EVOLUTION, SYMMETRIZATION, AND SYNTHESIS:  
THE PIANO SONATAS OF ALBERTO GINASTERA

DISSERTATION

Presented to the Graduate Council of the  
University of North Texas in Partial  
Fulfillment of the Requirements

For the Degree of

DOCTOR OF MUSICAL ARTS

By

Grace M. Campbell, B.A., B.M., M.M.  
Denton, Texas  
August, 1991
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When Alberto Ginastera's oeuvre is viewed as a whole, an essential continuity between compositional ideas often appears in different works. This is especially apparent in the three piano sonatas, where each sonata represents an evolution and a condensation of ideas occurring in the previous one.

The evolution of ideas throughout the three sonatas takes place through two primary processes. The first is a shift in cultural focus from reliance on Ibero-American material in the first sonata (1952) to AmerIndian in the second (1981), to a synthesis of the two cultural elements in the third (1982).

The second means of evolution from sonata to sonata is through a process of symmetrization. Along with constructions using symmetrical scales, material in each of the three sonatas is subjected to various symmetrical procedures which correspond musically to basic geometric symmetry types or operations (bilateral, rotational, and translatory, for instance).

The decreasing number of movements evidences a negative dilatation of material, moving from four movements in the
first sonata to three in the second, to one in the third. In each case, corresponding material from the previous sonata is integrated into the following sonata. Both independently and as a group the three piano sonatas exhibit "invariance under a transformation."
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Introduction

"From my childhood, I remember the night-sounds: the crickets, the birds, and the frogs. There was the atmosphere of the great plains of the Pampas and the huge expanse of night sky full of stars. I remember certain light effects--moonlight on the banana trees or on the Paraná River and the fireflies--all these become a part of one's soul, and they all reappear in my compositions."\(^1\) Alberto Ginastera (1916-1983) loved to talk about himself and the influences on his compositions. He would expound about his development as a composer and give tantalizing details about influences on his works. When Ginastera spoke of his compositions, however, he often did so in non-technical or subjective terms (romanticized references to the influences of the pampas are not uncommon), and while these glimpses give an interesting perspective on his works, they generally say very little about the compositional process. Although some clue may be found by considering the composers he lists as primary influences--the French Impressionists, Stravinsky, and Bartók--it is left to the musicologist to determine the various compositional strands woven together to create the musical work.

Ginastera was also known to reassess what he had previously said about his own music. Most notable is the instance where he conveniently—and somewhat arbitrarily—delineated his music as falling into three style periods: objective nationalism, subjective nationalism, and neo-expressionism.2 Perhaps realizing that this compartmentalization overlooked an essential developmental continuity between his works, Ginastera near the end of his life gave a considerably more open-ended reply to an interviewer who asked about his musical periods: "I think that there are not three, but two. The first I would call tonal and polytonal. Then a second period where I used atonality. But at the moment I am evolving. . . ."3

As a composer, Ginastera worked for and achieved a synthesis between a musical language expressed through the use of contemporary idioms and a voice of various musical traditions from his native country. As such, his identity as a contemporary composer is inextricable with his identity as a "Latin American" composer.

Three main cultural streams merge in the area we call "Latin America": the AmerIndian, most commonly associated with such aboriginal cultures as the Mayas, Aztecs, or Incas;

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3Tan, op. cit., 7.
the Ibero-American, namely folk musics brought to the Americas from the Iberian Peninsula; and the Afro-American, the influence of which is most pronounced in Brazil and the islands of the Caribbean.\(^4\) Although the Ibero-American is the prominent folk tradition in Argentina, Ginastera drew not only from it but also from a re-creation of the AmerIndian tradition.\(^5\) At times elements from the two cultures seem to merge and intertwine, or one cultural identity will appear to emerge out of the transformation of an element of the other.

An example of the latter is observed in the appearance of the "guitar chord" in its various manifestations. The notes of the guitar tuning (E-a-d-g-b-e\(^1\)) carry what Malena Kuss refers to as "cultural focus" in reference to Argentinean culture.\(^6\) The guitar was originally brought over to America from Europe, and it is the instrument of choice for the accompaniment of rural folk songs and dances, holding


\(^5\)Following the literary lead of historian and poet Ricardo Rojas (1882-1957), composers in Argentina had in fact incorporated what they misconstrued to be AmerIndian elements into art music (suppositions that aboriginal music was pentatonic are not supported by archaeological evidence) previous to "assert[ing] their cultural identity" by drawing from elements of the Ibero-American tradition. See Kuss, op. cit., 6, 36.

close musical association with the character of the gaucho. Thus a quotation of the guitar chord carries cultural meaning. Significantly, though, the notes of the guitar tuning can be reordered to create an anhemitonic pentatonic scale (E-D-B-A-G). The pentatonic scale, in turn, draws cultural relevance from pre-Columbian music and ritual. (Although recent findings show the notion that AmerIndian music was primarily pentatonic to be erroneous, Ginastera along with other composers still associated the pentatonic scale with aboriginal groups, and therefore the cultural significance remains.)

When in the compositional process this sort of syncretism, or merging of cultures occurs, the two formerly distinct elements undergo a process of what Melville J. Herskovits calls "reinterpretation"—"by which old meanings are ascribed to new elements or by which new values change the cultural significance of old forms."7

This process of reinterpretation shows itself in Ginastera's oeuvre as a whole, in the piano music and, as a more detailed study will show, specifically in the close relationship between the three piano sonatas—not only in such culturally relevant details as the reliance on the

---

guitar chord/pentatonic scale relationship exemplified above, but also in a compositional process of symmetrization.

Ginastera sets the precedent for the use of symmetrical procedures in the first composition he retained in his catalogue, the ballet *Panambí, Op. 1* (1934-37), which significantly is built on a culturally relevant framework. The plot of the ballet is of indigenous extraction, based on a romanticized Guaraní Indian legend. In the suite version of the ballet, Ginastera incorporates a variety of symmetrical formations within a succession of clear tonal centers. The symmetry of the work is demonstrated in the first movement of the suite, "Claro de luna sobre el Paraná." The climax of the movement, the "Canto del Paraná" in the horns, is centered between a succession of tonal areas moving symmetrically by interval 3 and 4 from the center (Example 1).\(^8\)

Example 1. Tonal regions in "Claro de luna sobre el Paraná" from *Panambí* by interval movement.

The writing includes the use of symmetrical scales—whole-tone, which divides the octave into six equal parts, and octatonic, which divides the octave into four equal parts (by interval 3). Symmetrical "Z cells" (interlocking tritones) appear throughout the work, both in hemitonic and anhemitonic forms.

Like Panambí, the song cycle Cantos del Tucumán, Op. 4 (1938) draws from the AmerIndian tradition. Here, however, aboriginal influences fuse with Ibero-American. The scoring—for voice, flute, Indian drums, harp, and violin—already expresses this juxtaposition of cultural elements. Different varieties of flutes and drums were among the instruments indigenous to the native Americans. The Europeans, on the other hand, brought with them stringed instruments. Broken chordal accompaniment imitating the strumming of the guitar, fluctuations between 6/8 and 3/4 time in "Algarrobo, algarrobal," and compound duple meter in "Solita su alma" reflect further Ibero-American influence.

The vocal melodies remain almost entirely pentatonic throughout all four of the Cantos del Tucumán; additionally, the binary meter of the first song "Yo nací en el valle" and rhythms such as the \( \underline{\underline{\downarrow}} \underline{\downarrow} \downarrow \) of the caja (Indian drum) are characteristically AmerIndian.\(^9\)

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\(^{10}\)Kuss, Latin American Music, 35-36.
Titles such as Tres danzas argentinas (1937), Estancia (1941), and Ollantay (1947) evidence that the majority of Ginastera's earlier works draw openly from the Ibero-American and AmerIndian traditions. However, even in works where the cultural reference is not articulated in the title, the influence is still present. This is clear in the Variaciones concertantes, Op.23 (1953), where the harp introduces the initial theme with a literal statement of the guitar chord (Example 2).


As in the earlier Panambi, symmetrical formations, especially "Z-cells," play an important role in the variations. Example 3, the opening of the third variation, "Variazione giocosa per Flauto," shows the juxtaposition of
hemitonic and anhemitonic Z-cells culminating in a vertical sonority comprised of three notes from the guitar tuning.\textsuperscript{11}


The developmental nature of the variations anticipates the compositional process which will take place between the

\textsuperscript{11}Kuss, "Type, Derivation, and Use of Folk Idioms in Ginastera's \textit{Don Rodrigo} (1964)," \textit{Latin American Music Review} I/ 2 (Fall-Winter 1980), 179.
three piano sonatas, where permutations of an original idea evolve into independent musical works.

Expressions of Cultural Identity in the Piano Sonatas

Ginastera admitted to suffering from writer's block only once in his life. After the immense success of his first piano sonata, written in 1952, he found himself at a creative loss to match its popularity, and, notwithstanding the completion of two piano concertos (and numerous works for other instrumental forces), he declined to write for solo piano for many years. Nearly thirty years, in fact, passed before the appearance of Ginastera's Piano Sonata No. 2, Op. 53, completed in 1981 and performed 29 January 1982 by his friend Anthony di Bonaventura at the University of Michigan. Despite the long hiatus between piano compositions, Ginastera claimed to have carried the idea for the second sonata in his head from the time he wrote the first. This is certainly true, for the first sonata contains within it the germinating idea for the second. In fact, the second sonata is in many ways a metamorphosis of the first.

Both sonatas contain culturally relevant material. The first, as the composer pointed out, was "inspired by music of the Argentine pampas."

In it the Ibero-American influences

are readily evident: passages in parallel thirds and phrases ending in falling thirds (a typical folk formula); a preponderance of compound duple meter in the first, second, and last movements; and characteristically Argentinean folk dance rhythms throughout. The fourth movement, for instance, represents the lively "malambo," identified by alternation between compound duple and triple meter (here 6/16 and 3/8), punctuated by "stops" of dotted eighth-note chords (Example 4).


Ginastera had highlighted this popular dance previously, first in his earliest piano work, Tres danzas argentinas (1937), and then again in the Malambo Op. 7 (1940), dedicated to Antonio de Raco, who also premiered the Sonata No. 1 in Buenos Aires.

The ubiquitous guitar chord makes its presence known in the first sonata, both in literal quotation, and in compositional transformation. The literal sequence of guitar
tuning pitches occurs in two places in the second movement, "Presto misterioso" (Example 5a and b).

Example 5a. Sonata No. 1 for Piano, second movement, measures 109-10.

Example 5b. Sonata No. 1 for Piano, second movement, measures 185-87.

The ringing sonority at the end of the movement serves as a sort of "definition" of the chord, against which the rhapsodic opening of the following "Adagio molto appassionato" gains expressive meaning. Contrasting with the literal statement at the close of the previous movement, the slow third movement begins with a transformed spelling of the guitar chord.\(^{13}\) Although only the B, D, and E are present in

\(^{13}\)Kuss, "Type, Derivation, and Use of Folk Idioms," 177-8.
the actual open string guitar tuning, the slow upwards sequence of intervals (perfect and altered fourths, a third and a fifth) opening the third movement suggests a plucking of the open guitar strings, and the directive "lasciar vibrare col ped." further hints at the desired effect (Example 6).


An even more subtle allusion to the guitar chord occurs near the end of the fourth movement within a series of pedal points which one by one outline the guitar chord. The sequence begins with the pedal octaves on E at measure 114. The rhythmic broken octave pattern on A in measures 130-37 creates the next pedal point. A left-hand octave pedal on D, sforzando, ensues at 144, followed six measures later by a similar octave pedal on G at 150 and another on E at 156. The final octave pedal climaxes on A, the pitch center of the sonata, bringing the movement to its close. In this sequence of temporary tonal centers defined by pedal points, all the
pitches of the guitar chord are represented, in order, with the exception of B.

Like the guitar tuning pitches and characteristic folk dance rhythms appearing throughout the first piano sonata, culturally relevant writing is also an important element in the Sonata No.2, but in a more abstract form. And while the first sonata takes its inspiration from the rural folk music of the pampas, Ginastera writes that the creative impulse for the second sonata is "the music of the northern part of my country, of Aymará and Kechua origin . . . with its pentatonic scales, its sad melodies or its joyful rhythms, its kenas and Indian drums, as well as its melismatic microtonal ornaments."¹⁴ This AmerIndian emphasis itself is in contrast with the cultural accent of his earlier pianistic writing, as the titles of earlier works confirm: Danzas argentinas, Suite de danzas criollas, Malambo, Rondo on Argentine Children's Folk Tunes, and so forth. However, in spite of the change in cultural focus and the greater abstractness of the second sonata in comparison with earlier piano works, the sonata remains less a departure from the earlier works than an evolution that systematizes ideas present in them.

Like the ancient Indian concept of recurring, spiral cycles of time, the change in cultural focus in the Piano

¹⁴Ginastera, op. cit., preface.
time to the AmerIndian past he had used in works composed earlier in his compositional journey—Panambi and Ollantay. But the return is not a simple one, for this time the aboriginal elements take on new meanings in the context of their intermittent contraposition to or fusion with systematic, symmetrical compositional procedures.

Initiating the return to the pre-Columbian past was the Cantata para América mágica (1961), based on works of Mayan mythological literature, the Popul Vuh and the Chilam Balam. The cantata integrates pentatonic and twelve-tone serial writing with symmetrical forms. As such, the Mayan world is represented not in a literal, programmatic sense, but, as Ginastera would later suggest, in a metaphysical one. For instance, the two-hundred and sixty days of the Mayan ritual calendar are symbolized by the two-hundred and sixty beats from the opening to the concluding sonority in the first movement. The first and second halves of the fourth movement are exactly mirrored, with a seven-second sonority in the orchestra marking the center of the movement, perhaps signifying the sun's zenith in the heavens at its seventh level of ascent, according to Mayan cosmology.¹⁵

Sometime after the composition of the cantata, Ginastera discussed the importance of the change he was making in the culturally derived materials in his music. It is, he said,

a kind of reversion, a going back to the primitive America of the Mayas, Aztecs, and the Incas. This influence in my music I feel not as folkloric, but--how to say it?--as a kind of metaphysical inspiration. In a way, what I have done is a reconstitution of the ancient pre-Columbian world. Some Inca music survives, you know, but it's very elementary--pentatonic like Chinese, very primitive. I do use that, but transformed by imagination and inspiration.16

Likewise "transformed by imagination and inspiration" is material from the first piano sonata which re-emerges in the second, metamorphosed in two primary ways: 1) by the application of several symmetry operations17 and 2) by a shift in cultural focus from one Ibero-American to one primarily AmerIndian (but with syncretic incorporation of Ibero-American traits). Ideas originating in the first sonata are further transformed, symmetrized and condensed in the third sonata, with a synthesis of culturally relevant material, as will be discussed later.

16 Tan, op. cit., 7.

17 "A symmetry operation can be defined as any transformation that leaves an object wholly unchanged or unchanged in certain important respects." Alan Holden, "Symmetry," The Encyclopedia Americana, 30 vols. (Danbury, Connecticut: Grolier Inc., 1985), XXVI, 169. One of the most familiar symmetry operations is the reflection of a person in a mirror, where the reflected image is an unchanged transformation of the real person.
Symmetrical Constructions

Interestingly, each of the basic geometric symmetry types appears in the second and third sonatas. Neither sonata is crafted on one single symmetrical principle; instead, successions of symmetrical constructions of different types alternate with non-symmetrical, culturally derived material. It will be helpful to review the different geometric symmetries and give a musical application of each.

The first symmetry type is "bilateral," where a vertical or a horizontal plane divides an object into two identically reflected halves. The human form is bilaterally symmetrical, with a vertical plane of reflection dividing the body into mirrored right and left sides. The letters "Y" and "M" likewise have vertical planes of reflection. A horizontal plane dissecting the letter "E" shows the reflection of its upper and lower halves. The letter "H" is symmetrical along both horizontal and vertical planes of reflection.

In music, bilateral symmetry is calculated in terms of the intervals extending out on either side from a center point (the plane of reflection). All three of Ginastera's sonatas for piano contain material that is bilaterally symmetrical. The first movement of the Sonata No. 2 includes symmetrical formations along all the planes of reflection. The sonority occurring on the first beat of measure 47 is symmetrical along either side of a horizontal plane of reflection. From the center, the notes extend in either
direction by interval 2, 4, and 5 (Example 7). Thus, a horizontal plane of reflection indicates symmetry in a vertical sonority (or a succession of mirrored vertical sonorities).


A vertical plane of reflection, then, displays symmetry in the horizontal movement on either side of the central plane. Measure 51 is an example of this. Two vertical lines drawn between the beats in the measure reveal that beats one and two are symmetrical across the reflective plane, as are beats two and three (Example 8).

Like the letter "H," each of the two halves of measure 12 near the beginning of the second sonata is symmetrical along both horizontal and vertical planes of reflection, so that the intervals are mirrored both linearly and vertically (Example 9).
Example 8. Sonata No. 2, first movement, measure 51.

Example 9. Sonata No. 2, first movement, measure 12.

While the letters "Y" and "E" illustrate bilateral symmetry, the letter "S" exemplifies the next type of symmetry—"rotational." The identical parts of the letter are arranged not by being mirrored across an imaginary line, but by rotation around a perpendicular line which passes through its center. This line is called an "axis of twofold symmetry," because the object is brought into correspondence with itself after a half turn around the axis and again after a full turn.\(^\text{18}\) The third sonata contains several instances

\(^{18}\)Holden, op. cit., 169.
of symmetrical rotations. In measure 27, rotation around a perpendicular axis centered between beats three and four of the 6/8 measure brings the two halves of the measure into intervallic correspondence. Furthermore, each pair of adjoining eighth-note sonorities forms a rotation within the measure (Example 10). It is important to remember that the symmetry is created by the vertical and horizontal arrangement of intervals, not by the literal notes. Thus in the first beat the vertical configuration F- A-flat- B-flat- G (moving from bottom to top) forms the intervals 3-5-6, and in beat two the notes E- B-flat- E-flat- G-flat comprise the intervals 6-5-3, accordingly. Since the horizontal interval movement concurs, it is easy to see how rotation around a central axis brings beat two into correspondence with beat one.

The third symmetry operation is one of the most basic and pervasive in geometry and science—and music. It is called "translation," and it occurs when two indistinguishable objects are aligned or are capable of being interchanged. In the word "Mississippi," even though the two "p"s are not symmetrical by themselves, they are symmetrical by translation with each other. Innumerable examples of translation exist throughout all music, not only in the piano sonatas of Ginastera. Any repeated notes or chords are linear translations; the opening sonority of Ginastera's first sonata is a good example of a translation operation expressed vertically: both hands play the notes C-E, interval 4.

Figure 1. M.C. Escher, ink drawing, 1967. Reproduced from M.C. Escher's Universe of Mind Play (Tokyo, 1983), 104.

The simple translation operation becomes enhanced when the object of symmetry is extended in two dimensions. For
instance, a row of bricks is a translatory symmetry. Rows of bricks built into a wall form a "plane tesselation." In art, M.C. Escher (1898-1972) was a master at creating plane tesselations of interlocking animals (Figure 1).\textsuperscript{19}

Two examples from the last movement of the second sonata exhibit the different types of plane tesselations found in the second and third sonatas. In the first, identical note combinations alternating in different registers create the tesselation (Example 11).


\begin{verbatim}
\end{verbatim}

\textsuperscript{19}Holden, op. cit., 172.
In example 12, the figure which begins on the white keys sounds one measure later in the black keys. Instead of identical notes repeating in different registers, identical intervals alternate on different notes. The tessellation is analogous to the inversions of light and dark figures which often appear in Escher's engravings.

A final geometric symmetry occurs when a dilatation (expansion) accompanies the translatory operation. Hermann Weyl defines the symmetry in mathematical terms thus:

"A similarity in one dimension that is not a mere translation has a fixed point o and is a dilatation s from o in a certain ratio a:1 where a ≠ 1. It is no essential restriction to assume a > 0. Indefinite iteration of this operation generates a group E consisting of the dilatations sn (n=0, ±1, ±2, . . . )." 20

In other words, the translation is accompanied by growth at a fixed rate. In nature, the shoots of plants such as ferns exhibit translation with dilatation, as do two types of shells, Turritella duplicata and Nautilus pompilius, or chambered Nautilus, the latter of which manifests the form of a logarithmic spiral 21 (Figure 2a and b).

Ginastera applies a symmetrical process of dilatation to several passages in the second and third sonatas; the


21 Holden, op. cit., 172.
symmetry is most pervasive throughout the third. The growth forms may be expressed through either rhythmic or intervallic expansion reflecting the mathematic ratio discussed above. For example, each of a series of analogous passages in the third sonata concludes with a measure of eighth-note double octaves. The first concluding measure is in 5/8 meter, the second in 7/8, the third in 9/8 and the fourth in 11/8. These symmetrical dilatations will be discussed in greater depth later.

Figure 2a. Turritella duplicata. b. Nautilus pompilius.

In addition to considering the geometric symmetry operations discussed above, the symmetrical structure of the sonatas may be analyzed in terms of their adherence to the procedures of inversional complementation. Calculating the sums of complementation in order to discover the axes of symmetry often discloses an integral relationship between what might otherwise appear to be merely successions of independent symmetrical formations.
Any dyad has an axis of symmetry, defined by the sum of its pitch classes (0-11, mod 12, where C=0). With the twelve notes of the chromatic scale representing the prime set (P), an alignment of P with its inversion (I) creates a set of dyads with the same sum of complementation. The point of intersection of P and I determines the sum of complementation for the scale set, because the simultaneously ascending and descending scales will be equidistant from that point. The P and I forms of the chromatic scale intersecting at C and F-sharp in Example 13, then, result in a set of dyads of sum 0.

Example 13. Chromatic scale, dyads of sum 0.

There are two "modes" possible in inversionsal complementation. The first produces dyads with even sums. The other generates odd-numbered sums. Furthermore, either of the two "modes" are found within any of six possible "keys"—"the six sums that represent the different

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transpositional levels of the collection of symmetrically related intervals." Figure 3 charts the possible dyadic combinations found in each of the six "keys" of the odd mode. Dyads of the same sum cycle are found in the vertical columns, and dyads of the same interval class are in the horizontal rows.

Figure 3. Dyads of the odd mode.

<table>
<thead>
<tr>
<th></th>
<th>1/11</th>
<th>3/9</th>
<th>5/7</th>
<th>7/5</th>
<th>9/3</th>
<th>11/1</th>
<th>(1/11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/11</td>
<td>C-C#</td>
<td>B-D</td>
<td>A#-D#</td>
<td>A-E</td>
<td>G#-F</td>
<td>G-F#</td>
<td>F#-G</td>
</tr>
<tr>
<td>3/9</td>
<td>C-D#</td>
<td>C-D#</td>
<td>C#-E</td>
<td>A-F#</td>
<td>A-F#</td>
<td>G#-G</td>
<td>G#-G</td>
</tr>
<tr>
<td>5/7</td>
<td>D-B#</td>
<td>C#-E</td>
<td>C-F</td>
<td>C#-F#</td>
<td>A-G#</td>
<td>A-G#</td>
<td>A-G#</td>
</tr>
<tr>
<td>7/5</td>
<td>D#-E</td>
<td>D-F</td>
<td>D-G</td>
<td>D#-G#</td>
<td>B-G#</td>
<td>B-G#</td>
<td>B-G#</td>
</tr>
<tr>
<td>9/3</td>
<td>E-F</td>
<td>D#-F#</td>
<td>D-G</td>
<td>D#-G#</td>
<td>C-A</td>
<td>C-A</td>
<td>C-A</td>
</tr>
<tr>
<td>11/1</td>
<td>F-F#</td>
<td>E-G</td>
<td>D-G</td>
<td>D#-G#</td>
<td>C-B</td>
<td>C-B</td>
<td>C-B</td>
</tr>
<tr>
<td>(1/11)</td>
<td>F#-G</td>
<td>C-A</td>
<td>A-A#</td>
<td>A-A#</td>
<td>C-B</td>
<td>C-B</td>
<td>C-B</td>
</tr>
</tbody>
</table>

The sums in Ginastera's second and third sonatas are primarily in the odd "mode" illustrated above. Even more specifically, they are generated by the chromatic scale which, when aligned with its inversion at sum 11, results in a set of dyads with that sum (11), or axis of symmetry (Example 14). The sonatas, then, may be said to be in the "key" of sum 11. If P in example 14 is displaced two pitches to the right, the result is a sum 9 set of dyads. Moving either scale over by any even number produces another odd-numbered set of sums. The presence of symmetrical structures

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23George Perle and Paul Lansky, op. cit., 292.
based on such a realignment of the scale is analogous to modulation or temporary key centers.

Example 14. Chromatic scale, dyads of sum 11.

Sum 11 figures prominently in main sections of Sonata No. 2 and No. 3 (notably in the first movement of Sonata No. 2 and in the opening "theme" of Sonata No. 3), while other sums function as "modulations" to those sums. The third movement of Sonata No. 2, in fact, does not center on sum 11 but moves freely through the odd sums. Shifts to the even sums do appear occasionally, however, in the last two sonatas. A series of "modulations" from the "key" of sum 11 through the odd-numbered sums 9 and 5 takes place in the first movement of Sonata No. 2, measures 33-39 (Example 15). The sum 11 "theme," which opens the movement, returns at measure 41, with octave doublings.

Although sum 11 symmetry is crucial to both Sonatas No. 2 and 3, serving as a unifying factor within them and a link between them, Ginastera does not form all the symmetrical
structures in the sonatas according to inversional complementation based on the chromatic scale. In addition to the chromatic scale, which divides the octave into twelve equal parts, octatonic and whole-tone scales are utilized, dividing the octave into four and six symmetrical parts respectively. The symmetry arising from the use of these scales does not generally manifest itself in surface constructions which are geometric symmetry operations; the
symmetry instead lies at a more structural level, within the scale itself.

**Origin and Evolution of Gesture and Symmetry in the First Movements of Sonatas 1 and 2**

The symmetrical possibilities worked out in the second and third sonatas are present in the first, though subtly perceived. Most important is the gesture opening the first sonata, which serves as the elemental link between the three sonatas, and which itself exhibits bilateral symmetry along a horizontal axis of symmetry as class 4 intervals in each hand move apart by interval 3 (Example 16a).

Example 16a. Sonata No. 1, first movement, opening.

This same gesture opens Sonata No. 2, again with interval 4 in each hand but with the bilateral symmetry extended (Example 16b).

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24 I am grateful to Dr. Malena Kuss for permission to use her unpublished analyses of pitch organization in Sonatas 1 and 2 from her forthcoming book on Ginastera's music.
Example 16b. Sonata No. 2, first movement, opening.

A similar gesture in measures 12 through 15 of Sonata No. 1 also moves symmetrically, and is parallel to a passage in perfect bilateral symmetry in the second sonata, where the gesture appears transformed within an inner pair of voices (Example 17a and b).\(^{25}\)

Example 17a. Sonata No. 1, first movement, measures 12-15.

Both examples from Sonata No. 2 (16b and 17b) illustrate the sum 11 symmetry pervasive throughout the first movement. Although the flourish which opens the sonata is not sum 11,

\(^{25}\)Kuss, unpublished analyses of Sonatas 1 and 2.
each of its vertical dyads is an odd-numbered sum and therefore related by mode.

Example 17b. Sonata No. 2, first movement, measures 29-32.

The examples from the first sonata (16a and 17a), on the other hand, do not exhibit such a uniform axis of symmetry. The dyads within the vertical sonorities in Example 17a do not share a single axis of symmetry because the compositional foundation is not the chromatic scale as in Sonata No. 2. The first movement of Sonata No. 1, however, is based on an overall symmetrical structure, for it is built on an octatonic scale with modal interaction.26

Pieter C. van den Toorn, in his analytical study of Igor Stravinsky’s works, introduced the concept of "octatonic-diatonic interaction" to explain pitch organization in works from Stravinsky’s Russian and neoclassic periods, such as the

26Kuss, unpublished analyses of Sonatas 1 and 2.
Symphony of Psalms (1930), where a Model A octatonic scale interacts with the E Phrygian scale.27

The two models of the octatonic scale are determined by the arrangement of whole and half steps. Model A alternates half-whole (intervals 1-2) while Model B alternates whole-half (intervals 2-1). Both models divide the octave into two equal halves at pitch numbers 0 and 6 (the tritone, interval 6) and into four equal parts at pitches 0, 3, 6, and 9 (cycle 4, minor thirds). The interval ordering 1-2 of the Model A scale, however, generates both major and minor triads at pitches 0, 4, 7 and 0, 3, 7, respectively (Example 18).

Example 18a. Model A octatonic scale.

Example 18b. Model B octatonic scale.

The first movement of Sonata No. 1 is built primarily on the type A octatonic. (Certain passages, however, such as the ascending octaves closing the movement, are generated by the Model B scale.) The fact that the "tonic" triad (9, 0, 4) occurs within the Model A scale explains the essential "A-minorness" of the movement. A comparison of the excerpts in examples 16a, 17a and 19 will show them to lie clearly within the Model A octatonic scale, interacting with the A Aeolian scale. The interactive A Aeolian further conveys the "feeling" of A minor to the movement.28

Example 19. Sonata No. 1, first movement, measures 5-6.

Thus, the symmetry present in the first movement of Sonata No. 1 is octatonically based, and it evolves into the symmetries of the second sonata which are chromatically based and primarily expressed as geometric symmetry operations and sums of complementation.

28Kuss, unpublished analyses of Sonatas 1 and 2.
One "problem" in the symmetrical analysis of Sonata No. 2 is the black key/white key dichotomy, where one hand plays only white keys and the other plays only black. Ginastera had a penchant for this particular pianistic device, beginning with the "Danza del viejo boyero" from his Opus 2 Tres danzas argentinas, which is almost entirely written with the left hand playing the black keys, the right hand the white. In the second sonata, the dichotomy expresses itself from the outset in the initial flourish. Both the first and third movements end with this black key/white key opposition. (Even in the second movement, which ends with a single note in each hand, one is black and the other is white.) The last movement in particular is replete with the black/white dialectic. Only in two parallel passages occurring in the first movement's central section and in one short passage in the last movement, is the explanation unequivocal. There, both hands are playing paired pentatonic lines, clearly stemming from the AmerIndian context. Otherwise, the dichotomy would seem to be simply a structuring of the symmetrical chromatic scale in a manner idiomatic to the piano. Additionally, it does have the potential of conveying what may be cultural relevance since the hand playing all black keys is necessarily in the anhemitonic pentatonic mode. The figure in measures 8-9 of the first movement exemplifies this: the pentatonic left hand sonorities hint at an AmerIndian context while the
parallel thirds in the right hand suggest the Ibero-American tradition (Example 20).


As discussed earlier, chromatically based symmetrical formations, particularly sum 11 bilateral operations, characterize the opening section of the second sonata. In the central section of the first movement, the AmerIndian elements come to the fore. This B section is arranged, in typical Ginastera fashion, in sub-sectional "blocks" which alternate AmerIndian-influenced melodies. Although these ornamented melodies contrast with the geometric formations of the previous section, the symmetrical unity is preserved in the left-hand ostinato cluster leading into the section which is to be played "come una cassa india"--like an Indian drum--and which also turns out to be sum 11 (Example 21).

When Ginastera says that he used the pentatonic scale as he understood the Native Americans to have done, but
"transformed by imagination and inspiration," he is referring to the anhemitonic pentatonic scales of the sectionalized blocks of melodies within the larger B section, beginning with the right hand "cantando" in measure 65 (see Example 21).


Hovering around B, the melody also moves up to D and down to A, the melody notes graced with interval 1 ornaments. As a matter of fact, some tritonic melodies were recognized as aboriginal; the scale is considered to be related to the pentatonic.²⁹ Like the modal interaction with the octatonic scale in the first movement of the first sonata, the "added" chromatic notes at the end of the melody might be considered as chromatic interactions with the pentatonic.

The melodic phrase beginning in measure 70 (Example 22) moves to the high register, accompanied by the directive "come kenas." The kena is a pre-Columbian vertical flute, dating back as far as 900 B.C., and prominently used throughout the Andean region. Kenas were crafted of bone (whether animal, bird, or human), but were most often made of cane. Others were clay, metal (gold or silver), or stone. The number of fingerholes varied from five to eight, producing up to a two-octave range. Aymará and Kechua Indians played pentatonic melodies on the kena, quite often pairing two together, either unaccompanied or accompanied by Indian drums. In the passage beginning at measure 70, the effect is of two different pairs of kenas playing simultaneously. Although each pair moves in similar motion, only the top line is anhemitonic pentatonic.

Example 22. Sonata No. 2, first movement, measures 70-74.

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When the parallel passage returns (measures 86-91), the top voice is once again the only one to remain entirely pentatonic.

Interestingly, these passages are very closely related to the lyrical second theme of the first sonata (first movement)—which in turn evolves out of the first theme of the same movement. The meter of the first two measures (6/8 and then 5/8), the falling whole steps in ♫♫ rhythm, and especially the formulaic descending fifth and minor third concluding the phrase are common to both sonatas (Example 23).

Example 23. Sonata No. 1, first movement, measures 52-55.

Corresponding passages appear two more times in the second sonata, this time with the melody in parallel ninths. After this alternation of related melodic blocks, a lengthy crescendo rising from the Indian drum ostinato leads to the return of the opening material. The last section is essentially a distillation of the mirrored motion in the first section.
The first movement of Sonata No. 2, then, is a large A B A form, with the outer sections characterized by symmetrical writing, and the central section characterized primarily by its associations with the AmerIndian culture. As such, the first movement is in effect a mirror of the sonata as a whole. Symmetrical formations highlight the outer two movements, while material with AmerIndian cultural relevance distinguishes the central movement.

**Sonata No. 2, Second Movement**

The relationship between the first movements of Sonatas 1 and 2 has been illustrated. In the same way, the second movement of Sonata No. 2 seems to be a crystallization, as it were, of combined ideas from movements II and III of the first sonata, but in reverse order of movements.


The opening "notturnale" of the second sonata, where repeated D's are progressively more highly ornamented, is a
condensation of the first twenty-two measures of the corresponding slow movement of Sonata No. 1. In Sonata No. 1, rhapsodic statements of the altered "guitar chord" lead similarly to repeated D's, the D's more highly ornamented as the sequence is extended in repetition (Example 24—cf. Example 6).

The melodic "harawi" then corresponds to the more melodic B section (measures 23-56) of the first sonata. Furthermore, just as the opening of the first sonata's slow movement is the guitar idea in altered form, so the ornamented pentatonic melody in the second sonata might be seen as a further evolution of the guitar chord as comprising the notes of the anhemitonic pentatonic scale (Example 25).


\[\text{Example 25. Sonata No. 2, second movement, harawi.}\]

The central section, "scorrevole," of the later sonata takes its point of departure from the "Presto misterioso" (movement II) of the previous sonata (Example 26a and b). Both are legatissimo, pianissimo, and quite fast, the quiet
unbroken rhythm not unlike the "wind across the graves" atmosphere of the last movement of Chopin's B-flat minor sonata.

Example 26a. Sonata No. 1, second movement, opening.

Example 26b. Sonata No. 2, second movement, B section opening.

Like the twelve-tone theme opening the second movement of Ginastera's first sonata, the swirlings of the "scorrevole" are patterns fashioned out of all twelve notes of the chromatic scale, with the two voices usually separated by interval 2. An arpeggiated pattern in measures 84-89 outlines a Model B octatonic scale, leading into a sequence
of chordal tremolos with the black key/white key dichotomy
once again between the hands.

It is throughout this movement that the memories
Ginastera recounted are heard and felt: the night sounds of
"the crickets, the birds and the frogs," and the breath of
the wind. It is here also where the inspiration of composers
Ginastera admired makes itself known.

Example 27. Maurice Ravel. "Oiseaux tristes," from Miroirs
(Melville, N.Y.: Belwin Mills, n.d.), opening. Used by
permission.

Doors: Five Piano Pieces (London: Boosey and Hawkes,
The "notturnale" languid opening and expressive harawi melody recall the mournful birds of Ravel's "Oiseaux tristes" from Miroirs (Example 27) and of Bartók's "Musiques nocturnes" from the Out-of-Doors suite (Example 28).

That Ginastera intended the movement to convey not only a nocturnal atmosphere but specifically an aura reminiscent of the Andean AmerIndians is apparent from his labeling of the anhemitonic pentatonic melody as a "harawi." The harawi, haravi, or yaravi is a pentatonic song cultivated by the Indians of Peru, Bolivia, and Argentina. It remained the most popular indigenous song-type throughout the colonial era and still exists in the form of the triste. By the end of the colonial period, the haravi (known then as yaraví) was characterized as a lover's lament, especially dwelling on the grief of being separated from the "distant beloved." The pre-contact haravi, however, was not always a plaintive lover's song, but was sometimes sung as part of a religious festival. At this festival a red llama would stand tied, bleating softly as noble women sang the stanzas to a haravi, beginning high and lowering each stanza until they matched the llama's pitch. In between each stanza a chief would sing a refrain imitating the pitch and rhythm of the llama's

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cry. But in pre-contact and colonial times, the haravi melody was often doubled on the kena, or on pairs of kenas. A journal report from 1791 gives a description of the haravi of the time as a European listener heard it:

The tonality is regularly minor with only transitory modulations into major. Accidentals often colour harmony—which as a rule is enriched with appoggiaturas, suspensions, and those other ornaments which give breath and soul to music. The meter varies between 3/8, 3/4, and 6/8; but the tempo never exceeds moderato, scaling on down through andante and andantino to largo. Invariably the sentiment is serious. . . .

This description certainly fits Ginastera's melody. Additionally, the ornaments seem indicative of those which might be played on a kena.

Sonata No. 2, Third Movement

Ginastera titles the last movement of Sonata No. 2 "Ostinato aymará" (a reference to the Aymará Indians of Argentina and surrounding regions) and writes that it "takes the form of a toccata whose fundamental rhythm comes from a

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32 Stevenson, op. cit., 142.

33 Ibid, 147, as quoted from the Mercurio Peruano no. 101 (22 December 1791), 285-86.
dance called 'karnavalito.'”  

To be sure, the frenetic rhythm is the driving force of this movement, like the *malambo* rhythm imbuing the last movement of the first sonata. But where the *malambo* is a dance of Ibero-American import, the *karnavalito* is of AmerIndian descent. The rhythmic allusion to the *karnavalito* is in the opening rhythm, a rhythm typical of the bombo (drum) accompaniment to this fast, indigenous dance. The other ostinato rhythm introduced at the opening and recurring throughout the movement is a 3+3+2 grouping of eight beats. In reference to the typically anhemitonic pentatonic melody of the *karnavalito*, Ginastera includes several measures of pentatonic writing. Even in these short passages, the movement retains its chromatically-based structure, for the passages superimpose black key and white key pentatonic scale figures.

As a whole, the movement is organized as a succession of symmetrical formations or groupings involving a variety of geometric symmetry operations. Each symmetrical "event" is from one to four measures long, and may include more than one symmetry operation. For instance, in measure 16, each sixteenth-note grouping exhibits bilateral symmetry along a horizontal plane of reflection (that is, a central axis of

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34Ginastera, op. cit., preface.

35Aretz, op. cit., 52.
symmetry exists when the vertical sonorities are aligned). The first two sixteenth-note groupings are also symmetrical along a vertical reflective plane (indicated by dotted lines in the example). Additionally, the repetition of identical interval combinations at different pitch levels creates a plane tesselation (Example 29).

Example 29. Sonata No. 2, third movement, measure 16.

Similarly, many of the symmetrical events throughout the movement are translations or plane tesselations which incorporate additional symmetries. Example 30 shows two independent interval 6 tesselations moving in contrary (although not mathematically exact) motion in which each vertical alignment is bilaterally symmetrical.

In Example 31, the vertical sonorities within the tesselation of measure 60 are not bilaterally symmetrical, but instead are intervallic translations. The measure is framed by chords which have an axis of twofold symmetry and both horizontal and vertical planes of reflection.
Furthermore, the karnavalito rhythm is incorporated within symmetrical interval 2 clusters.

Example 30. Sonata No. 2, third movement, measure 35.

Another interesting plane tesselation occurs in measure 56. The vertical sonorities within this tesselation are formed out of notes from the whole-tone scale. In fact, each vertical sonority draws alternately from the whole-tone scale.
beginning on D and the scale beginning on C-sharp (Example 32).

One important operation is the expansion (dilatation) which develops out of the first (bilaterally) symmetrical event in the movement. In repetitions of the two-measure event, each vertical sonority expanding the first measure is sum 5, and each sonority added to the second measure is sum 9 (Example 33).

Example 33a. Sonata No. 2, third movement, measures 6-7.
The above dilatation, however, is not as mathematically precise as the one which will grow out of the opening measures of the third sonata.

Symmetrical events such as the above often are introduced or interrupted by allusions to the _karnavalito_ taking the form of a rhythmic ostinato or a pentatonic pattern. Other asymmetrical events in the movement—most notably a series of parallel glissandos with the white keys superimposed over the black—are generated by the chromatic scale. Of interest near the end is a succession of five-note
clusters all of which outline the first five notes of a major scale, as borrowed from common practice tonality. The pentachord itself is not a symmetrical formation, though Ginastera at first moves the chords symmetrically (D to A-flat, F-sharp to C, B-flat to E—which in scalar order outlines a whole-tone formation: C- D- E- F-sharp- A-flat). The piece ends with a C pentachord in the left hand and the five black keys in the right. The final pentachord perhaps presents a touch of irony, for it alludes to neither the chromatic nor pentatonic scales on which the piece is built, but to conventional tonality—and yet does so without giving the aural impression of common practice tonality.

As in the previous two movements, the return of the A section is in abridged form. Thus, the overall form of the sonata is symmetrical in that each of the three movements is an A B A form with an abbreviated final section.

_Sonata No. 3_

Where the second sonata presents ideas from the four movements of _Sonata No. 1_ condensed and integrated into three movements, the _Sonata No. 3_ further transforms and distills ideas from _Sonata No. 2_ into a single movement. This condensation from four movements to three movements to one in the sonatas constitutes a symmetrical negative dilatation.
That the Sonata No. 3 represents a continuation of the evolutionary process from sonata to sonata is evident in the opening measures. The opening gesture has undergone a metamorphosis, and yet its relationship to the opening gestures of the previous sonatas is clear. Here in the third sonata, the interval 4 pattern which opens the first sonata and then again initiates the second sonata is inverted into interval 8. As in the previous sonata, interval 2 separates the initial pairs of intervals, and the opening axis of symmetry for the "theme" is again sum 11. And once again the opening pairs of intervals are extended and symmetrized. But instead of applying the reflective planes of bilateral symmetry to the opening gesture, Ginastera in the last sonata begins a series of symmetrical dilatations.

The opening gesture (after four introductory octaves analogous to the "flourish" opening the second sonata) is four measures long. The gesture is repeated five times in the course of the sonata, with symmetrical expansion (or contraction) each time. The dilatations take place in the increasing number of repetitions in the leading voice pair of the principal interval 8/4 "cell" which is four eighth-notes long (bracketed in the example); in the number of beats in the asymmetrical measure of octaves which concludes each statement of the gesture "theme;" and in the distance by interval between the voice pair which opens each successive repetition of the theme. The first three repetitions of this
gesture occur consecutively and are shown in Example 34; the last three statements are spread throughout the sonata.

Example 34. Alberto Ginastera, Sonata No. 3, measures 2-11.

In the opening statement the primary cell, which is the subject of imitation in the left hand, repeats three times at ascending pitch levels. The cell is repeated four times in the second statement. In the next four statements of the theme the ascending cell's repetitions number five, five,
four, and then three. The resulting sequence of repetitions 
(3, 4, 5, 5, 4, 3), then, is a symmetrical dilatation, since 
dilatations may include both positive and negative growth.

The distance between each statement also expands at a 
symmetrical rate—until the last statement, when the sonata's 
symmetrical structures begin melding with an emerging 
amalgamation of Ibero-American and AmerIndian musical 
influences. The opening gesture and the second statement are 
separated by interval 2. Interval 3 separates the pair of 
voices at the opening of statement two from the pair of 
voices leading statement three. Between the next two 
statements is interval 4, then interval 5, and finally, the 
sixth statement of the theme begins at interval 5 once more 
from the previous statement's opening. Thus the growth 
between statements is by interval 2, 3, 4, 5, and 5.

Likewise, the measure in octaves which concludes each 
statement is augmented rhythmically at a fixed rate, 
beginning with a measure in 5/8 meter, then 7/8, next 9/8 and 
finally 11/8. The measures concluding the last two 
repetitions of the theme demonstrate the gradual
"disintegration" of symmetrical formations as the writing 
focuses on culturally relevant structures. Statement number 
five does not continue the expanding metric sequence with a 
measure of octaves in 13/8 meter; instead it concludes with 
two measures in 6/8 meter, a hint at Ibero-American rhythms. 
The final statement of the theme eliminates the concluding
octaves altogether and instead establishes an overt Ibero-
American reference—to the rhythmic strumming and literal
notes of the guitar chord (Example 35).

Example 35. Sonata No. 3, measures 75-77.

Interposed with these dilatations and before the final
consolidation and synthesis of culturally relevant musical
references lies a succession of symmetrical events which are
constructed similarly to the ones in the outer movements of
the second sonata. Like the third movement of Sonata No. 2,
many of the symmetry operations take the shape of translation
operations or plane tesselations, many of which also exhibit
bilateral or rotational symmetries. And again, similar to
the second sonata, the black/white dialectic is present: in
the third sonata it is even more pervasive than it was in the
second. The dichotomy does not always occur in this sonata
with either the black or the white remaining superimposed
over the other for the length of the "event"—vertical
juxtapositions of black/white sonorities will alternate as
well, creating a "checkerboard" effect.
Example 36. Sonata No. 3, measures 15-16.

Example 37. Sonata No. 3, measure 18.

Example 38. Sonata, No. 3, measure 36.

Example 36 illustrates a plane tesselation with black/white superimposition; Example 37 shows a translation operation with black/white alternation and vertical planes of symmetry; Example 38 demonstrates glissandi similar to the ones in Sonata No. 2, third movement, but in contrary motion.

The cultural elements begin subtly in this sonata and become more insistent as the work progresses. The first
references are rhythmic allusions to the Ibero-American tradition, beginning with a measure in simultaneous 3/4 and 6/8 time (Example 39).


Pentatonic glissandos and clusters such as the ones in Example 38 may hint at an AmerIndian tradition, especially in light of this sonata's derivation from the second sonata. However, characteristically AmerIndian binary rhythms such as the ostinato opening the last movement of Sonata No. 2 are not present in the third sonata, with the exception of a few pentatonic scale figures in duple meter measures.

Just before the coda begins, and after the final statement of the opening gesture "theme," the guitar, object of Ibero-American cultural focus, becomes the object of compositional focus as it is quoted both in rhythm and in the pitches of its tuning (see Example 35). The "come chitarra"

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strumming are interrupted by a chromatic run which leads into the coda. The coda, in turn, commences with a pair of ascending pentatonic scales (which incidentally do not exhibit the black/white dichotomy). Four measures later the material imitating guitar strumming returns, is transposed successively higher, and climaxes in an anhemitonic pentatonic duet over an accompanying pentatonic cluster (Example 40).

Example 40. Sonata No. 3, measures 89-94.

The pentatonic duet hearkens back to the climactic melody in octaves accompanied by repeated left hand clusters, also in 6/8 meter, at the end of Sonata No. 1, fourth movement.

A final pentatonic tremolo and metamorphosed guitar chord strums lead to the final sonorities of the third sonata (Example 41). Thus, the symmetrization of ideas which was
introduced in the first sonata and geometrized in the second is completed in the third, giving way to a synthesis of cultural elements represented by a merging of the transformed guitar chord and the anhemitonic pentatonic scale.

Example 41. Sonata No. 3, measures 104-108.

Example 42. Sonata No. 3, final measure.

The final sonority of the piece remains puzzling, for it is neither symmetrical (an F-sharp replacing the G would make it bilaterally symmetrical) nor pentatonic. Perhaps this is a bit of irony, like the pentachord ending the second sonata:
with C's the outer pitches, the G which unbalances the symmetry creates an ironic "dominant" in a work removed from major-minor tonality (Example 42).

Ginastera's three piano sonatas, then, are connected in several ways: by the first sonata's single opening gesture which is metamorphosed in the last two sonatas; by a foundation of symmetrical scales, octatonic in the first sonata and chromatic in the second and third; by development of materials deriving importance from the Ibero-American and AmerIndian cultures of Ginastera's native Argentina; and by an overall contraction of form from sonata to sonata. The mathematical definition of symmetry is "invariance under a transformation." According to this definition, the Ginastera sonatas demonstrate symmetry not only within themselves, but as a group as well. The three sonatas together constitute a symmetry operation inasmuch as the sequence of works embodies invariance of gesture, of character, of underlying structure and of cultural significance within a transformation of surface forms and cultural focus.

37Holden, op. cit., 172.
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