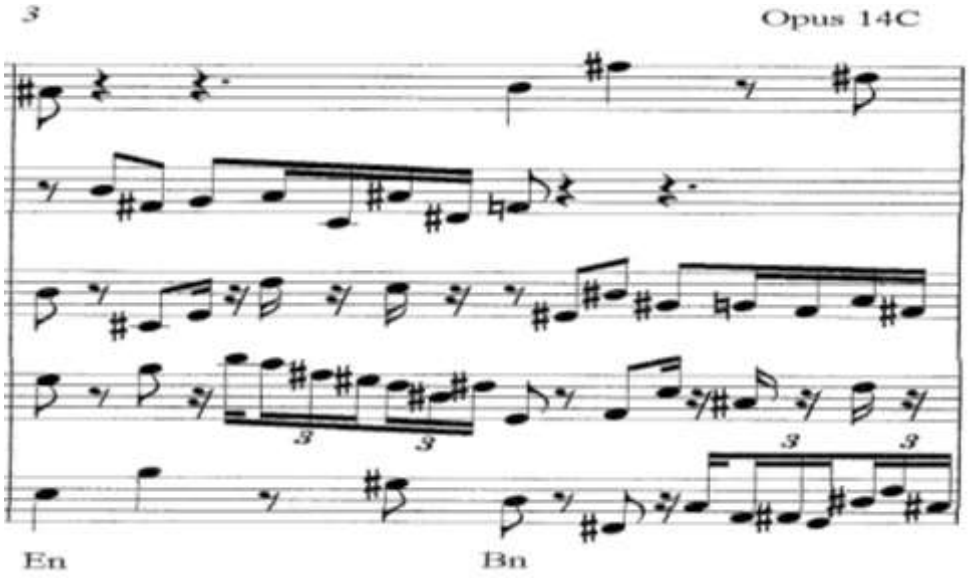
Thus we begin to see what determines the notes and order of the countersubject. It consists of notes that alter, reaffirm, or enrich the harmonies suggested or produced by the interaction of the voices carrying the subject. So the order and duration of its notes are entirely governed by that function. Its notes are wholly determined by what works with the voices below it on the pentagram. It must have twelve notes, with none repeated. That is the only rule, as regards choice of notes and their order. Rhythmic values are chosen to take advantage of the points where the other voices produce harmonies. Rests are liberally used to keep the texture light. No note lasts longer than needed to produce its effect.

The Cello enters the second half of Bar 2 with crotchet A2 E3, quaver C♯3: an A major triad, and a real answer to the subject. A thus rules that half of the bar. Its rule, however, is rendered a mere figurehead reign, in orthography only, by C♮4 in the Viola and F♮4 in the Second Violin, forming an F major triad in second position. F♮4 is the Second Violin's first note in its iteration of the countersubject. Since we have begun to see how it is formed, we can now integrate its description into that of the bar as a whole.

The crotchet A2 held by the Cello tolerates the intrusion of a quaver D♯4 in the First Violin, producing an augmented fourth, the Devil's interval. Thus is 'tolerable' dissonance admitted to the ball during the reign of a weak ruler. But the Cello's following crotchet E3 soon produces a triumphant E major triad, with G♯3 in the Viola, G♯4 in the Second Violin, and B3 in the First. While the Cello's crotchet E3 is held into its second quaver beat, the Viola leaps from G♯3 over the semiquaver rest to semiquaver B3; the Second Violin plays D5, producing a dominant seventh on E3; and the First Violin plays the G♯3 abandoned by the Viola, thus keeping that chord sounding. This is a swap between voices.

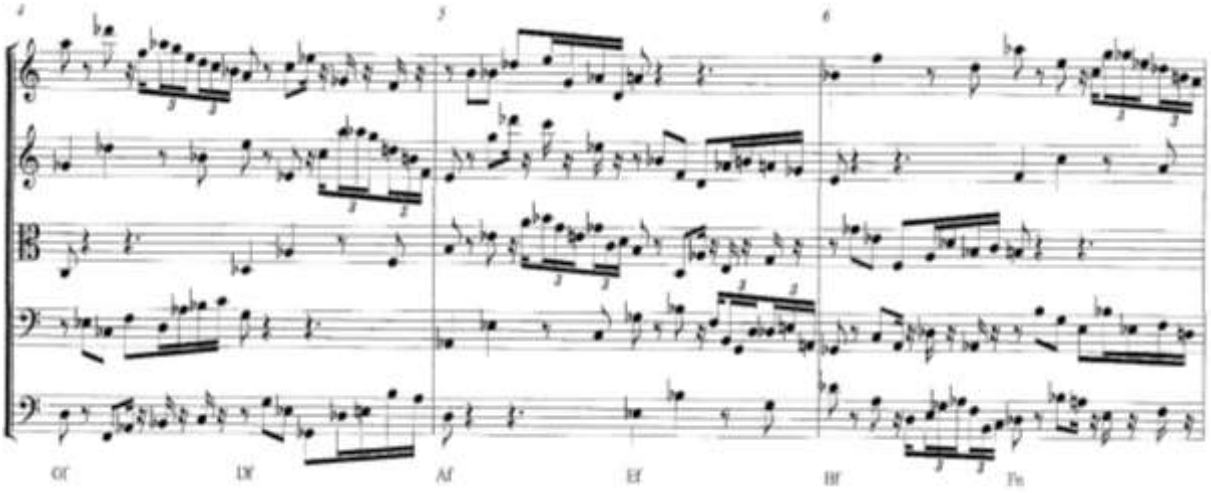
The Cello rests for the first quaver of the last crotchet beat in Bar 2. During that quaver rest, the Viola plays its own variation on the first of two semiquaver triplets: E3 F3 A♯3. The Second Violin plays a semiquaver C5 followed by a semiquaver rest, above the First Violin's semiquaver duplet G3, D4. This produces, in the first semiquaver beat of the Cello's quaver rest, a C major triad in second position. The rest of the Viola's semiquaver triplet, F3 A♯3, together with the First Violin's D4, sounding during the second half of the Cello's quaver rest, produces a fleeting impression of B♭ major, written as A♯. A semiquaver duplet combines with a semiquaver triplet to produce rhythmic complexity.

In the last quaver beat in Bar 2, the Cello plays C♯3; the Viola its second semiquaver triplet, G3 C♯4 D♯4; the Second Violin a semiquaver E4, followed by a semiquaver rest; the first Violin a semiquaver duplet, A4 F4. This produces, in the first half of that quaver beat, a dominant seventh chord on A4 in second position. The rest of the Viola's semiquaver triplet, C♯4 D♯4, together with the First Violin's F4, both played over the Cello's quaver C♯3, produce a fleeting impression of a ninth chord on C♯3 together with a tenth, thus the tolerable dissonance of a major second. It is so fleeting as almost to pass unheard. This is not unlike some passages in Bach's fugues where dissonance occurs. Again, a semiquaver duplet combines with a semiquaver triplet, again producing rhythmic complexity.

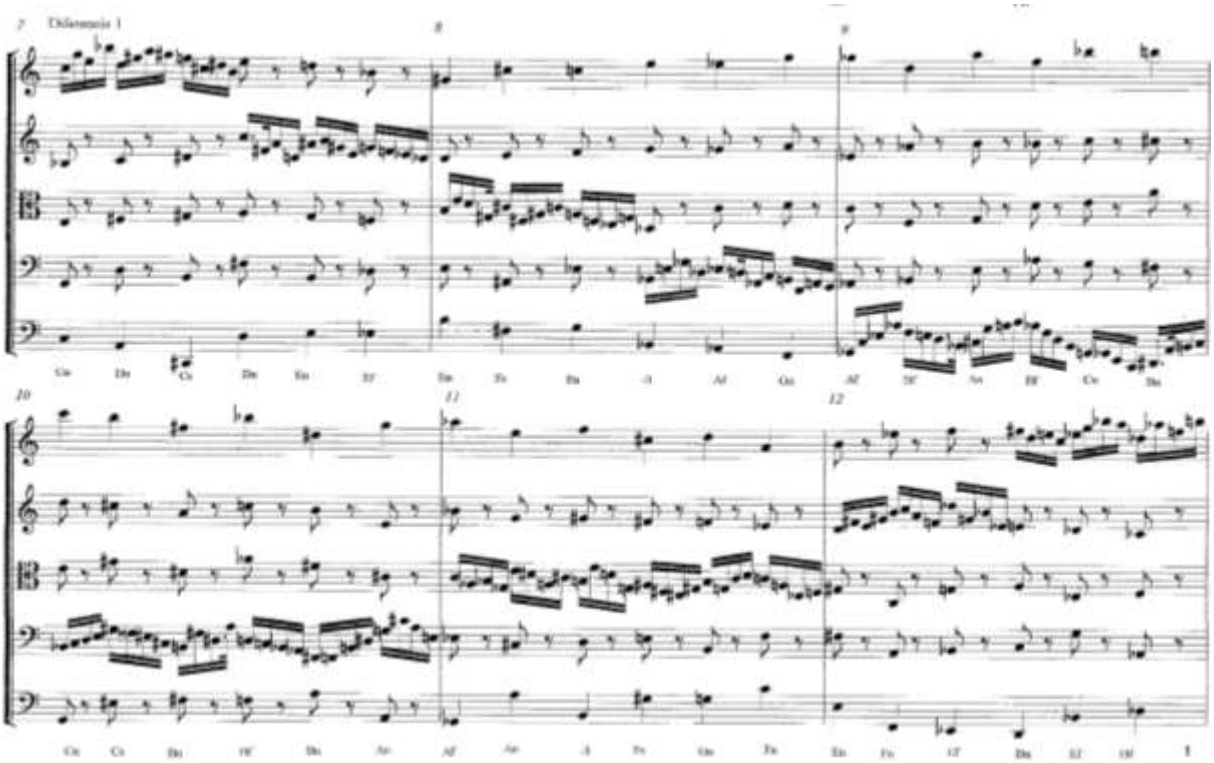


Luckily for writer and readers, it is unnecessary to analyse the rest of *Exposition* in such detail. We have seen its compositional method at work, and so can understand how this generates its theory. It suffices to note that in Bar 3, the First Violin plays a quaver A♯4 before taking a well deserved rest of nearly half a bar, before returning to the fray with a new iteration of the subject: B4 F♯5,D♯5. That A♯4 stands outside both subject and countersubject. Like a note similarly standing outside the initial statement of the theme in *Zarabanda*, it is a punctuation sign, perhaps an exclamation of relief!

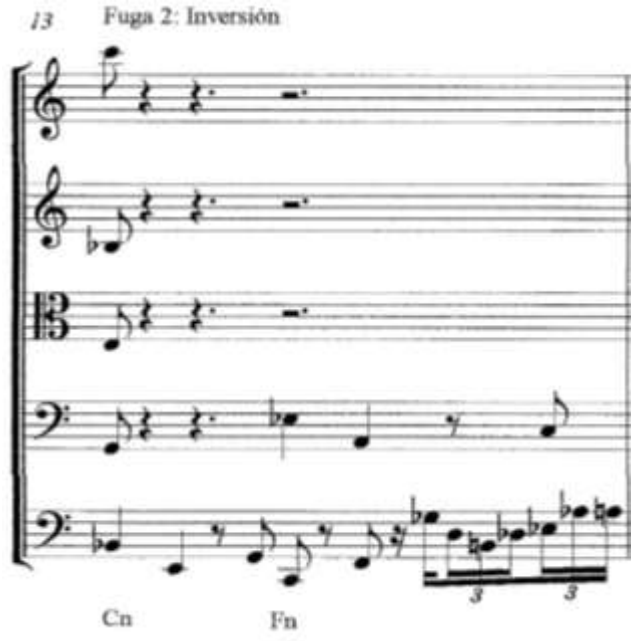
In this bar, the Second Violin iterates the second half of the countersubject; the Viola the whole countersubject. The Cello iterates the second half of the subject, then begins the countersubject, while the Double Bass iterates the whole subject. The first halves of all iterations of the subject remain fixed in the same three note pattern, while their second halves are free in the order of the eight notes after the fourth, but not in their choice. The countersubjects are free in both parts, in both ways. What is fixed for all, and has been from the start, is the rhythmic pattern of the whole.



This regularity, in all its forms, is carried through into the second half of *Exposition*. The rhythmic pattern is clearly visible in the score of its three bars. Here, the orthography reflects the fact that the keys ruling this half of the circle of fifths are all written with flats. Having completed one full lap around that circle, and having given every instrument at least two full engagements with the subject, it is time to leave *Exposition*, its purpose served. This is done without giving any sense of ending. There is neither *ritenuto* nor cadence; just as smooth and imperceptible as possible a transition into the next section.

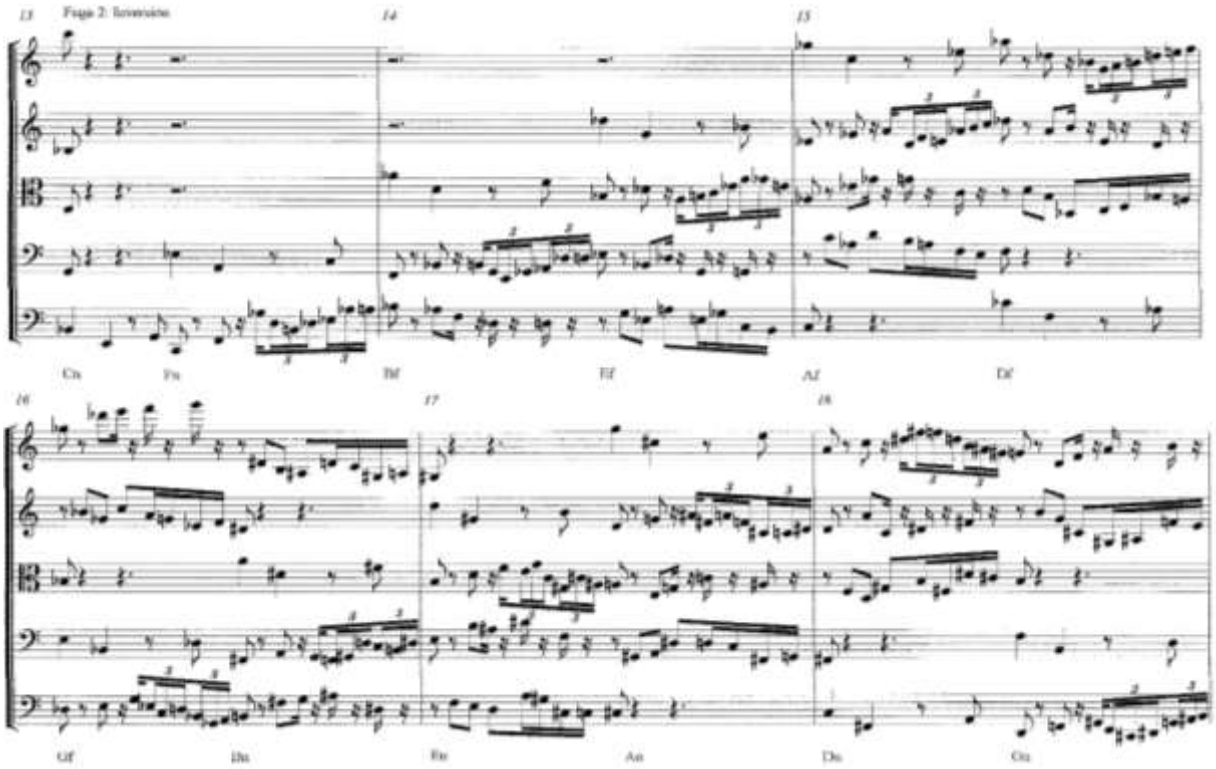


Diferencia 1 is also dodecaphonic. Two sets of three semiquaver quadruplets to a bar iterate variations on the theme, beginning with one identical in order of notes, then differing. The series of crotchets spanning two bars are dodecaphonic. The series of two continuous bars with quavers separated by quaver rests (those of the Second Violin in bars 8 & 9, ditto in 10 & 11, and of the Cello in 11 & 12) are also dodecaphonic. Only the quavers separated by quaver rests in bars shared with semiquaver quadruplets, or in isolated single bars (Viola and Cello in Bar 7, the same in Bar 9, Viola and Double Bass in 10, and Viola alone in 12) are merely harmonic accompaniment. Key progression here is free, but reaches every key. Dotted semiquavers with hemi-semiquavers are introduced in the quadruplets.



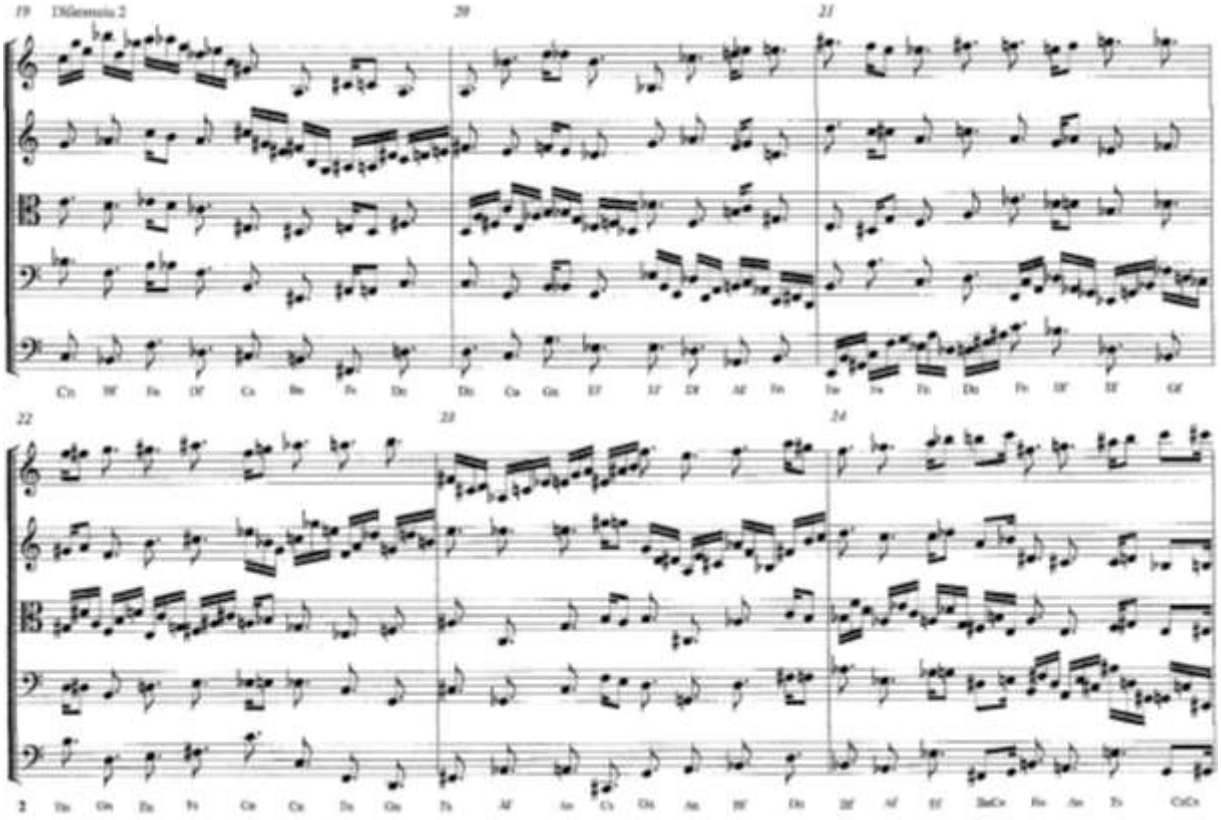
Fuga 2: Inversión, inverts the order of notes in the first half of the subject. The Double Bass, inverting instruments' order of entry, begins its statement of the theme with the dominant seventh note of C, the ruling key, crotchet B♭1, (written, as is usual for that instrument, as B♭2). The rest play a quaver of C's dominant seventh chord: G2:E3:B♭3:C6. This is punctuation.

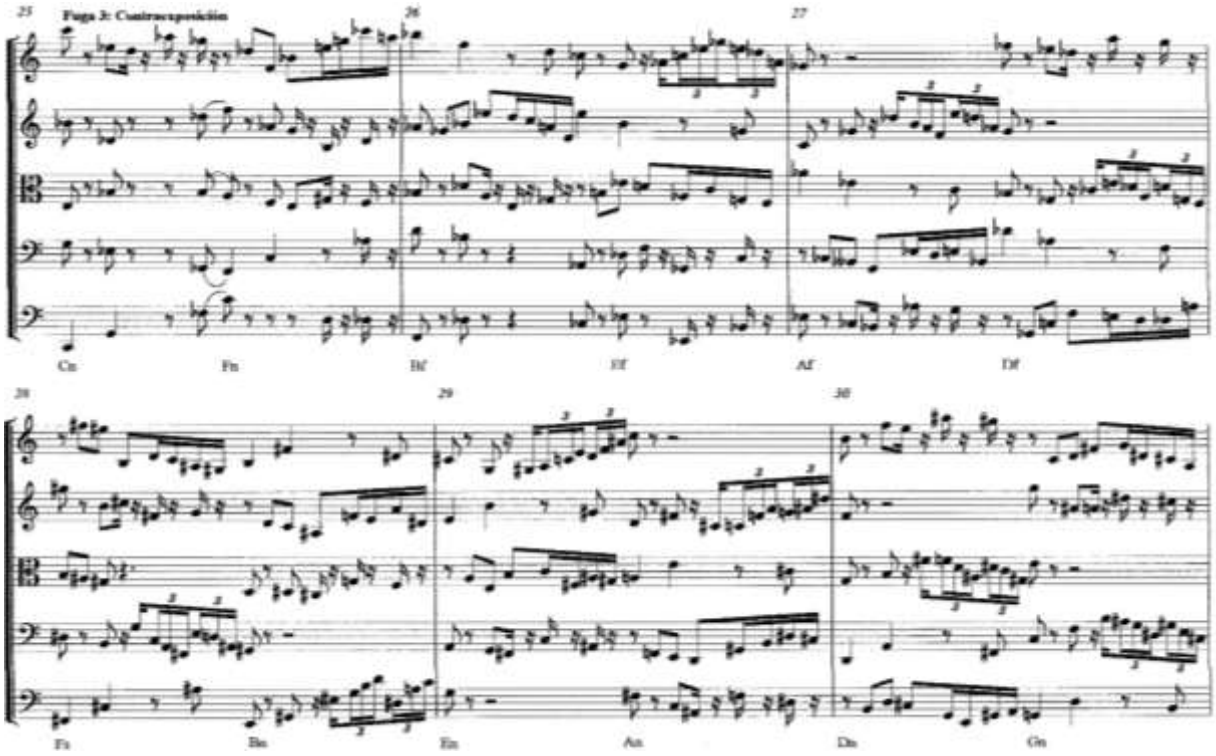
The Double Bass now plays C's major third, E1, its dominant, G1, and tonic, C1, its own lowest note. This tonic note is a quaver played during the first half of the first crotchet beat of the second half of bar 13. It is the dominant note of the next ruling key, F, and is joined by that key's minor seventh note, E♭3, played by the Cello. F's tonic note, F1, played by the Double Bass, and its major third, A2, played by the Cello, sound in the second crotchet beat of the second half of the bar. A by now expected leap over a semiquaver rest takes the Double Bass to G♭2, then into the semiquaver triplets: D B D♭, E♭ A♭ A♮, all in octave 2. Over the second triplet sounds the Cello's C3. The first triplet suggests B minor, then B major; the second A♭ major straining upward.



Thenceforth the same relative harmonic sequence is repeated and developed, with variations in the order of the semiquaver triplets in the second half of the subject. The countersubject fulfils the same function as in *Exposition.* The same rhythmic pattern is observed. Keys progress through the circle of fourths.

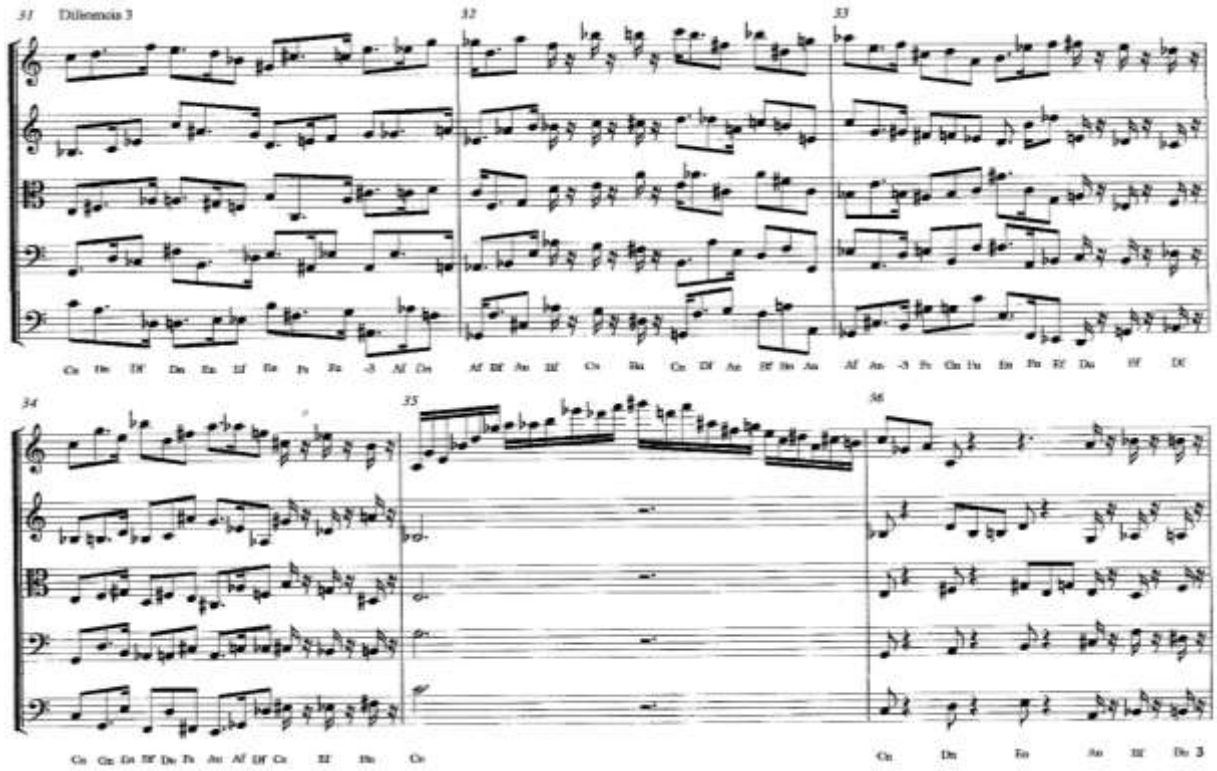
Diferencia 2 divides the theme into four sets of three semiquavers each, generating new variations. Harmonies adjust accordingly, as does the rhythmic pattern. Key progression is free and covers all keys. Though the tempo setting has not changed, if played *portato*, it seems to move quicker and lighter.



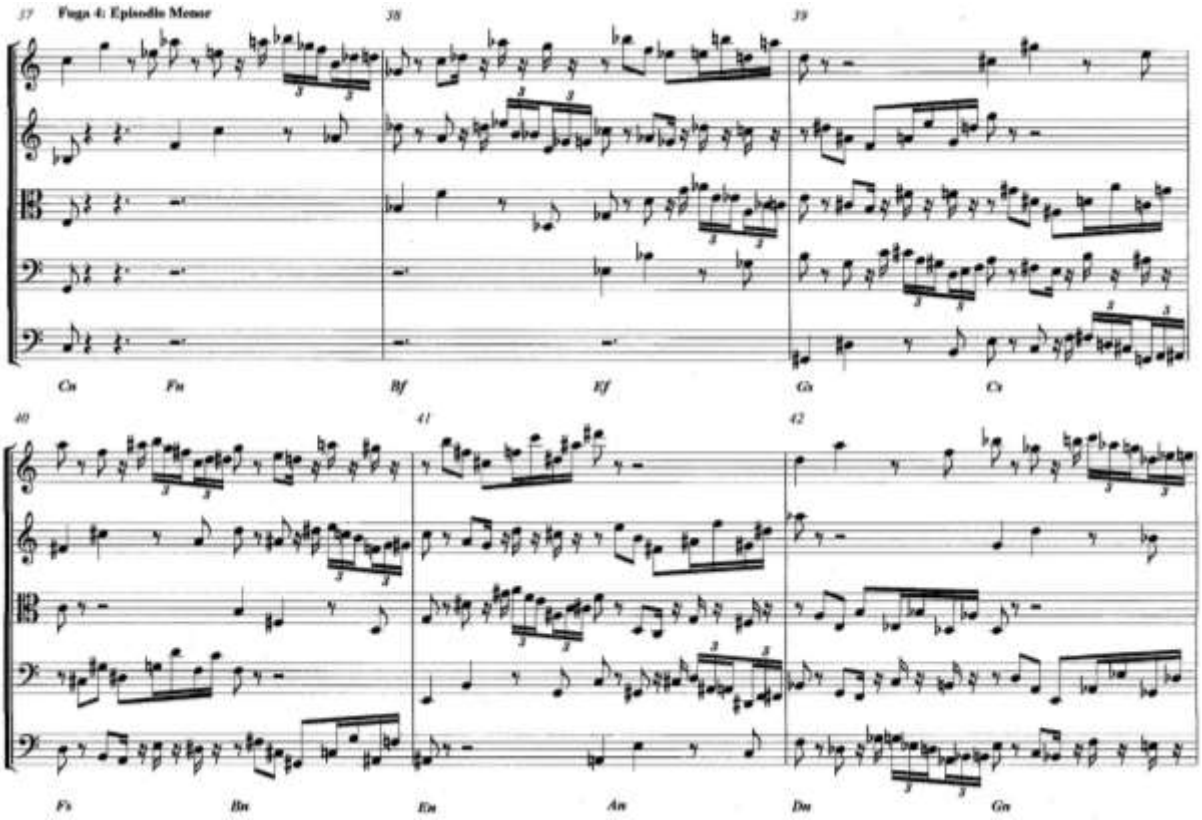


Fuga 3: Contraexposición, inverts the order of subject and countersubject. It adds a few extracurricular notes in the lower voices of Bar 25, to help establish the keys of C and F in the circle of fourths. The rhythmic pattern, and variation in the second part of the subject, continue as before.

Diferencia 3 recovers the rhythms of Bar 79 in the *Fandango*, recalling alternate clapping in *Flamenco*. It explores various harmonic sequences, in an order dictated by the melody, rather than by theory. In Bar 34 it restates the original theme. This is followed by a First Violin solo cadenza, then by a transition.



Fuga 4: Episodio Menor, takes the subject through the circle of fourths in minor keys. These are written below the pentagram, in italics, to indicate that they are minor. The key signature of a minor key is that of its own relative major, its minor third, the third note of the subject in this *Minor Episode*.



In the first half of Bar 37, the First Violin first plays a crotchet C5. The other instruments play quavers to form a C major dominant seventh chord: C2:G2:E3:B♭3:C5. This is punctuation of the previous *Diferencia*. The First Violin, still holding C5, goes on to play G5, E♭5 thus completing a minor triad in the same order as the major triads of the subject in previous episodes.

In the second half of Bar 37, the First Violin plays a quaver A♭5, the minor sixth of C, over the Second Violin's crotchet F4. This minor tenth suggests F minor. The First Violin's E5 quaver over the Second's C5 crotchet is the major third of C. The First Violin leaps over a semiquaver rest to A♮5, above C5, still sounding. This major sixth suggests A minor. The First Violin plays a semiquaver triplet: B♭5 G♭5 F5, as the Second rests a quaver. The turn A♮5 B♭5 G♭5 F5 contains the first four notes of a B♭ minor scale descending. The First Violin's next semiquaver triplet, B4 D♭5 D♮5, the first three notes of a B minor scale ascending, sounds over quaver A♭4 in the Second Violin, producing the minor third of A♭ minor.

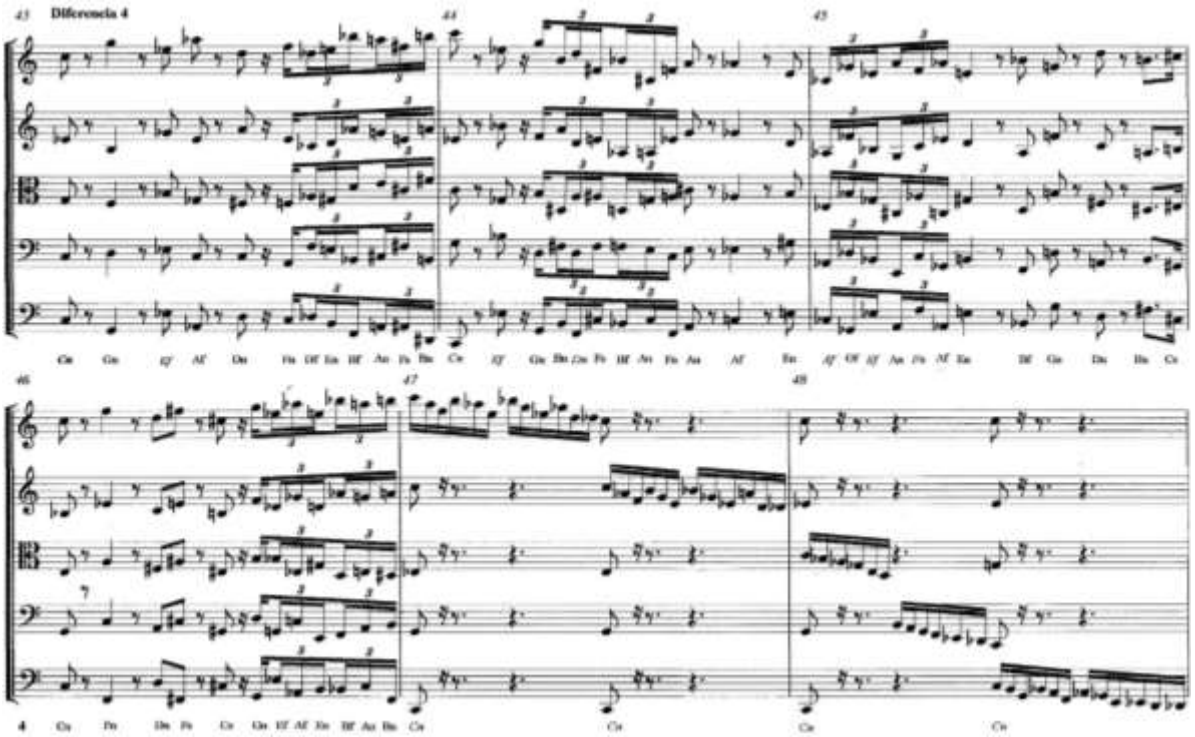
In first half of Bar 38, as the First Violin plays the countersubject, the Second Violin, Viola and Cello develop the subject. Their first chord, B♭3:G♭4:D♭5, is the G♭ major triad; their second, F4:A4:C5, that of F major. As the first Violin's quaver C5 climbs to semiquaver D♭5, A4 is replaces by a semiquaver rest, and F4 continues to sound, this becomes a minor sixth on F, suggesting, however, A major. The Second Violin's leap over a semiquaver rest takes it to D♮5, then E♭5, the start of a semiquaver triplet. The chromatic run from C5 to E♭5 is thus shared between the two violins. E♭5 sounds together with the First Violin's A♭5, an interval of a perfect fourth, belonging, as the next two notes of that semiquaver triplet, C♭5/B♮4 B♭4 confirm, to the key of A♭ minor. Again C♭ is written as B♮ because the ruling key here is B♭ minor. The first note of the Second Violin's second semiquaver triplet, E4, sounds between the First's semiquaver G5, and the Viola's quaver D♭3, forming a minor third chord, reinforced by the

memory, in the mind's ear, of the Second Violin's B♭4 immediately before. The remaining two notes of its semiquaver triplet, G♭4 G♮4, constitute, within this chord, a semitone cadence.

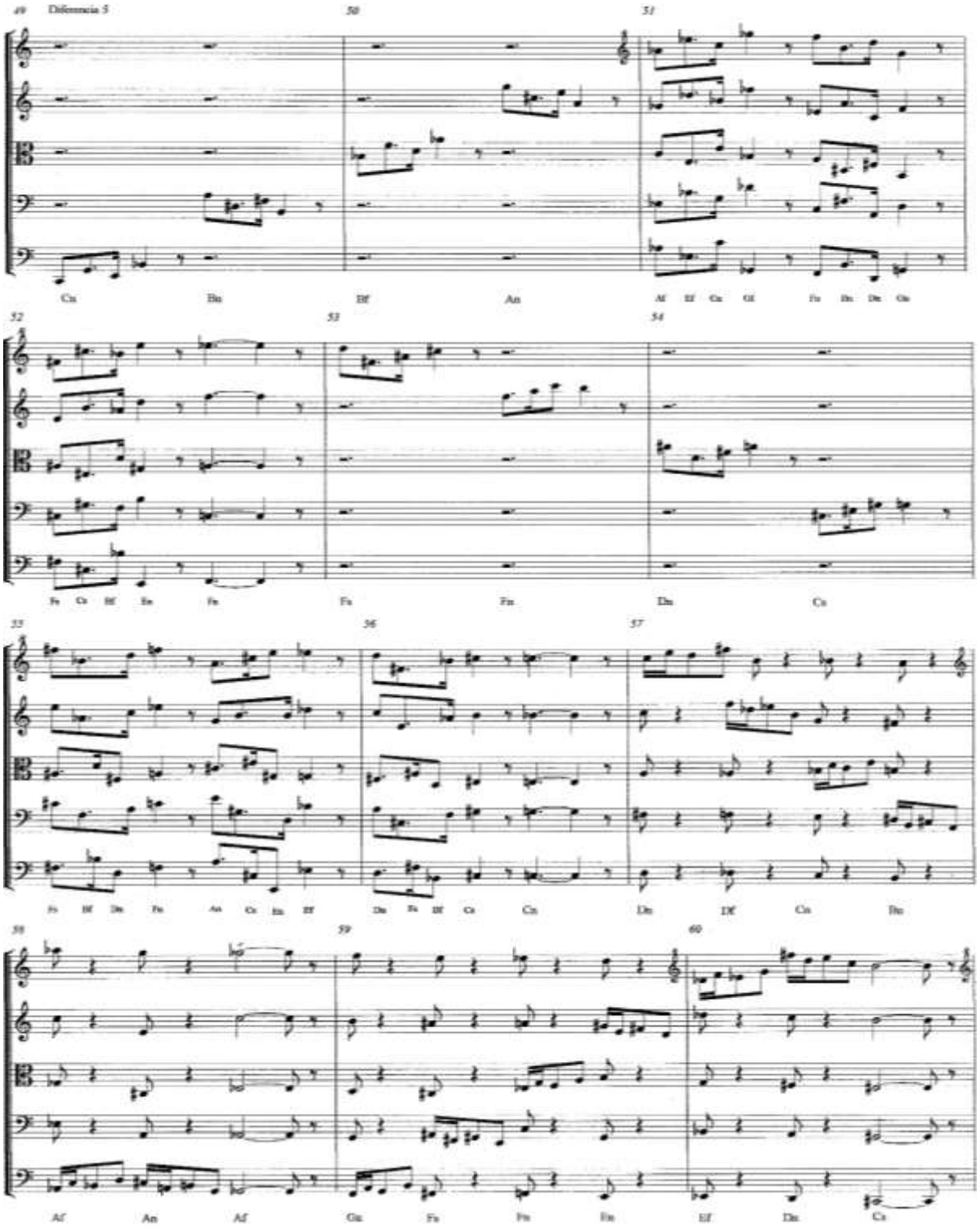
It resolves itself, as the Cello inaugurates the second half of Bar 38, in a C♭ major triad in second position: E♭3:G♭3:C♭5, written so, because the ruling key here is E♭ minor. The First Violin's B♭5, while the Second Violin and Viola rest for a quaver, suggests the chord's transformation into E♭ minor. The next chord, B♭3: D♮4: A♭4:F♮5, is the dominant seventh of B♭ major. It turns, as the Cello's B♭3 is held, the Viola rests for a semiquaver, the Second Violin plays G♭4 and the First E♭5, into E♭ minor. The Viola's leap from D4 over a semiquaver rest takes it to G♮4, sounding over B♭3, under E♭5, producing E♭ major. The Viola's first semiquaver triplet, A♭4 E♮4 E♭4, with the Second Violin's semiquaver D♭5 and the First's duplet E♮5 B♮5, produces a D♭ minor triad and a cadence, E♮4 E♭4 under B♮5, resolving into the dominant seventh of D: G♭4/F♯3:A♮3:C♮5:D♮5. The second triplet A♮3 C♭5 C♮5, under the duplet D♮5 A♮5, produces a cadence resolving itself in the next Bar's opening dominant seventh of E major chord.

Again, it is not necessary to analyse the rest of this Minor Episode in quite such detail. We have seen how the same structural, melodic and harmonic principles work, *mutatis mutandis*, in minor keys.
With *Fuga 4: Episodio Menor*, what may be termed Exposition, Inversion, Counterexposition and Minor Episode, if one seeks to adapt standard fugal terminology to *Fuga y Diferencias*, concludes.

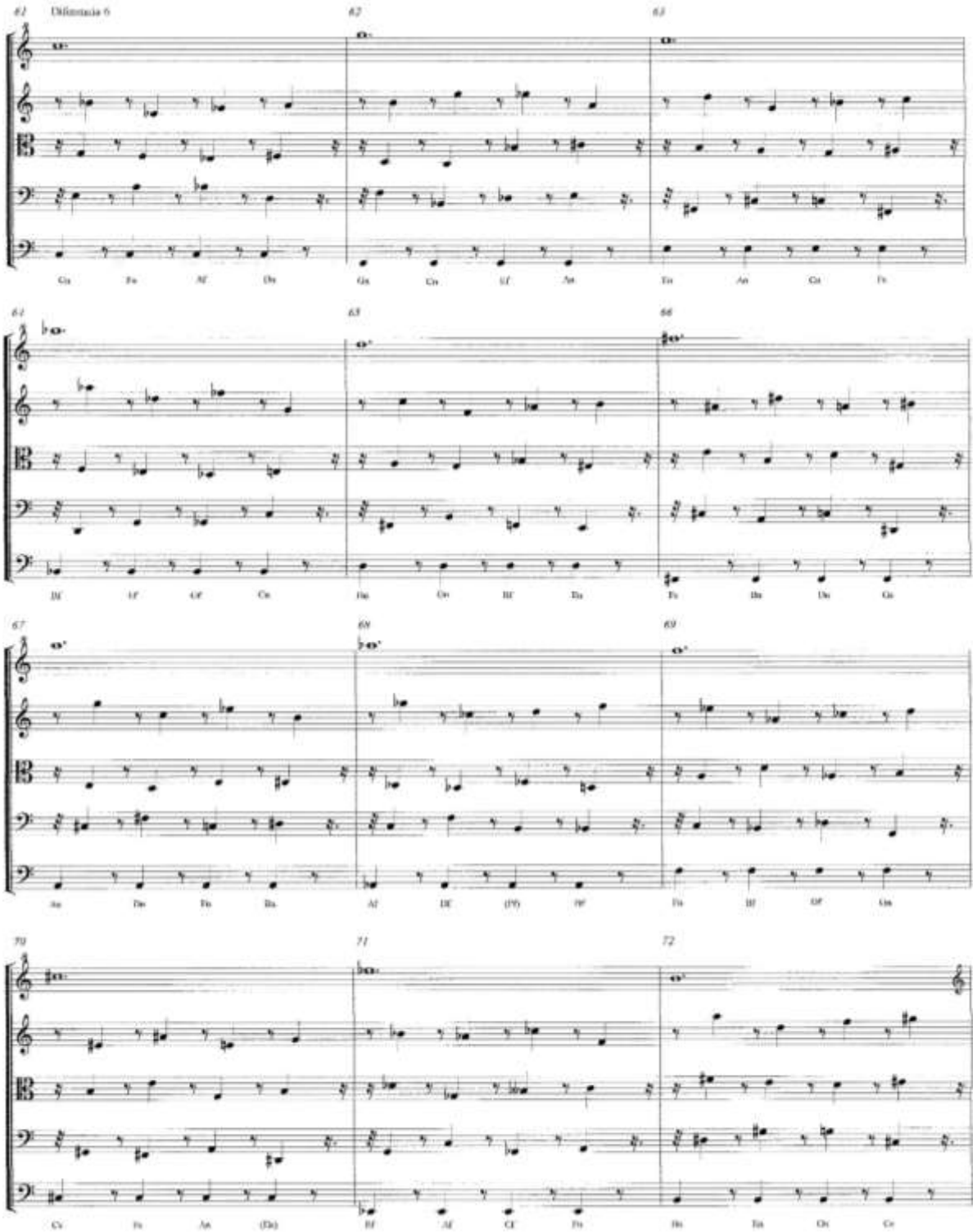
Diferencia 4, beginning in Bar 43, has all the instruments play the theme in choral harmony, in three rhythmic permutations, returning to the original rhythm in Bar 46. Here, since every column of notes is in a different key from that before and after, the key ruling each column is marked, justifying its orthography. In Bars 47 and 48, the instruments play relays of a serial theme, acting as a cadenza.



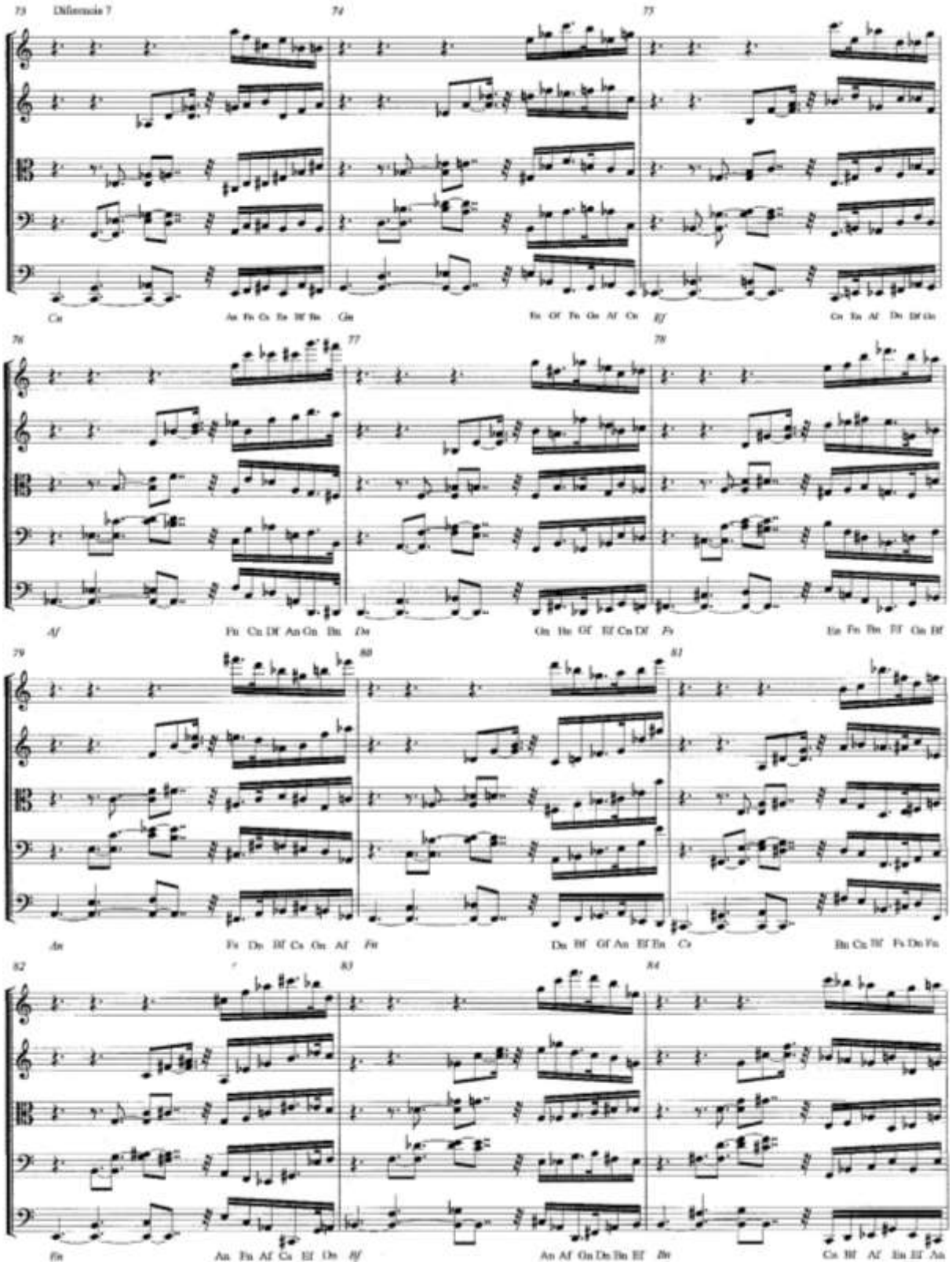
With *Diferencia 4*, the first main part of *Fuga y Diferencias sobre un Tema Dodecafónico* concludes. It has shown that it is possible to compose a dodecaphonic fugue on a serial theme, and to do so harmonically. Whether standard fugal terminology applies to it or not, it has, so far, been a successful experiment. Henceforth, in the second main part, fugal composition as such will be held in reserve, while four *Diferencias*, each of twelve bars each, explores diverse possibilities inherent in the theme.



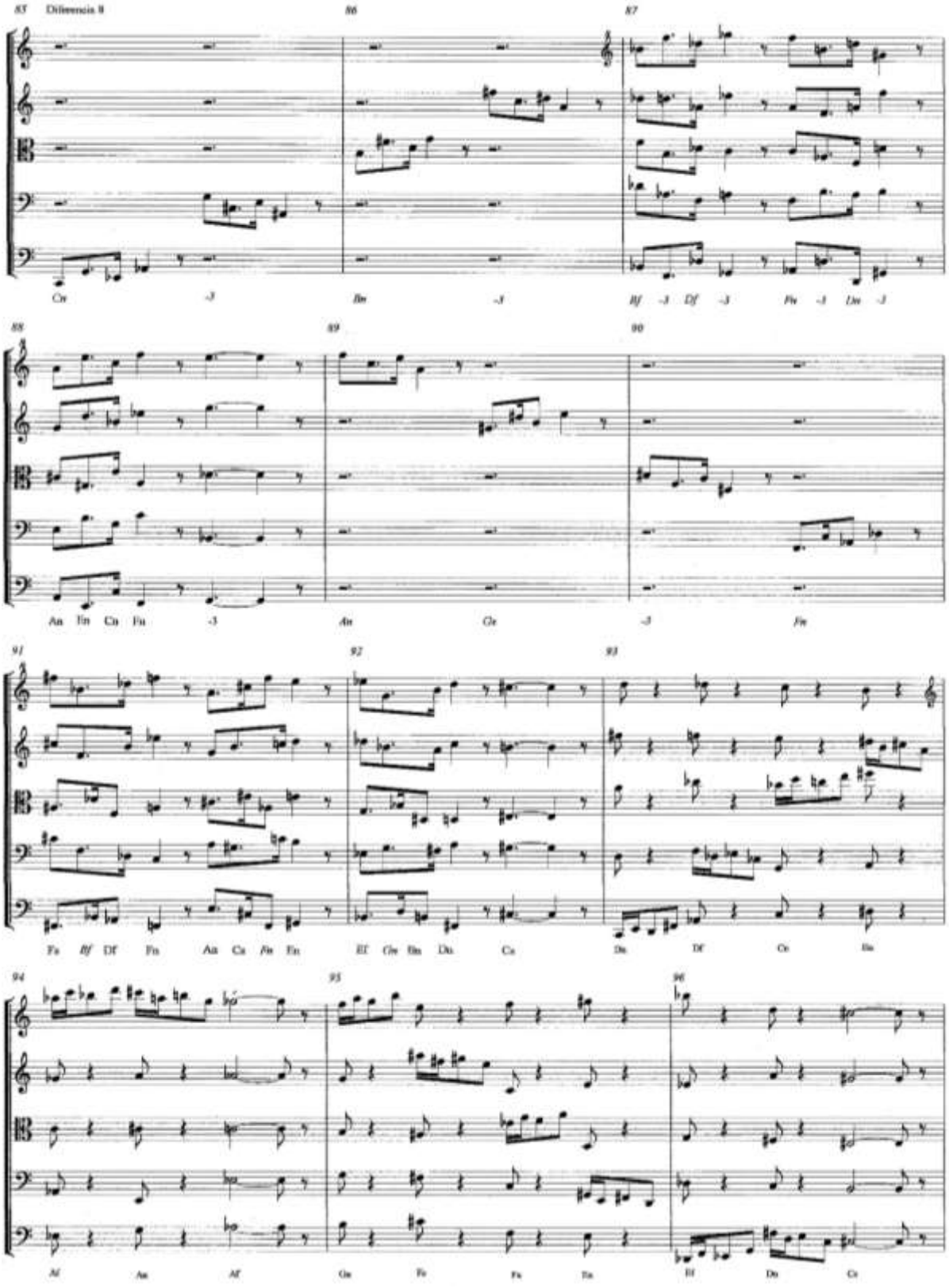
Diferencia 5 dissects the theme into three parts, consisting of four of its notes each. The first, in Bars 49-52, plays the first four notes of the theme forward and backward, in a chromatically descending key progression, ascending melodically to consonant choral harmonies recalling the *Fandango* and *Diferencia 3*. The second, in Bars 53-56, does the same for the second four notes of the theme, descending melodically but not chromatically. The third, in Bars 57-60, borrowing its rhythm from the *Mazurka*, does the same for the last four notes of the theme. It descends a whole chromatic scale, from D to C sharp, melodically descending then ascending.



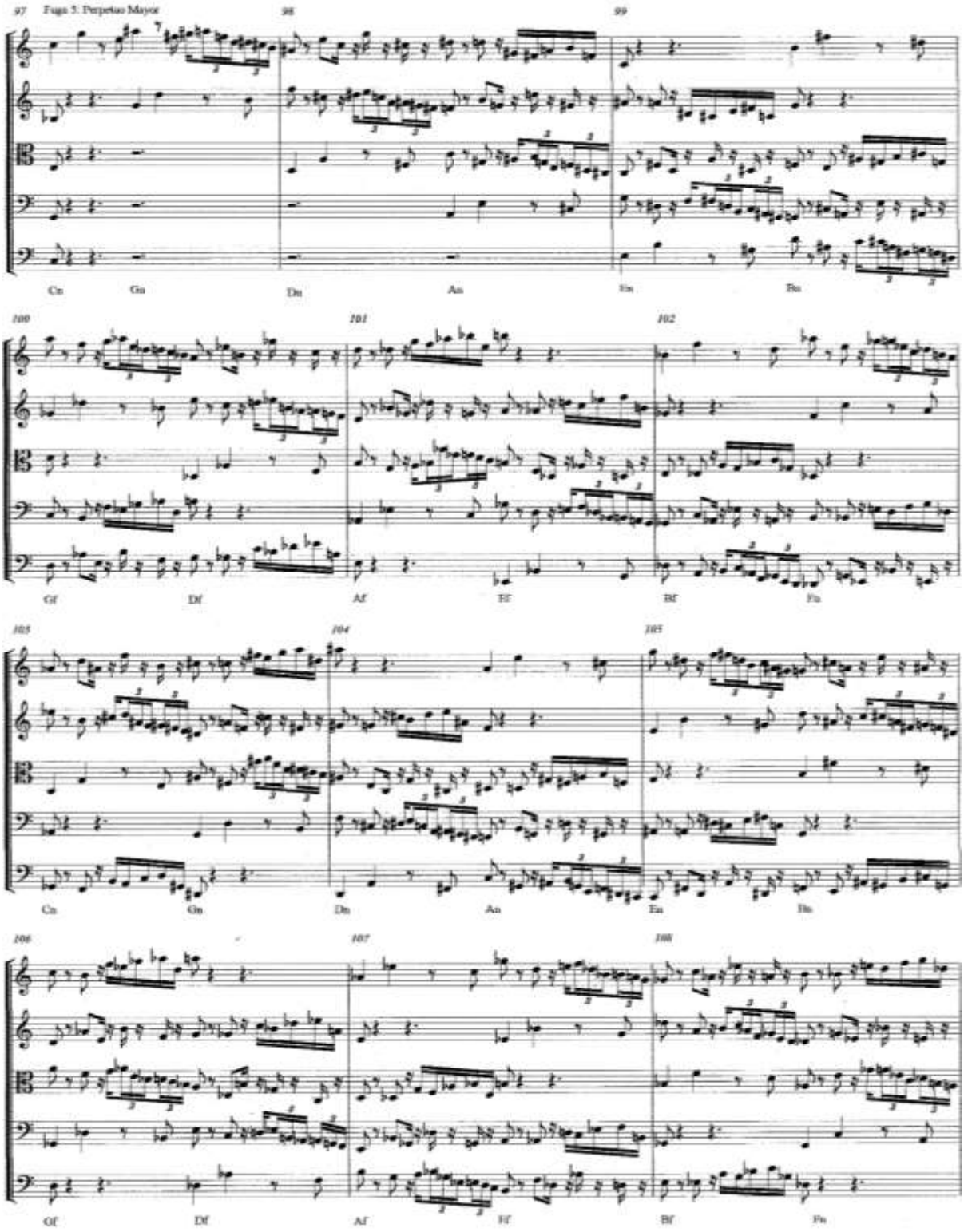
Diferencia 6 follows the overall structure of the *Fanfare*, in giving one whole bar to each note of the theme, played by the first Violin in a pentagram using the superior octave G clef. The other instruments play the four chords from other keys in which the thematic note of the First Violin occupies a place in that key's dominant seventh chord. Thus in Bar 61 the key progression is C, in which C is the tonic, F in which it is the dominant, A flat in which it is the major third, and D in which it is the minor seventh. The same procedure is used for the rest of the notes of the theme. The chords are played pizzicato. This creates a harp-like sound, with the high pitched theme notes sounding ethereal. Although there is no change in tempo marking, this *Diferencia* gives an impression of the music slowing down.



Diferencia 7 follows the example of *Diferencia 6*, in assigning a whole bar to each note of the theme, now in the Double Bass, with five harmonics developing above it as in *Fanfare*. But here the theme is in its minor key version. Moreover, this format only occupies the first three dotted quavers of the bar. The fourth, after a hemi-semiquaver rest, plays columns of semiquaver, dotted semiquaver, and hemi-semiquaver harmonies. The First Violin thus completes the six notes of the theme corresponding to that bar. Again with no change in tempo marking, this *Diferencia* gives a sense of the music speeding up.

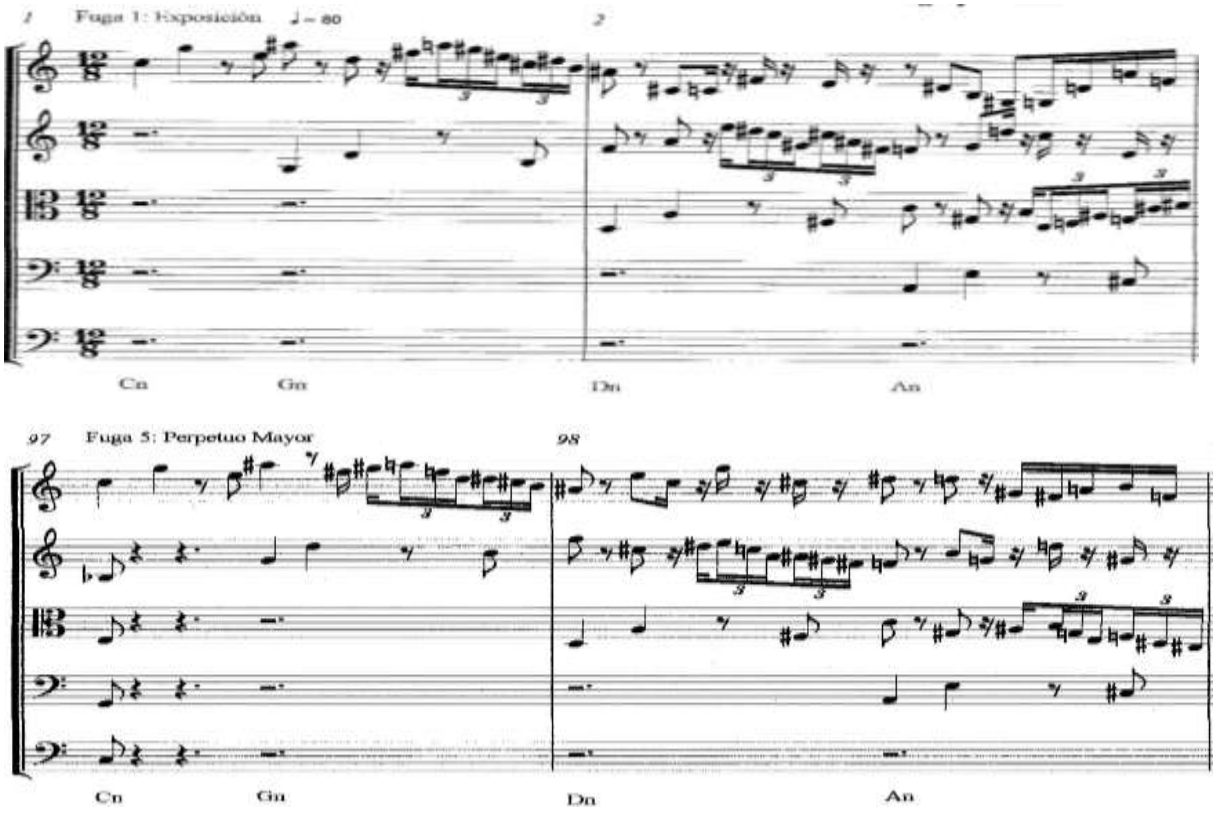


Diferencia 8 follows the basic structure of *Diferencia 5*, but in the minor key form of the theme. This articulates the minor triad, Tonic, Dominant, Minor Third, then leaps from Tonic to Minor Sixth. Thereafter, note order may be freer, but tends to favour minor triads, such as Minor Sixth, Major Third, Minor Second, then Major Second, Perfect Fourth, Major Sixth, leaving Augmented Fourth, and Minor and Major Seventh to be ordered freely. With this, the middle section *of Fuga y Diferencias* concludes.

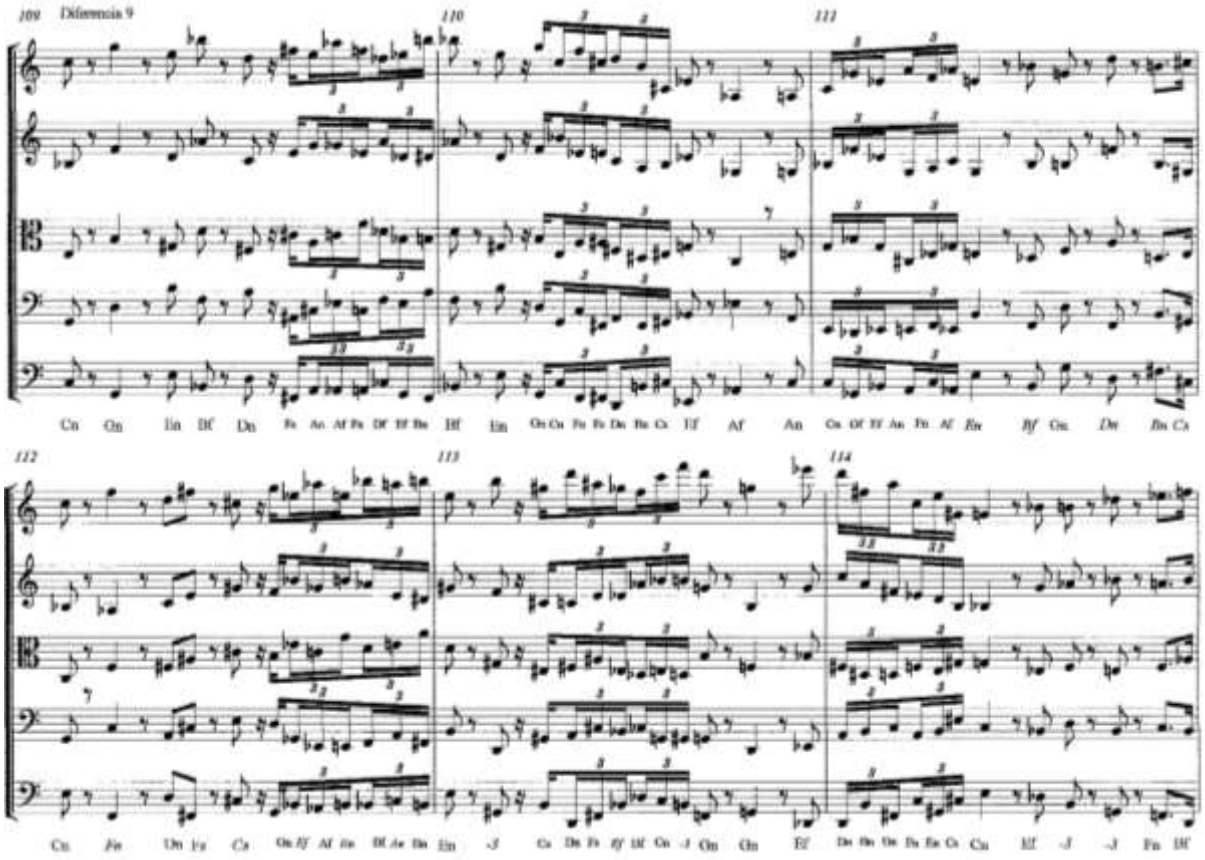


Fuga 5: Perpetuo Mayor manifests the final form, in *Fuga y Diferencias*, of Subject and Countersubject. It is a form which allows the same permutation of these elements to run uninterrupted relays around the circle of fifths indefinitely, theoretically forever, eventually returning to its starting point, defined as when the same instrument, here the First Violin, reiterates the subject in original key at original pitch. *Perpetuo Mayor* does not itself complete the four full laps needed to return to that point. That would prolong it to twenty four bars, and throw out the macrostructure of *Fuga y Diferencias* as a whole. It leaves that completion, and its repetition on into infinity, to the listener's musical imagination.

To understand how this *perpetuum mobile* works, one may compare the subject's original statement, in *Exposición*, with its iteration in *Perpetuo Mayor*. The first four notes of the First Violin in the first bar, A5 G5, E5 B♭/A♯5, are the same in both. The first difference between them is that the Second Violin enters *Perpétuo Mayor* an octave higher than in *Exposición*. Otherwise, the Second Violin's contribution to the first bar is the same. The First's however, is slightly different. Rather than going next to D5, it goes to F♯5. Moreover, this note is a semiquaver, not a quaver, as is D5 in *Exposición*. And it is followed, not by a semiquaver rest, as in the original statement, but by semiquaver G♯5. This goes to A5, thus affirming the key of D major. The semiquaver triplets that complete the iteration of the subject in *Perpetuo Mayor* also differ from those in *Exposición*. Rather than A5 G♯5 E♯5 and C♯5 D♯5 B4, they are A5 F5 D5 and D♯5 C♯5 B4. The first triplet is the triad of D minor, the second a downward run to B in B major. The tonic of that fragment of a scale sounds in the Second Violin, immediately below the First's first note, and coincides with its last. Thus the harmonies also differ.

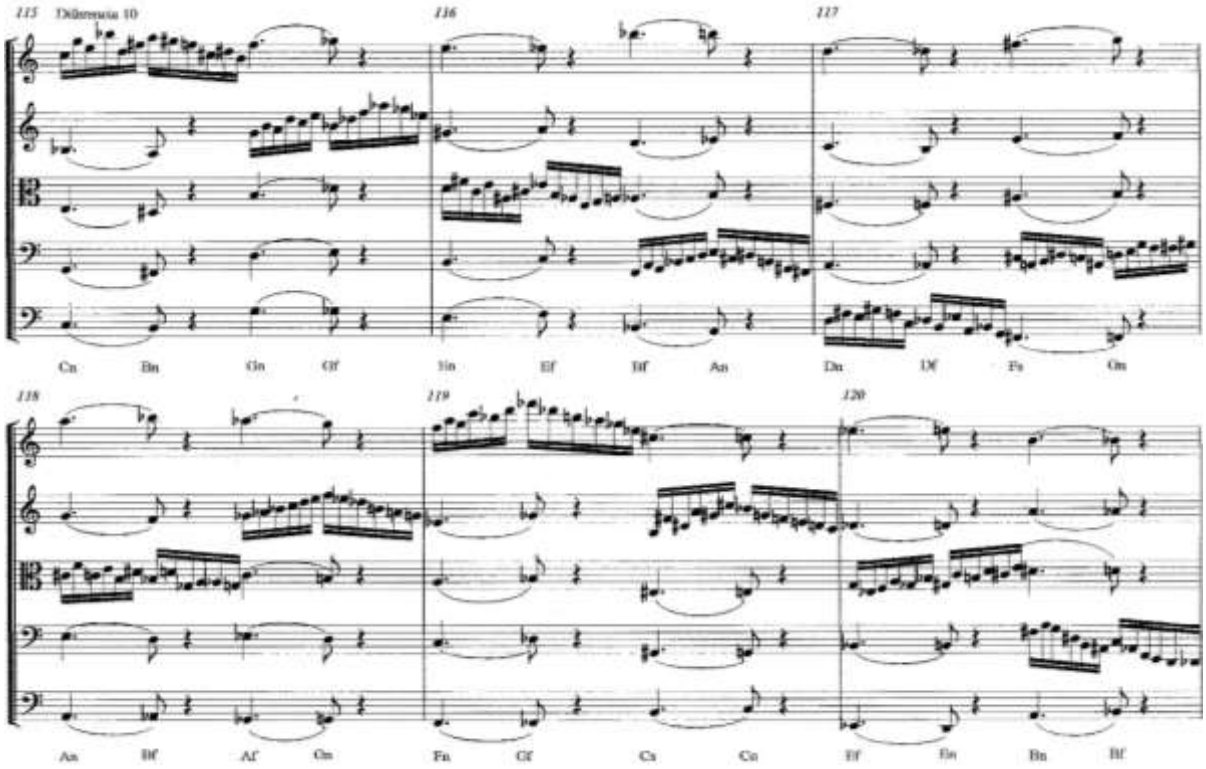


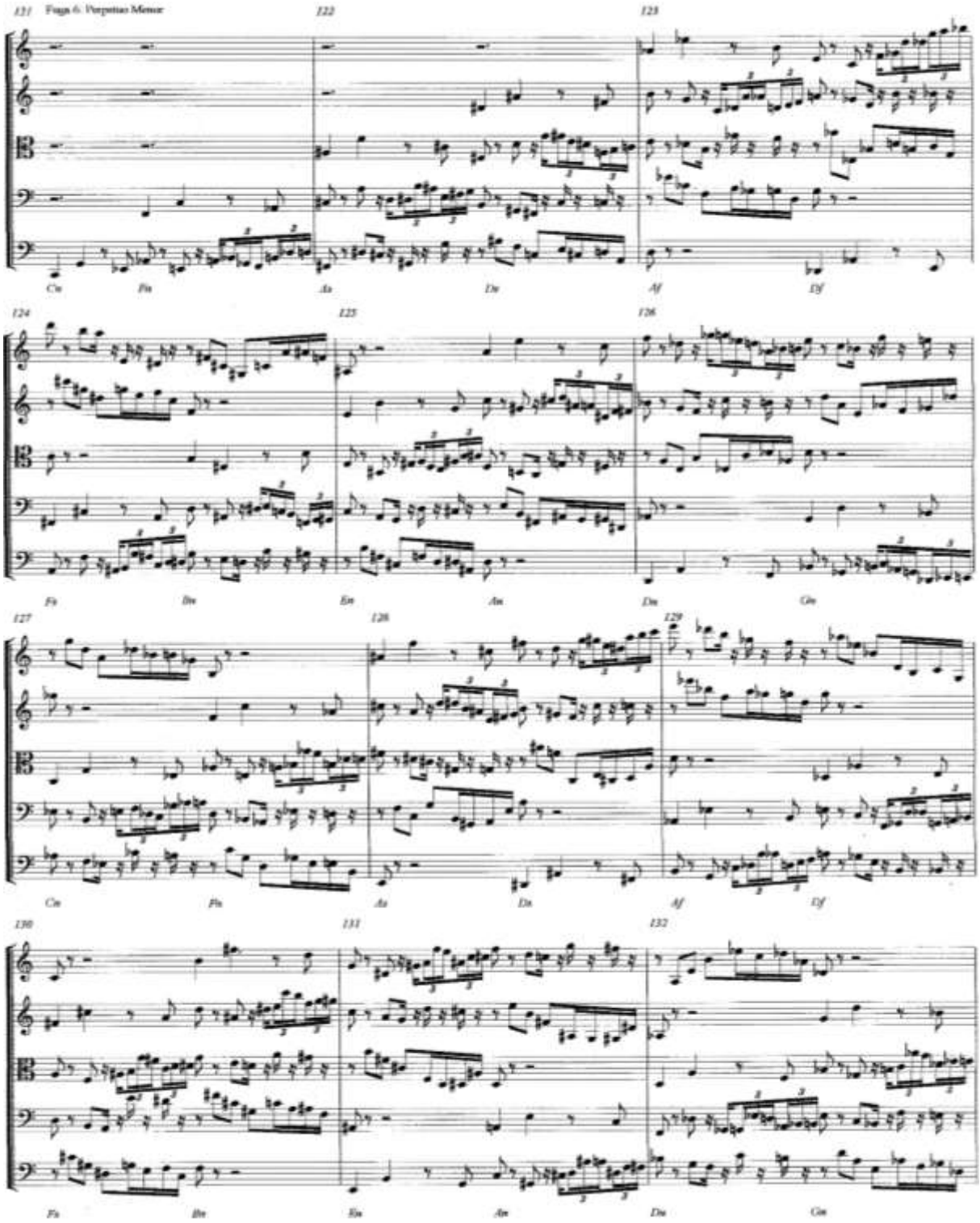
The second bars, though similar, also differ. In Bar 98, as in Bar 2, the Viola enters on D3, iterating the subject in D major. But in Bar 98, the Second Violin's iteration of the second part of the subject differs from the First Violin's of the corresponding part in Bar 2, and in Bar 97. The First Violin's B♭/A♯4, and the Second's F5, in Bar 98, as in Bar 2, though differently arranged, do turn D minor into B♭ major. But the Second Violin's F5 in Bar 98, corresponding to the First's B♭/A♯5 in Bar 97, is a quaver, not a crotchet. After a quaver's rest for both Violins, over the Viola's D3, as the Viola plays A3, the First Violin plays a quaver E5. The Second's quaver C♯5, corresponding to the First's quaver rest in Bar 97, is a quaver, not a semiquaver, as is its delayed counterpart F♯5 in Bar 97. Thus in Bar 98 an A major triad sounds on beat. It is followed, in the Second Violin, by a semiquaver rest, filled by the First's C5, changing the key, as in Bar 2, from A major to A minor. Next, semiquaver D♯5 is followed by a semiquaver triplet unlike that in Bars 1 and 2, but like that in Bar 97: a minor triad descending. Here, E5 C5 A4 is followed by a major scale descending: A♯4 G♯4 F♯4. The Viola's F♯3 and First Violin's C♯5 affirm the key of F♯ major. Bar 98's then, is the format that allows the *perpetuum mobile* to work. It was not sought for that purpose, but, once emerged, made it possible. So does evolution work.



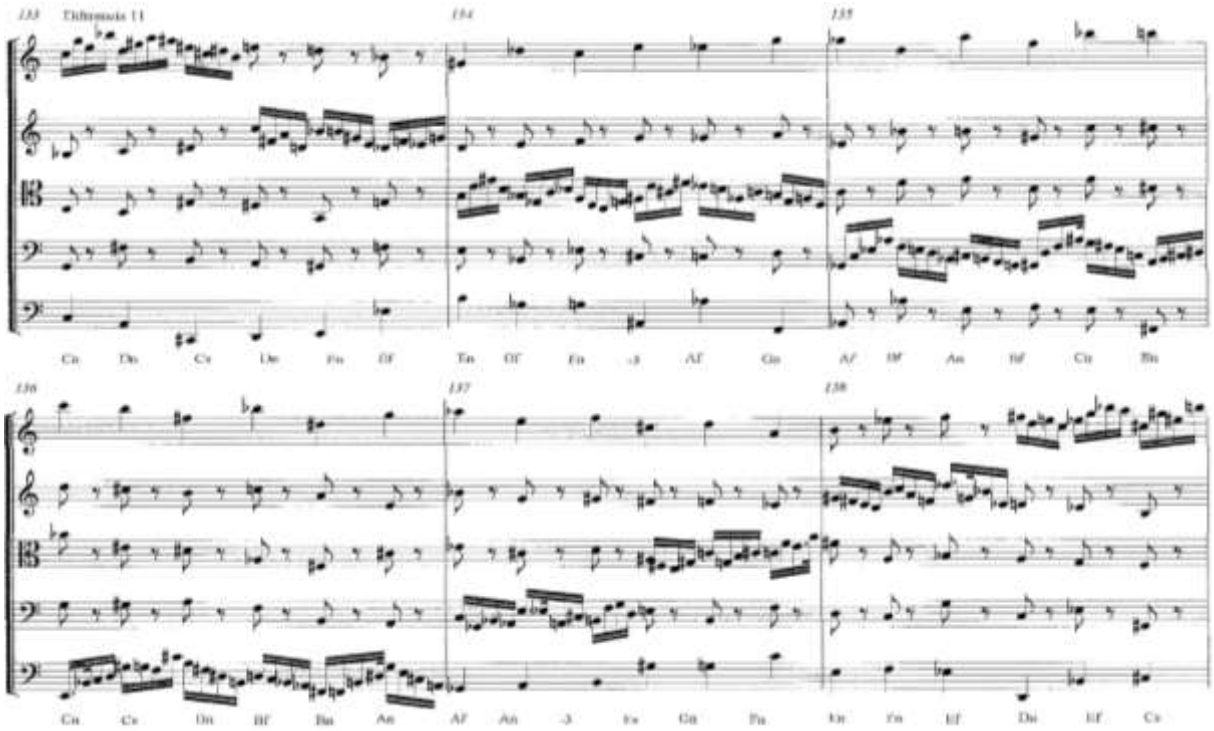
Diferencia 9 is a minor key version of *Diferencia 4*, with the harmonic columns extended to the whole. Somewhat dramatic, it serves to introduce, by way of contrast, the last new idea in *Fuga y Diferencias.*

Diferencia 10 aims at lightness and transparency. The theme in smooth semiquavers goes through twelve permutations over slurred harmonic columns, entering all twelve keys, one way round or other.





Fuga 6: Perpetuo Menor, follows the same principles, and achieves the same results, as *Fuga 5*, but with the minor key version of the theme. It was, in fact, composed before *Fuga 5*, which adapts this version's mutations to its major key version. Although this version does respect its own rules, it enjoys the freedom – sometimes necessary in the Viola part – to raise or lower the octave in which it does so. Leaving, as does *Fuga 5*, its possible perpetuation into infinity to the listener's musical imagination, after twelve bars it passes seamlessly into the final two *Diferencias* which conclude *Fuga y Diferencias*.



Diferencia 11 is *Diferencia 1* in reverse order. Each beat of four sequential semiquavers and four simultaneous quavers keeps the same order in itself, but is placed in reverse order, the last first. This results in a draft which begins in D♭/C♯ and ends in C♮. The first three bars are lowered, the second three raised, one semitone, resulting in this version which leads into the next, and final *Diferencia*.

Diferencia 12 is *Diferencia 2* in minor keys, until Bar 142, when it reverts to major. The First Violin's F5 on the seventh beat of Bar 143 is the first note in the last iteration of a dodecaphonic series in *Fuga y Diferencias*. Its last note is B4 in Bar 144, followed by a final C5. This concludes *Dódeca*.