

## Percussion solo parts in Rogério Duprat's *Antinomies I*

Partes para percussão solo em *Antinomies I* de Rogério Duprat

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### SCIENTIFIC ARTICLE

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**ABSTRACT:** This article aims to analyse the solo percussion parts in *Antinomies I*, written for chamber orchestra by Brazilian composer Rogério Duprat (1932–2006) in 1962. Characterised by its graphic notation, the composer uses indeterminacy to lead the orchestra into an unconventional paradigm of sound creation. The analysis focuses on the percussionist's range of choices in order to understand how they affect the macro and microstructural elements of the work. There is considerable scope for choices in the percussion part of *Antinomies I*, which requires the use of "multi-percussion". Eight of the thirty-two circular structures that form the score are percussion solos. It is a significant number, greater than any other individual instrumentalist from the chamber orchestra. These circles form a heterogeneous group with different degrees of indeterminacy whose analysis reveals the interpretive process of transforming a graphic score into percussion sounds.

**KEYWORDS:** Antinomies I; Rogério Duprat; Graphic scores; Multi-percussion; Percussion notation.

**RESUMO:** Este artigo tem como objetivo analisar as partes de percussão solo de *Antinomies I*, escrita para orquestra de câmara pelo compositor brasileiro Rogério Duprat (1932–2006) em 1962. O compositor usa a indeterminação da partitura, caracterizada pela notação gráfica, para conduzir a orquestra a um paradigma não convencional de criação sonora. A análise centra-se na gama de escolhas do percussionista, a fim de compreender como elas afetam os elementos macro e microestruturais da obra. Há uma margem considerável para escolhas na parte de percussão de *Antinomias I*, que requer o uso de "multipercussão". Oito das trinta e duas estruturas circulares que formam a partitura são solos de percussão. É um número significativo, superior ao de qualquer outro instrumentista individual da orquestra de câmara. Esses círculos formam um grupo heterogêneo com diferentes graus de indeterminação cuja análise revela o processo interpretativo de uma partitura gráfica em sons de percussão.

**PALAVRAS-CHAVE:** Antinomies I; Rogério Duprat; Partituras gráficas; Percussão múltipla; Notação para percussão.



## 1. Introduction

The present article extends from the research I completed for my PhD in 2023, which analyses *Antinomies I*, written by Brazilian composer Rogério Duprat (1932–2006) for chamber orchestra in 1966. In this article, I am focusing on percussion performance. Characterised by its graphic notation and indeterminate elements, *Antinomies I* is unique and highly innovative in this era. The work is a complex composition whose features constantly vary between high mathematical precision, freedom of choice, and random outcomes. The composer works with different indeterminacy levels, using geometric notation figures, graphic textures, diagrams and textual instructions. The methodology used was the meticulous observation of the symbols and instructions of the score compared to the practical solutions found in the 2017 live performance and studio recordings of *Antinomies I*, in which I participated as a percussionist<sup>1</sup>. The objective is to delimit decisions to find practical and achievable solutions.

The meaning of antinomy in the Cambridge English Dictionary is: "a situation in which two statements or beliefs that are both reasonable seem to contradict, disagree with, or be opposite to each other." The textual content of the score instructions is often ambiguous and can have many different interpretations. The notation explicitly establishes the parameters of frequency (pitch), timbre, duration, dynamic and connection between the sounds. Navigating these parameters at different degrees during the piece is the responsibility of the performers. The score also offers freedom of choice for performers regarding the sequence of events, changing the relationship between the parameters throughout the piece. The performance is a process of creative exploration. Within the ensemble, the percussion part is particularly sophisticated and presents the performer with unique challenges. The percussionist's choices, correlated to the musical parameters specified by the notation and the performance decisions of the other musicians (director and instrumentalists), impact the work's structure. The pitches will be translated into percussion sounds according to the instrument's range or tessitura. Instrumentation, timbre, striking implements to be used, duration, dynamics, and connection of the sounds will be analysed separately. Thus, evaluating the decisions necessary to control these parameters in performance situations will be possible, considering a range of possibilities.

There is a gap in the international literature on Brazilian experimental music. Also, although Brazil is rich in percussion music, little is known about its experimental percussion music. The present investigation reveals the musical significance of this complex work, which deserves more attention.

## 2. Historical background

*Antinomies I* was written in 1962 and published in 1966. According to Gaúna (2002), Stuani (2015) and Vidal (2022), Duprat wrote *Antinomies I*, for chamber orchestra, in 1962. The composition was strongly influenced by Pierre Boulez's structuralism. Unfortunately, Duprat forgot the score in a European subway during his study trip to Darmstadt in the same year. Back in Brazil, he (re)wrote the work, which was eventually published in 1966. Between the first writing of *Antinomies I* and the version dated 1966, Duprat had come in contact with Cage's ideas and electronic music. Duprat's relationship with the piece is ambiguous. In some statements, he underestimates the work: "When I left Brazil, I took my piece *Antinomies* to show it in class, but I lost it on the European subway... honestly what a relief to have lost it, it was no longer necessary to

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<sup>1</sup> Available in [www.antinomies.com.br](http://www.antinomies.com.br)

show it to anyone" (Gaúna 2002, 51). In other declarations, Duprat explains the piece proudly, such as in an interview with Maximo Barro: "*Antinomies I* had precise scientific marking of duration, pitch and dynamic of the only notes that constituted the score" (Barro 2009, 204). The composer also specifies the degree of indeterminacy in the score, attesting that "the score, written without the usual staff, contains few notes, placed in circular areas that, by conductor choice, can last from one second to one hour" (Barro 2009, 96). According to Barro (2009, 96), the score was made by Frederico Capella, then a friend of Duprat, and would have been given to the composer as a gift. There are no details about the way the circles have been projected.

### 3. Explanation of the score

The circles on the score have no reference marks. For the analysis function, I have numbered them from 1 to 32, as seen in Figure 1 and 2, starting from the upper left circle and moving from left to right. This numbering is completely arbitrary without any relation to the structural order of the circles.

ANTINOMIES I  
ROGÉRIO DUPRAT - 1962

45-11 PAN AMERICAN UNION

Figure 1 – *Antinomies I* score with added numbers  
Source: Duprat (1966, 11)

The thirty-two circles are independent and can be arranged within certain limitations. Each of them must be performed by instrumental groups that, except percussion, are represented by specific symbols. Instrument interventions must be decided upon prior agreement between the director and the instrumentalists, decided during the rehearsals according to the composer's instructions. Decisions related to timbre are the instrumentalists' responsibility.

*Antinomies I* score has two sets of instructions that accompany the graphs. The first is called "general instructions" (Duprat 1966, 6-8), a part of the instructions dedicated to the work's microstructure. It contains a decoding of the circles' symbols, explanations about groups of instruments, the relations between the circles' graphic divisions, and the parameters such as notes duration and dynamics. From left to right, the letters below the circles specify timbre (P, TP, M, and TM), connection (C, CC, J, and S), general dynamics (*p*, *mf*, *f*, and *ff*) and tempo (And, Mod, All, and Lento).

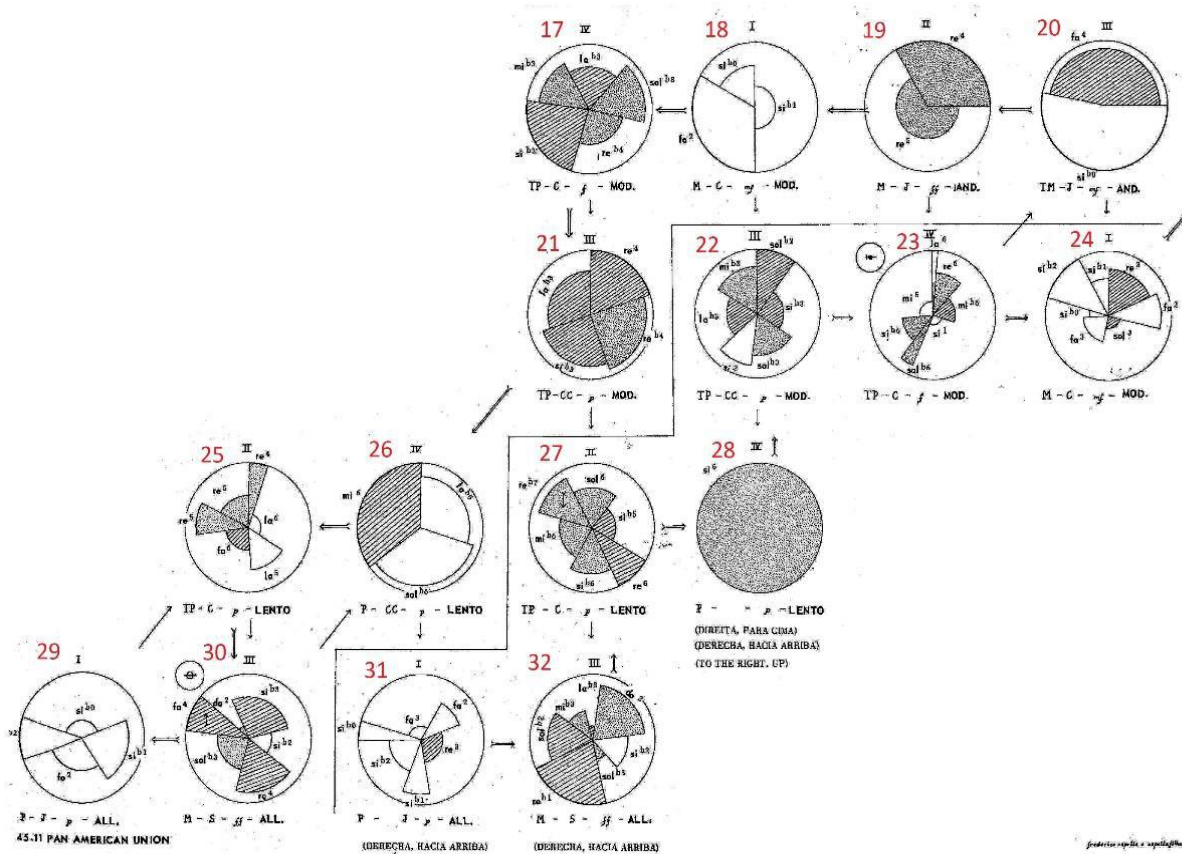


Figure 2 – Second page of the score with added numbers

Source: Duprat (1966, 07)

The second part of the instruction is called "performance instructions" (Duprat 1966, 8-10) and deals with the macrostructure of the work. The composer explains, through items numbered from 1 to 12, how the circles succeed and relate to each other. Duprat creates sequences of circles that connect following predetermined lines imposed by arrows or indications in the performance instructions. These instructions build the macrostructure of *Antinomies I* and affect its microstructure in different ways. Some circles are to be repeated and explored by switching the parameters indications such as dynamics, sound connections and timbre. In contrast, other circles are performed once, without repetition and with the internal sounds played simultaneously by all instrumental groups. This navigation between the circles allows an organisation that purposefully opposes the traditional musical score. The score is rarely read from left to right and never from top to bottom.

### 3.1. Pitch notation

In Duprat's notation, the frequencies are represented by the solfeggio in Portuguese Do, Re, Mi, etc. I have translated the pitch names into the standard letters C, D, E, etc. The composer's pitch material has three

different tuning patterns, each played by a group of instrumentalists. The tuning patterns are standard tuning A=440, higher tuning A= +440, and lower tuning A= -440. All notes have their range specified by the location in the octaves. The lowest note is in octave 0, and the highest is in octave 7. The highest note of the piece is called Db7, and the lowest is Bb0.

### 3.2. Instrumentation

*Antinomies I* is composed for chamber orchestra. The instrumentalists are separated into three groups (I, II, and III), which use different tuning standards represented by graphic symbols that divide the circles, as shown in Figure 3. The fourth group (IV) is formed by percussion and the symbols are shown in the figure below:

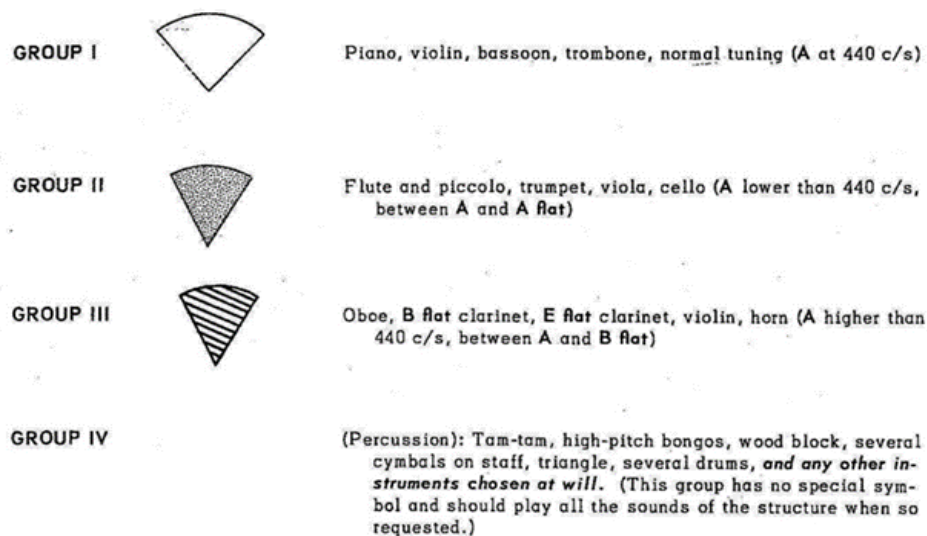


Figure 3 – Instrumentation groups and their respective graphic symbols

Source: Duprat (1966, 10)

### 3.3. Timbre

The composer works with four timbre treatments, which he identifies by the letters P, M, TP and TM. For P and M indications, the instruments must be played using their standard technique. The composer uses the term "pure sounds" (*sons puros* in Portuguese) for this timbre category. For the other category (indications TP and TM), Duprat uses the term "transformed sounds" (*sons transformados* in Portuguese), meaning the sound must be played differently or using some extended technique. The criteria used to separate pure sounds from transformed sounds are mainly centred on controlling the timbre of each instrument. The difference is significant. For Duprat, dynamic nuances or vibrato are considered transformed sounds, as well as more extreme timbre changes, such as those caused by the use of extended techniques. The extended technique is an established practice for a specific repertoire in each instrument and historical context. Duprat describes transformed sounds as:

Any actions beyond the normal playing of an instrument, for example, vibrato, tremulo, frulato, mutes, blared, cupo, col legno, pizzicato, bow, bow and pizzicato together, harmonics, preparations (addition of any physical elements that modify the sound), attacks, accents, dynamics nuances, hand clapping, etc. (Duprat 1966, 6)

Each timbre treatment is applied to eight circles, so the thirty-two circles are divided evenly among the four timbre types:

- P (Pure sound) – "normal" emission (no timbre modifications such as vibrato, appoggiaturas, expanded techniques...). Only one instrumentalist in the group plays the indicated frequency: Circles 7, 8, 10, 12, 26, 28, 29, and 31;
- M (Mixed sounds) – "normal" emission (no timbre modification). Any number of instruments from two up to the whole group plays the indicated frequency: Circles 1, 4, 6, 24, 19, 18, 30, and 32. Circles with the indication M can use different instrumentation and timbre colours for the same pitch. The players of each group can adjust the note according to the tessitura of their instrument by changing the octave. However, no extended techniques should be used. Instead, the performer should explore the range of timbres possible with standard playing techniques. For example, a Gb6 written for group I can be played on the piano, violin, trombone and bassoon simultaneously, adjusting the octave so the trombone and bassoon can perform it without the help of extended techniques. For percussion, pitches in the circles with an M indication allow the choice to play more than one percussion instrument at a time;
- TP (Transformation of pure sounds) – only one instrumentalist in the group plays the indicated frequency but with timbre alteration (vibrato, appoggiaturas, extended techniques...) of free choice: Circles 3, 5, 17, 21, 22, 23, 25, and 27;
- TM (Transformation of mixed sounds) – Any number from two up to the whole group plays the indicated frequency but with timbre alteration of free choice: Circles 2, 9, 11, 13, 14, 15, 16, and 20. The most diverse instrumental choices (and timbral exploration) can be made with the notes in the circles with indication TM. The pitches in the circles with this indication are the most indeterminate regarding timbre and instrumentation. These sounds can be performed by more than one instrument at a time and with extended techniques. Each player within a group can choose their actions. For percussion, the circles with the indication TM allow the most significant possibility of choosing combinations of instrumentation and performance techniques.

Specific actions on each instrument to produce transformed sounds will cause changes in all other parameters. Depending on the chosen technique, there might be modifications in the material's dynamics, duration and frequency.

### 3.4. Duration

In the microstructure, the composer works with sound circles with no predetermined beginning or end. Nevertheless, the notation developed by Duprat controls the proportional duration of every sound of *Antinomies I*. According to the composer: "Duration is indicated by the degrees of the angles, establishing a purely relative tempo (the wider the angle, the longer the note), per the general tempo indicated below the circles" (Duprat 1966, 06). The total duration of each note will be the proportional duration specified by the angles within the circles, which can rotate slower or faster according to the tempo indications. Furthermore, the tempo indications provide the overall character of each circle, achieved through the articulations of the sounds. The process of analysing *Antinomies I* concerning the proportional duration of the notes was accomplished by:

1. Measuring the angles that graphically represent each sound duration within the circles;

2. Assigning an arbitrary numerical value of 60 seconds to the 360 degrees of a circle;
3. Transforming each circle's angles into a seconds/minute ratio. A duration chart in seconds was made for each note. For example, circle 26 is shown in Figure 4 with their measured angles:

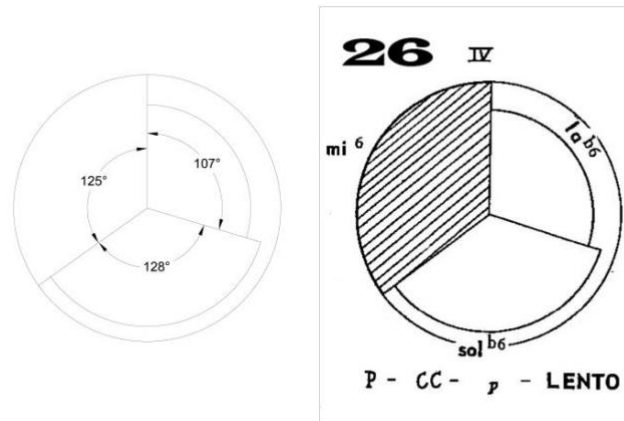


Figure 4 – Measuring the angles of circle 26  
Source: Author's archives (illustration by Carolina Nery)

Transform each angle into seconds/minutes:

- Ab6:  $107 (107 \times 60 / 360) = 17.8s$
- Gb6:  $128 (128 \times 60 / 360) = 21.3s$
- E6+:  $125 (125 \times 60 / 360) = 20.8s$

### 3.5. Dynamics

According to the general instructions of the score by Duprat (1966, 06), "Intensity is related to the length of the side of an angle (the longer the side, the louder the sound), with attention to the indications of the general dynamics given below the circles (*p*, *mf*, *f*, *ff*)". The composer works with four ranges of dynamics with variations within each. The notation determines the general dynamics of each circle and the proportional dynamics of each sound. I identified ten variations by measuring the radii of the angles inside the circles. I used these variations to theoretically specify levels of dynamics within a general dynamic determined by the four indications used by Duprat. An arbitrary value of 1 to 10 was attributed to the lines controlling each note's proportional dynamics. The centre of a circle is 0, and the distance from the centre of a circle to its edge is 10. For example, circle 17 is shown in Figure 5 with the radius measurements:

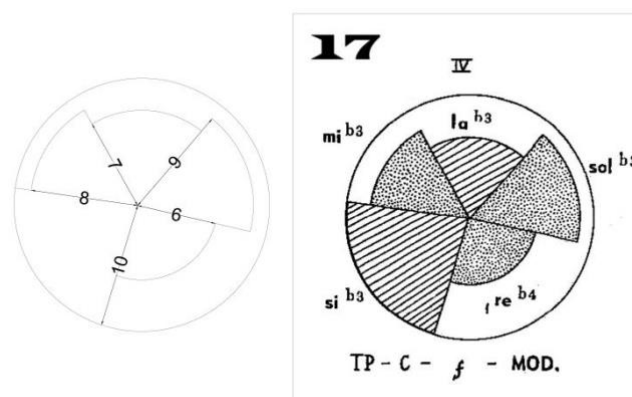


Figure 5 – Circle 17 with the radius measurements  
Source: Author's archives (illustration by Carolina Nery)

### 3.6. Connection of sounds

Duprat prescribes the connection of sounds using the indications J, C, S and CC below the circles. These indications will ensure a combination of notes and timbres of more than one of the four groups of instruments sounding together. Duprat arranges the notes simultaneously and successively. The composer uses two options for the successive organisation of notes. According to the score's general instructions (Duprat 1966, 06), the letter J below the circle means "juxtaposition: following one another without interruption". Juxtaposition is a melodic, legato articulated note with consecutive sounds. Figure 6 shows the connection in juxtaposition (indication J) for the notes in circle 1.

The figure illustrates the connection of sounds in juxtaposition for circle 1. It consists of four musical staves and a circular diagram. The staves are labeled: 'High tuning' (Mib 6), 'High tuning' (Re 6), 'Low tuning' (Reb 7), and 'Standard tuning' (Solb 6). The circular diagram, labeled 'I', shows a circle divided into four quadrants. The top-left quadrant is labeled 'sol b6', the top-right 'mi b6', the bottom-left 're b7', and the bottom-right 're 6'. A vertical line with a downward arrow labeled 'J' is positioned between the left and right halves of the circle. Below the diagram, the text 'M - J - ff - AND.' is written.

Figure 6 – Connection of sounds in juxtaposition  
Source: Author's archives (illustration by Carolina Nery)

C means "contiguity – with short interruptions" (Ibid). Contiguity will also be a melodic treatment of the sounds, with pauses following each note. With these indications, it is possible to know when to perform different articulations of notes for successive sounds, whether it is to be performed continuously or if the combination of the notes will be interrupted by silences. Figure 7 shows the three notes of circle 18 in contiguity connection. Proportional durations for each note are accurately displayed.

The figure illustrates the connection of sounds in contiguity for circle 18. It includes a circular diagram and three musical staves. The circular diagram, labeled '18 I', shows a circle divided into three segments. The top-left segment is labeled 'si b0', the top-right 'si b1', and the bottom-left 'fa 2'. Below the diagram, the text 'M - C - mf - MOD.' is written. The musical staves are labeled: 'Sib 1', 'Fa 2', and 'Sib 0'.

Figure 7 – Connection of sounds in contiguity  
Source: Author's archives (illustration by Carolina Nery)



Two options are also provided for simultaneous note arrangements. The letter S means: "Simultaneity-attacking together with each stopping according to its indicated time" (Duprat 1966, 06). Figure 8 shows the seven notes of circle 15 in simultaneous connection. Proportional durations for each note are accurately displayed.

The musical score for Figure 8 consists of seven staves, each representing a different group of notes. The staves are labeled as follows from top to bottom: Group I (440), Group I (440), Group II (-440), Group I (440), Group II (-440), Group II (-440), and Group III (+440). The notation includes various rhythmic values such as quarter notes, half notes, and eighth notes, with some notes beamed together. Vertical lines connect the notes across the staves, indicating their simultaneous attack and release. The first two notes are marked with '1' and '2' above them.

Figure 8 – Connection of sounds in simultaneity (indication S)

Source: Author's archives (illustration by Carolina Nery)

CC means: "Concomitance: having some point of simultaneity in the attack, either in the main part or at the end" (Ibid). The concomitant connection will lead to a polyphonic texture for the sounds, with them coming together in different layers. Figure 9 shows the two notes of circle 11 in concomitant connection. Proportional durations for each note are accurately displayed.

The diagram for Figure 9 illustrates the connection of sounds in concomitance. It features a circle divided into two horizontal sections. The top section is shaded with diagonal lines and labeled 'Ia<sup>6</sup>' and 'I'. The bottom section is labeled 'Ia<sup>b6</sup>'. To the right of the circle is a large Roman numeral 'II'. Below the circle, there are two musical staves. The top staff is labeled 'TM-CC- ff - LENTO' and 'High tuning', and the bottom staff is labeled 'Standard tuning'. Both staves show a series of notes with proportional durations indicated by horizontal lines above them. The notes are labeled 'La 6' and 'Lab 6'.

Figure 9 – Connection of sounds in concomitance

Source: Author's archives (illustration by Carolina Nery)

## 4. Parameters and percussion

Although the composer separates the parameters into individual indications, they are all connected. For example, timbre specifications such as using extended techniques (T indication) or a combination of instruments playing simultaneously (M indication) will affect the dynamics. Decisions about instrumentation will also influence how durations are controlled and vice versa.

### 4.1. Pitch and Instrumentation

*Antinomies I* percussion part requires a multi-percussion set-up, which can be used to play all of the percussion sounds of the piece. Duprat's set-up includes: "tam-tam, high-pitched bongos, wood blocks, several cymbals, triangle, several drums, and any other instrument chosen at will" (Duprat 1966, 10). The composer specifies indeterminate-pitch percussion instruments comprising of low to high tessitura: membranophones (several drums and high-pitched bongos), metallophones (e.g. tam-tam, triangle, and several cymbals on staff) and wooden idiophones (e.g. woodblock). The possibility of including any other instruments in the percussion set-up opens up almost endless possibilities, as nearly any object can be used as a percussion instrument. It is an opportunity to explore materials such as plastic, glass, bone, water, fabric, whistles and electronics. Small glass bottles produce short, high-pitched sounds when struck with hard xylophone mallets. They can be useful for notes such as Bb6 in circle 7. The composer does not specify any particular pitched percussion instruments; however, tuned percussion can be included in the "chosen at will" instruments category. Although the pitch material is highly determined, the composer did not specify tuned percussion. These specifications suggest that Duprat was utilising percussion for its richness in noise and complex frequencies. I argue that the use of tuned keyboard instruments increases the timbre possibilities for percussionists due to the vast range of tones these instruments offer and allow the percussionist to highlight some frequencies during the performance, such as notes Bb and F in pure sound circles (e. g. 29 and 31), which are played at the same tuning as the group I (A = 440).

I consider three different scenarios regarding the use of tuned percussion instrumentation. In the first scenario, the percussionist and conductor choose to add pitched percussion that can enable the player to play all of the pitches (seventy-eight different pitches) in the score. Keyboard percussion is selected, membranophones must be tuned, and idiophones have to be found or custom-made according to specific + and - pitches. Many types of membranophones are capable of being tuned to set pitches. Timpani and tablas, for example, are often used for specific, definite pitches. Idiophones that produce that particular pitch can also be found or tuned (e.g. pipes, metal plates, or even pieces of wood). The percussionist can choose the instrumentation according to the specific frequency emitted by the instrument (e.g. a triangle that sounds like an A6 tuned higher in circle 11). Performers would have the ability to reinforce Duprat's pitch material by choosing instruments that produce the exact frequencies of each note in the score. The percussionist can also adapt the pitch material to indeterminate-pitch percussion instruments according to the tessitura when necessary.

The second scenario uses a balanced choice between pitched and indeterminate-pitch percussion instruments. Here, pitched percussion instruments are used to play the notes indicated for Group I, as the tuning is standard A=440. The pitches with lower tuning (A=lower than 440, between A and Ab) are played on indeterminate-pitch percussion instruments, maintaining the tessitura. The notes with higher tuning (A=higher than 440, between A and Bb) will also be played on indeterminate-pitch percussion instruments,

maintaining the tessitura. In my interpretation, the percussionist can choose any amount of percussion instruments, including whistles and electronic devices. There are a wide variety of aerophones, such as whistles, each with its own specific pitch and tessitura characteristics. Most types do not produce pitched frequencies; therefore, they will not be classified as pitched instruments in these considerations.

In a third scenario, the performer plays with the minimum set-up required by Duprat, using only indeterminate-pitch percussion instruments. In this third scenario, the pitch material must be translated to the instruments by approximation, according to their tessitura. In one instruction, Duprat refers to the pitch range (tessitura) of the percussion: "Group IV (percussion) plays all the sounds of the structures for which are indicated endeavouring to maintain the tessitura. For example, a Bb1 should be played by a low-pitched instrument, not by a triangle" (Duprat 1966, 10). This is the critical instruction by Duprat. Whatever the instrumentation, the percussionist must "endeavour to maintain the tessitura" of the sounds. The free choice of instrumentation is constrained by the pitch material, which means that even with this freedom, certain types of sounds will probably keep occurring even with different instrumentation. For high-range notes, high-pitched instruments, such as triangles, glockenspiels, cymbals, or high-pitched drums, like bongos, should be used. Duprat explores the limits of the low and high frequencies. "Sometimes, we describe the percussive sound as having 'low' or 'high' pitch, even if they do not convey an identifiable pitch, but it would be correct to describe this a high or low range or tessitura" (Duprat 1966, 01).

For percussion instruments, notes in octaves 0, 1 and 2 can be played on large-sized membranophones, large-sized wooden instruments, such as log drums or large-sized metal instruments, such as gongs and tam-tams. Notes in octaves 3 and 4 can be played on medium-sized membranophones and medium-sized wood/metal instruments such as suspended cymbals. Notes in octaves 5, 6 and 7 can be played on small membranophones and small wood/metal instruments such as triangles.

## 4.2. Timbre

The sound spectrum of a note is what characterises its timbre. It is influenced by harmonics and inharmonics produced by the material in which the instrument is built, such as wood, bone, rubber, skin, metal, plastic, and glass. Different types of percussion instruments playing the same pitch with the same tuning will have different sounds. Some composers (such as Cage in 27'10.554 for a Percussionist) separate instruments into different categories (wood, skin, metal, and all others), resulting in a distinct contrast of timbre between them. In addition to the material from which they are constructed, percussion instruments have their natural timbre defined by their specific shape and size. For example, the tam-tam and the triangle are metal instruments with entirely different sound spectrums. Other parameters of the sound (e.g. dynamics) will also influence timbre. For example, a sound shorter than 4 ms is recognised as a click or a slap.

For *Antinomies I* percussion performance, the division between pure and transformed sounds can have different interpretations. According to Duprat (1966, 06): "Transformations are any action beyond the normal playing of an instrument". The "normal" playing technique referred to by Duprat changes depending on the specific percussion instrument. Some instruments have several normal playing techniques. For example, a suspended cymbal played with sticks or mallets made of diverse materials and different hardness can all be understood as a standard playing technique. A strike attack will be made about halfway between the edge and the dome, producing pure cymbal sounds. The same technique applied to other instruments,

such as hand drums, can be considered transformed sounds or extended techniques. In the same way, a suspended cymbal played with the hands will produce transformed sounds.

The examples of techniques provided by the composer in the score instructions are mostly wind and string instrument techniques. However, they can be adapted for percussion. My interpretation is: Vibrato and tremolo are "rolls" for percussion. Mutes can include "dead strokes". Different playing locations and selective hand-muting on percussion instruments can produce harmonics. Attacks, accents, dynamic nuances, and hand clapping are part of the percussionist vocabulary. The percussionist will choose these nuances and may include grace note "rudiments" (e.g. flams, drags, four-stroke ruffs). Some of the decisions can be made in real-time, at least theoretically. Discussions about extended techniques on percussion in this period were rare and constantly under development. Morphological interferences (water, chains, clips) and other activation modes (scraping, rubbing) can also be associated with extended techniques and transformed sounds.

It is interesting to note the wide range of actions that form the vocabulary of gestures of a percussionist. According to Labrada (2014, 48-49), three distinct elements can be combined for the production of sounds in percussion instruments with a great variety of timbres: the activation modes (the different possible actions to be taken), the driving materials (the operators of these actions) and the locations (where specifically the action will take place in the instrument's body). Among the elements contained in the activation modes, we have examples of scraping, rubbing, striking, shaking, pinching, and blowing, among others. A cymbal can be scraped, played with many different sticks, using single-stroke or closed rolls, with muted and open tones, with amplification, combined with other instruments, or dipped in water (water percussion techniques). Generally, these arrangements would be decided beforehand by the performers, which requires a great deal of consideration and preparation. Dead strokes are another possibility for modifying timbre and duration. The resulting sound will depend on what kind of material is being hit (e.g. metal or wood), where the mallet strikes the instrument, what kind of mallets are being used, and how much pressure is being applied. For example, keyboard percussion instrument bars can be played on the node, centre, or edge. The dead strokes will produce different timbre results in each of these locations.

On membranophones, rim-shots, harmonics, dead strokes, and specific playing areas have different sound characteristics (e.g. rattan snaps against drum heads). The activation modes can be direct or indirect, the latter being possible when the interpreter's action does not occur directly on the instrument but through the action of a third and intermediate object. All of the techniques mentioned above can be used to produce transformed sounds.

The driving materials have a much greater diversity of possibilities, assuming that any objects can be used as triggers. For example, different striking implements (triangle bass drum beaters, mallets, rubber sticks), strings, instruments themselves (castanets, triangle, rattles, cymbals), and unusual triggers (spoon, knife, wooden spoon, finger, nails) can all be considered to produce transformed sounds.

### 4.3. Striking implements

As the composer does not specify what striking implements to use, this decision is up to the percussionist. As in many works, this choice allows the percussionist greater control over timbre and articulation results. In *Antinomies I*, the instrumentation and other parameters in the score (timbre, duration, dynamics, and connection of sounds) will generally guide the choice of different striking implements. Occasionally, there is

not enough time to perform a mallet change in a multi-percussion set-up, and compromises need to be made. Dierstein et al. (2019, 309) state that the average change time for a change with two mallets is 1.5 to 2 seconds. This time can vary in specific cases, for example, picking up big mallets or bows. According to the authors, the player will need 2 seconds for four-mallet changes. Multiple-mallet techniques can be used in this case. According to Dierstein et al. (2019, 318), performing a multi-percussion set-up can result in choosing unusual mallets, beaters, and drumsticks. Many times, custom-making double-ended and two-sided head mallets of different constructions will help to facilitate what would generally require quick stick changes. There are four characteristics of striking implements:

1. Material (felt, wood, metal, rubber, and plastic);
2. Size (large, medium, small);
3. Weight (heavy, medium, light);
4. Construction (soft, hard).

A combination of these four characteristics will determine the production of the desired sound.

## 5. Percussion in the macrostructure

The decision to include percussion in each of the macrostructure's twelve items is left up to the director and performers. The percussionist and other instrumentalists can request the participation of percussion, as well as any other instrument, and the director can "request the contribution of the percussion whenever he wishes" (Duprat 1966, 06). The percussionist may not play for the entire piece if the director decides or can play all sounds in every circle. However, there are two moments in the macrostructure that the percussion must play: in item 4, where there are eight circles that are solo for percussion and in the last item 12 of the macrostructure. The musical context is different for each item.

In item 4, there are eight percussion solo circles in which all sounds are played by percussion. The only sounds to be heard are percussion sounds. The percussionist's decisions in these parts are structural. Item 4 is formed by two fixed sequences of 16 circles: sequence a) and sequence b). The percussionist features as a soloist on four circles in each sequence, identified by the Roman numeral IV above these circles, equalling eight solos in total. The remaining 24 circles are tacet for percussion. Performing both sequences in a single performance is not mandatory; however, it is a possibility. The solo percussion circles are underlined:

Sequence a): 31 – 32 – 27 – 28 – 22 – 23 – 24 – 20 – 19 – 18 – 17 – 21 – 26 – 25 – 30 – 29

Sequence b): 14 – 13 – 10 – 09 – 07 – 06 – 05 – 01 – 02 – 03 – 04 – 08 – 11 – 12 – 15 – 16

By analysing the separate parameters for each solo percussion circle, it is possible to observe the different levels of indeterminacy of each one of them. The composer always controls the dynamics and proportional duration parameters. Duration is always subject to variation within the performance, which the director and instrumentalists decide. However, the translation of the angles to seconds and the time indications provided by the composer give enough information for a precise hypothetical determination of the sound's proportional durations. Pitch is also strictly controlled. However, translating the pitches for percussion

instruments requires the percussionist's choice. Decisions regarding instrumentation and dynamics are restricted by the timbre indications.

In the four solo percussion circles from sequence a), the composer works with individual instruments, whether they have the indication P or TP. There are two circles indicated P: This indication is attributed to circles 28 (pitch B6-) and 26 (pitches Ab6, Gb6, E6+). Circle 28 is shown in Figure 10:

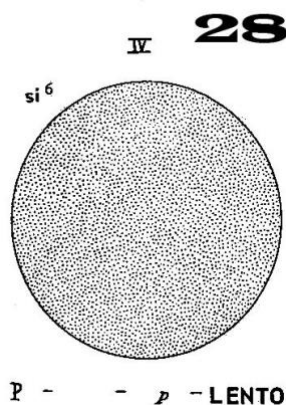


Figure 10 – Percussion solo, circle 28

Source: Duprat (1966, 07)

This high-pitch note can be played on a small membranophone, small metal instrument, small wood instrument or small idiophone. The specific dynamics for this sound were measured as 10, which means the highest intensity within a general context *p*. As it is a pure sound circle, dynamic nuances and accents are not allowed. Lighter wooden sticks with small tips best suit soft dynamics on small membranophones in high tunings. Rolls can be used in dynamic *p* as long as they do not alter the natural timbre of the instrument. Wooden sticks with small tips are more appropriate in softer dynamics.

It is important to keep the usual sound of each chosen instrument as per indication P. On cymbals, strokes closer to the bell will be easier to control with smaller headsticks. In general, thin light beaters produce quiet, brighter overtone sounds on triangles. Small idiophones such as shaker, maraca, and caxixi might be used. Rapid sequences of back-and-forth, circular or rotary movements will create a continuous high-pitched sound from these instruments. At the microstructure level, only one sound must be chosen for this structure. If the option is to use more than one instrument, only one must be played at a time with no mixing of sounds. I argue that a reasonable decision is to play this sound on a small triangle. The total duration of this solo circle is determined by the percussionist. This choice, mediated by the director and instrumentalist, directly influences the macrostructure.

In circle 26, the percussionist chooses the instrumentation to translate the high-pitched sounds Gb6, Ab6, and E6+. The circle is shown in Figure 11. Using marimba, xylophone and glockenspiel for the standard tuning notes is a reasonable choice. The other note can be played on small membranophones, small woodblocks or small metal instruments such as triangles that are part of the set-up determined by the composer. The three notes have an approximate theoretical duration (20.4s, 23.9s, 24.4s). The percussionist can use articulations in a *Lento* tempo character or rolls to comply with the durations. The dynamics of the three notes also have an approximate value within a piano context. The strongest note will be E6+ (*p*10), and the softest will be Ab6 (*p*8). The difference will be very subtle. Indication P of pure sound will guide the percussionist's choice of striking implements. This circle has a concomitant connection (CC), in which the sounds will have

simultaneity at some point, either in the attack, during the execution of the notes, or at the end. It is the only solo percussion structure with this indication. The performer can choose how to make this connection as long as the three instruments' sounds come together at some point in the structure. This decision influences the microstructure. The total time of the circle's performance is dictated by the duration of the longest note, Gb6 440 (theoretical duration= 24.4s). The final duration of this sound also influences the macrostructure.

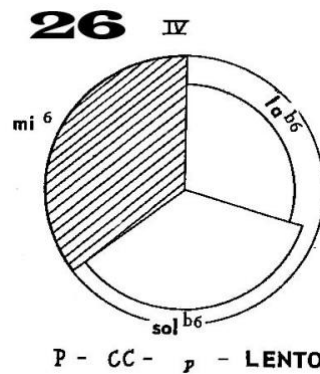


Figure 11 – Percussion solo, circle 26  
Source: Duprat (1966, 07)

The other two percussion solo circles are indicated TP. This indication is attributed to circle 23 (pitches Bb6-, A6, Gb6 -, D6 -, Eb6 +, E5, B1) and circle 17: (pitches Db4 -, Bb3+, Ab3+, Gb3-, Eb3). The decisions available to the percussionist multiply due to the possibilities of using extended techniques on each chosen instrument.

For circle 23, the percussionist chooses the instrumentation, which should translate the seven sounds with a pitch range that spans from the low to the high, spanning five octaves. The circle is shown in Figure 12:

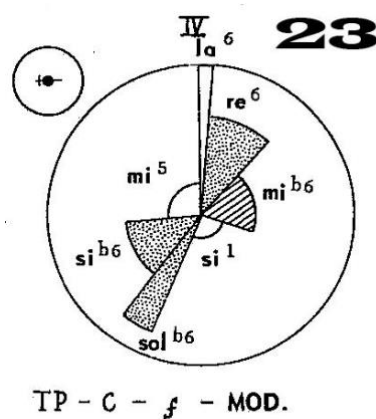


Figure 12 – Percussion solo, circle 23  
Source: Duprat (1966, 07)

This solo percussion circle contains the most significant number of internal divisions. The pitches need to be played one note at a time with transformed sounds. This circle has a contiguity connection. The percussionist needs to treat each sound separately, exploring extended techniques, accents, and dynamic nuances. The longer the note lasts, the greater the possibility of exploring sound transformations, which are the interpreter's decisions. However, these rudiments and different articulations must be controlled to give the

Moderato character. The percussionist also gets to decide which note begins the performance and in which direction to proceed, clockwise or counterclockwise. These decisions influence the microstructure.

A reasonable instrumentation choice is to use a xylophone for the standard tuning note A6, which is the shortest one, 0.5s, and has the highest dynamic level  $f_{10}$ . Another standard pitch note that can be played on a mallet percussion instrument is the E5. It has a longer duration (8.5s) and lower dynamics ( $f_2$ ), making it suitable for the vibraphone with a bow, for example. E5 is also the lowest pitch and the sound with the lowest dynamic level ( $f_1$ ). A reasonable choice is to play it on a concert bass drum, large tam-tam, or wooden or metal bar. Gb6- is a short note (1.3s) with a high dynamic level ( $f_8$ ). It is suitable to be played on a woodblock. The other notes are in the same octave 6 with approximate duration and dynamic rates. They can be distributed on small membranophones, small wood or small metal instruments by an option of the interpreter.

In the item 4 sequence, circle 23 will be performed after circle 22, which is tacet for percussion. During this tacet circle, the percussionist can make preparations on their instruments and exchange striking implements to prepare for the next circle. As an example, a possible clockwise sequence D6-, Eb6+, B1, Gb6-, Bb6-, E5, A6 can have: cymbal over timpani, woodblock with flams, concert bass drum with dynamic nuances, small membranophone with rim shots, triangle played with a snare drum stick, vibraphone played with a bow, and xylophone played with a snare drum stick. Muffling techniques should be applied to interrupt each sound before the next attack, producing small pauses whose durations are controlled by the performers. The final duration of this circle influences the macrostructure.

Circle 17 has the exact indication of general dynamics ( $f$ ), tempo (Moderato), connection (C), and timbre (TP) as the previous structure. The circle is shown in the Figure 13:

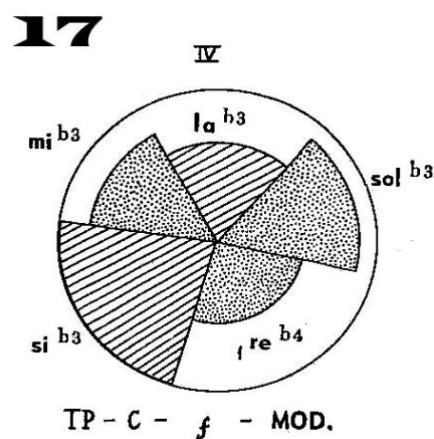


Figure 13 – Percussion solo, circle 17  
Source: Duprat (1966, 07)

The specifications regarding its performance are the same as the previous circle: the percussionist will have to choose the instrumentation to be played one at a time, transformed sounds with small interruptions between one pitch and another. Rudiments and different articulations must be controlled to give the Moderato character. The performers choose which note begins the performance and which direction the circle will follow—clockwise or counterclockwise. These decisions influence the microstructure. In the sequence of item 4, this circle is performed after four tacet circles for percussion. The five notes that form circle 17 are in the middle range, covering the 3rd and 4th octaves. Possible instrument choices include



medium-sized membranophones, wood and metal instruments. There are no notes in standard tuning, which discards the use of standard keyboard percussion instruments. The use of timpani is a possibility. For example, a possible clockwise sequence Gb3-, Db4-, Bb3+, Eb3-, Ab3+ can include a cymbal over timpani, woodblock with accents, 23" timpano with pedal glissandos, medium-sized membranophone with rudiments, and a cymbal played with a bow. The final duration of this solo percussion circle influences the macrostructure.

In sequence b), the composer works with combinations of instruments, either with the indication M (without extended technique) or TM (with extended technique). Combinations of the basic pitch range with sounds in different ranges should be explored.

There are two solo percussion circles indicated M. This indication is attributed to circle 6 (pitch D4 -) and circle 4 (pitch Gb4+). Circle 6 is shown in the Figure 14:

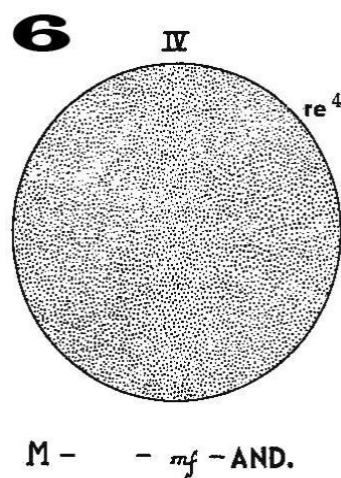


Figure 14 – Percussion solo, circle 6  
Source: Duprat (1966, 11)

The specific dynamic for this sound was measured as 10, which means the highest intensity within a general context *mf*. The basic sound is a medium-pitched note which can be played on a medium-sized membranophone, medium-sized wood instrument, medium-sized metal instrument, and medium-sized idiophone. The percussionist will have to control the dynamics in combinations of two or more instruments. The performers decide on these combinations, which will influence the microstructure. Articulations and rolls on different instruments can be added during the performance of this circle. The *mf* dynamics and the normal timbres of each instrument must be maintained. In this case, dynamic nuances or accents are not allowed. There is no connection determined for the sounds. Possibilities include playing two or more cymbals simultaneously or a cymbal and a timpano together. Each sound does not need to be interrupted for the start of the next one. The percussionist can explore the combination of the sounds of different instruments ringing simultaneously. The articulations performed on one or more instruments must be controlled to give the Andante character. These decisions will influence the microstructure.

In circle 4, the percussionist must choose the instrumentation to translate the medium-pitch sound Gb4+. The circle is shown in the Figure 15:

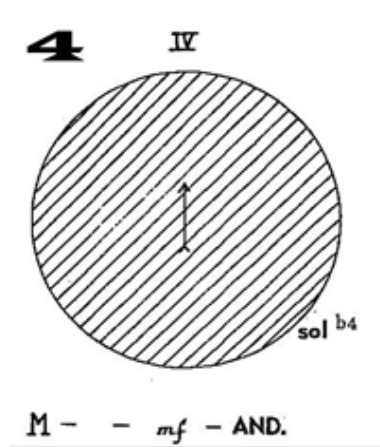


Figure 15 – Percussion solo, circle 4  
Source: Duprat (1966, 11)

Like the previous circle, a reasonable choice is to use a medium membranophone, woodblock or metal instrument. The percussionist controls the final duration, which can be the same for circles 6 and 4, as they have the same theoretical (51.6s). This decision can have significant variations that influence the macrostructure. The percussionist does not have a choice of dynamics since it is *mf*10 throughout.

Two solo percussion circles are indicated TM. This indication is attributed to circle 14 (pitch Bb0) and circle 16 (pitches D3+, Bb2, F2, Bb1, B0). TM indication gives the performer the most significant possibility of choices for each note. Circle 14 is deemed to have the highest indeterminacy level among the solo percussion circles. This difference is due to the connection assignment of circle 16 notes, which is controlled by the composer, as well as the proportional durations of each sound. In circle 14, these connections and proportional durations do not exist, which can make the final duration vary enormously.

For circle 16, the percussionist must choose the instrumentation, which should translate the five sounds to a pitch range that spans four octaves from the extreme low to a medium range. The circle is shown in the Figure 16:

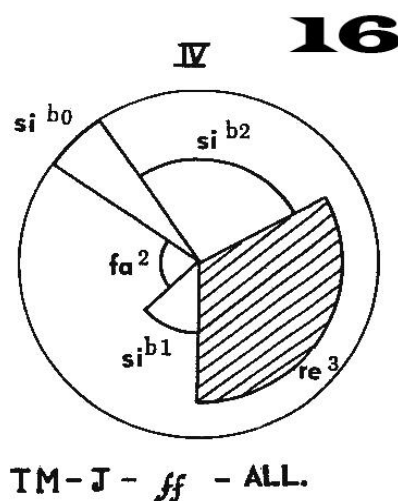


Figure 16 – Percussion solo, circle 16  
Source: Duprat (1966, 11)

The pitches must be played simultaneously on multiple instruments, using unusual sounds. The composer determines the connections of sounds, which have a J indication. It is the only solo circle percussion that has

this indication. The sounds shall be played according to the duration of each note established by the composer, without interruption between the attacks of each pitch. Combinations of two or more instruments in different pitch ranges are allowed by the percussionist's choice.

The percussionist is invited to explore a great variety of sounds, including extended techniques, accents, and dynamic nuances. All of these rudiments and articulations must be controlled to give the *Allegro* character of the structure. The percussionist also chooses which note begins the performance and which direction in the circle they follow, clockwise or counterclockwise. This decision influences the microstructure. Four of the five notes determined by the composer are in the standard tuning, which makes the use of keyboard percussion instruments viable. A reasonable instrumentation choice is to use a pedal bass drum for the basic note Bb0, which is the shortest and has the highest dynamic level. Bb1 is another low-pitch note that can be played on a concert bass drum or a large tam-tam. It has a longer duration and smoother dynamics, making it suitable for expanded techniques, such as using superballs. The longest note is D3+. Possibilities include playing it on a medium-sized membranophone or medium wood or metal instrument. Its longer duration makes it easy for the percussionist to explore rudiments, dynamic nuances and accents. F2 and Bb2 can be played on timpani, vibraphone or marimba. Other keyboard percussion instruments can be added in octaves.

A wide variety of striking implements can be used for transformed sounds. The percussionist can choose to make preparations to modify the timbre of the instruments and use rudiments, accents or nuances of dynamics. In the item 4 sequence, this circle is performed after four *tacet* circles for percussion. There is plenty of time for several extended techniques, preparations, and exchanges of the striking implements. For example, a possible counter-clockwise sequence Bb2, B0, F2, Bb1, D3+ could include a 26" timpano, pedal bass drum, vibraphone, tam-tam, and cymbal with tom-tom. Articulations should be controlled to give the *Allegro* character.

Circle 14 is formed by only one pitch (Bb0) in the category of transformed mixed sound. The circle is shown in the Figure 17:

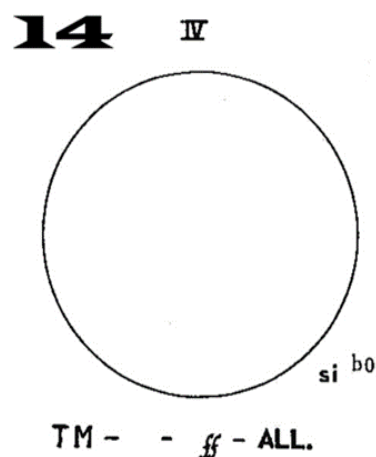


Figure 17 – Percussion solo, circle 14  
Source: Duprat (1966, 11)

There is no connection determined for the sounds. The TM indication allows all of the instruments within the percussionist's set-up to be utilised in the performance of this circle, including the keyboard percussion instruments, since the tuning is standard 440. The basic sound is a low-pitch note to be played on a large

membranophone, large metal instrument, and large wood instrument. During the performance of the circle, different combinations of instruments can be made to change their usual sounds, influencing the microstructure. For example, striking two or more cymbals on top of each other to change the instrument's sound properties or placing a cymbal on the head of a timpano. Each sound does not need to be interrupted for the start of the next one. The percussionist can explore the sum of the sounds of different instruments ringing simultaneously. The articulations performed on one or more instruments must be controlled to give the Allegro character of the structure. Indication for transformed sounds allows for different dynamic nuances, attacks or accents, using expanded techniques in a general *ff* dynamic context.

## 6. Conclusion

When exploring the percussion part of *Antinomies I*, specific musical results are suggested, even if these results constitute a range of possibilities examined here. The pitch material determines the basic instrumentation that must respect the tessitura. This basic instrumentation may have variations considering each instrument's material, size and shape. Percussion instrumentation can undergo enormous changes from one performance to another, but the tessitura of the sounds will always be close to the established pitch material. Timbre indications narrow down the choices regarding techniques to be applied with standard or transformed sounds. These choices are more restricted in the P indication. The other timbre indications increase the percussionist's responsibility in manipulating sounds and instrumentation possibilities, dramatically affecting the sonic result. TM indication allows for the broadest range of possibilities. Dynamics and durations are also parameters that determine instrumentation, techniques to be applied and choices of striking implements. The connections between the sounds determine the microstructure, which the percussionist controls in the solo circles. In *Antinomies I*, Duprat offers an opportunity for the percussionist to make important decisions that would not be allowed in other works, even if the director and other orchestra musicians mediate these decisions. Choosing pitched percussion instruments can amplify the role of percussion to emphasise frequencies. This function is optional. I argue that Duprat's approach to percussion is based more on timbre than pitch.

Through this investigation, the elaborate process of interpreting graphic scores for percussion that use elements of indeterminacy becomes more evident. *Antinomies I* is a complex work that challenges pre-established contexts and deserves more attention. This article adds to the research on early Brazilian experimental music. Many complex and unknown works deserve future research, especially in the experimental music repertoire of Latin America.

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