

The Presence of a Mysterious Black Silhouette

From a Print to a New Form of Usage of Guitar Multiphonics

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ABSTRACT

The author recounts how she came to carry out artistic research on guitar multiphonics when composing a piece for solo guitar. She explains how the investigation gave rise to a new form of usage of that unconventional technique.

My latest compositional output has been mainly centered on the classical guitar and the technique of multiphonics on this instrument. This unconventional performing technique has been the subject of my scientific research for some years now. Nevertheless, when composing a piece titled *Si amanecce, nos vamos* (If day breaks, we will be off), which I wrote in 2015 at the request of guitarist Jürgen Ruck to contribute to his project *Caprichos Goyescos*, I ended up carrying out artistic research and arrived at a new form of usage of the technique.

Ruck's project consists of short caprichos for solo guitar written by various composers; the guitar caprichos were to be inspired by a print of the set *Los Caprichos* (1797–1798) by the Spanish artist Francisco Goya. At the same time, my piece would be written in the context of my research on guitar multiphonics, and therefore make use of this technique.

THE MULTIPHONICS TECHNIQUE

The term *multiphonics* originated from the adjective *multi-phonetic*, which was possibly first used in 1967—in the English translation of a book by Bruno Bartolozzi [1]—to characterize the sounds of a technique used on woodwinds. On wind instruments the multiphonics technique consists in the production of more than one pitch exclusively by blowing. On stringed instruments, a single (portion of a) string produces

a (complex harmonic) tone, in which multiple pitches are easily perceivable; on plucked strings, the string is excited only once. The technique differs thus from (1) string tapping, with which two tones are produced on (different vibrating portions of) a string; and (2) a technique that, according to Andia [2], produces “multiphonic sounds” and consists in playing harmonics, followed very rapidly by plucking the string at that harmonics location with the same finger that originally lightly touched the string. The sounds produced by this technique are, nevertheless, perceived very similarly to those produced at the same location by the technique of multiphonics explained below (in both cases, the more easily perceived pitches are those of the usual harmonic tone and the open string tone). I will hereafter refer to the tones produced by multiphonics as *sounds*.

MULTIPHONICS ON THE GUITAR

On the guitar, the technique of multiphonics works best on wound strings. Like the technique of harmonics, it consists in damping out some of the vibrational modes of the string. This is achieved by lightly touching the string (as opposed to conventionally stopping it, where the string is pushed against the fretboard) during or after its excitation (or both). Unlike harmonics, with multiphonics the filtering of the vibrational modes is not systematic with respect to mode number. This makes the perception of multiple pitches easier. I call the sound's partials that correspond to the more easily perceived pitches *main partials* [3]. Also contrary to harmonics, the technique is continuously possible along the string. Most sounds of multiphonics present unusual colors and a low loudness level, rendering it difficult to perceive some of its components at a distance [4]. In some cases, this applies to all main partials but one, such as when attempting to play higher harmonics. In this case, it is because the vibrational modes without a node at the touch location are all strongly damped (but not damped out).

The subject of guitar multiphonics was absent from scientific publications for 25 years but is now receiving renewed at-

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tion. The publications by other authors consist essentially of compendia on unconventional guitar techniques [5–13]. Possibly due to their large scope, their information on multiphonics is limited. For example, a detailed explanation of the acoustics and psychoacoustics of multiphonics is not provided, the sounds suggested are limited in number, and the amplification of the sounds is not explored. I have attempted to address most of these literature gaps in my research [14,15].

The majority of scientific publications being recent [16], and the oldest having been out of print for many years, could explain why I found the technique in only 42 scores by other authors [17]. In most of these compositions the technique is used conventionally—that is, the string is plucked with a single stroke while lightly touched and is left to ring freely. Variation in the beginning or end of the sounds can be found in five pieces, as well as in a piece of mine. In these compositions the sounds are produced (1) with a *quasi pizzicato-Bartók* (i.e. the string is softly pulled but does not hit the frets) [18]; (2) after slowly increasing the thumbnail's touch pressure on a vibrating open string [19]; (3) with a *legato* articulation departing from an open string [20]; (4) with *tremolato* (i.e. repeatedly plucking the string downward and upward with a single exciter and a rapid movement) [21]; (5) with bow [22]; (6) conventionally but damped afterward (a) abruptly with *staccato* [23] or (b) progressively by leaving the touching finger on the string [24].

THE PRINT

I chose Goya's *Capricho* number 71, titled *Si amanece, nos Vamos*, for this project. This print depicts a group of five witches resting under a starry sky; behind them is the black silhouette of a figure with wings [25]. One of the witches has small children strapped to her back—supposedly the group's meal, as witches were thought to consume the flesh of babies at Sabbats [26].

I therefore assumed that the scene takes place before the meal of a Sabbat, and I interpreted the silhouette as a symbol of the devil, yet to arrive, for which the witches have just settled down and are getting ready for their ritual. In fact, contrary to other witchcraft prints of *Los Caprichos*, in which the witches are flying on broomsticks, this print suggests quietness and not movement, emphasized by the starry night scenery. However, the black silhouette creates an atmosphere of suspense.

THE IDEA

The underlying suspense created by the black silhouette inspired the main gesture of the piece: a dark pedal tone (i.e. a continuously sustained note) with the lowest pitch of the traditional tuning of the guitar (i.e. E₂ on open string 6). I chose to produce this pedal tone by exciting the string with *tremolato* in *pizzicato* (i.e. while damping the string at the bridge with the side of the hand palm), as exemplified in the first sound found in Audio Example 2 in the online supplemental materials.

THE PROBLEM

The pedal tone in *tremolato* posed two constraints. First, the possibilities of excitation of the other strings by that hand are limited. Second, I wanted to have the pedal tone played simultaneously with and on the same string as the technique of multiphonics, because the assumptions that I had made from the results and was going to implement were for string 6. Therefore, I decided to explore the *tremolato* as the form of excitation of the string when playing multiphonics, while simultaneously a pedal tone with the pitch of the open string's tone (which is the pitch of its fundamental frequency) is to be perceived. Given the first constraint, it was my goal to arrive at a solution, around which I could build most of the piece.

THE RESEARCH

When a string is excited with *tremolato*, the part of the sound that is repeated is that right after the attack, which is the loudest. This allows the listener to perceive very rapidly decaying components of a sound of multiphonics, such as those that originate from vibrational modes that are strongly damped due to the continuous touching of the string, which is the case of the fundamental frequency. If the string is excited in *pizzicato*, however, as is desired for the pedal tone, most other components of the sounds are damped out. When playing multiphonics with *tremolato*, the string needs then to be free from *pizzicato (normale)*. In this transition between the pedal tone alone in *pizzicato* and the sound of multiphonics with pedal tone played *normale*, a discrepancy can be noticed in the pedal tone's timbre. This undesired discrepancy is smoothed by gradually increasing the touch pressure while gradually releasing the *pizzicato* and vice versa when returning to the pedal tone alone. This effect is emphasized by departing from low dynamics, increasing the dynamics in the first part, and decreasing it in the second part. This method was to my knowledge previously unused and presents an innovative way of overcoming the guitar's short-sustain problem, because the *tremolato* is varied through unusual sounds.

The sounds of multiphonics that I seek in the piece are of two kinds: sounds with unusual colors and sounds of more conventional colors played at usual harmonics locations. The former sounds are produced with *very light* touch pressure. If *light* touch pressure is used—I assumed this to be the usual employment for harmonics—the pedal tone is too weak and the sound too dark. With *extremely light* touch pressure, the pedal tone is too strong. Figure 1 depicts the touching of the string with the three above-mentioned pressures. To compensate for the loss of brightness of the sounds due to the uninterrupted touching of the string, the excitation location that in *pizzicato* is near the rosette (i.e. near the decoration of the soundhole, which is the usual excitation location; *ordinario*) is either near the bridge (*sul pont.*) or *not so near* the bridge (*poco sul pont.*). *Very near* the bridge (*molto sul pont.*), the pedal tone is on the one hand weaker, while on the other too bright. Figure 2 provides spectrograms of sounds of multiphonics produced with the different above-mentioned

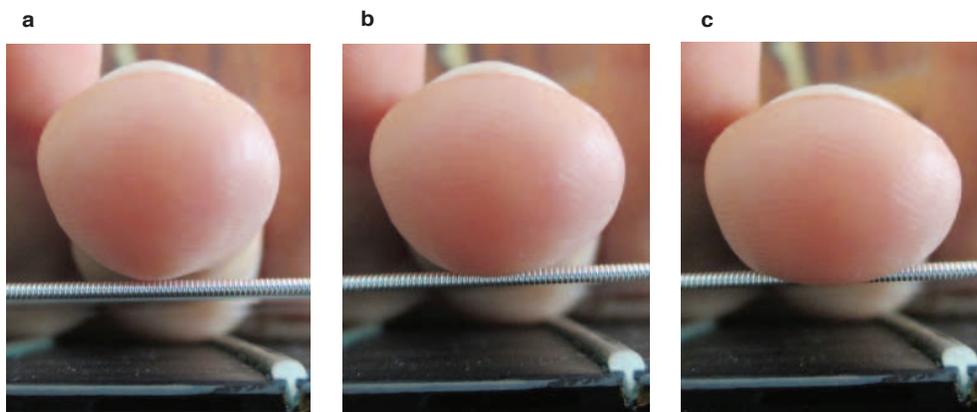


Fig. 1. (a) String touching with *extremely light* pressure. (b) String touching with *very light* pressure. (c) String touching with *light* pressure. (© Rita Torres)

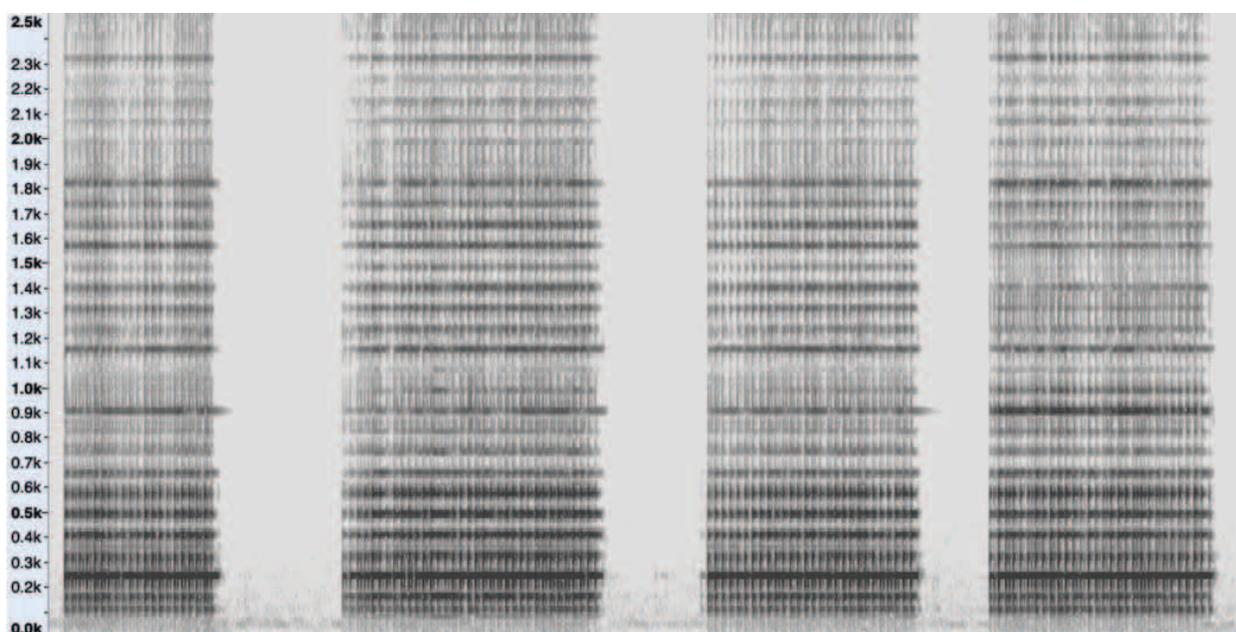


Fig. 2. Spectrograms of sounds of multiphonics produced on string 6 by exciting it at different locations with *tremolato* using a plectrum and touching the string slightly below fret VIII with different pressures. The playing conditions from left to right are: *sul pont.*, *light* touch pressure; *sul pont.*, *extremely light* touch pressure; *sul pont.*, *very light* touch pressure; *molto sul pont.*, *very light* touch pressure (FFT settings: window size/type: 4096/Hann; zero padding: 1). (© Rita Torres)

playing conditions; the sounds can be found in Audio Example 2 of the online supplemental materials.

My quest for sounds of multiphonics at usual harmonics locations is possible because the continuous *tremolato* allows playing this kind of sound without failing. When the string is excited conventionally, the feasibility of multiphonics (i.e. the degree of achieving the technique) at the usual harmonics locations is low, because the touch pressure needs to be *extremely light* (this is the case for most locations when the open string's pitch is to be perceived in the sounds), which is difficult to control; moreover, for lasting sounds the touch duration needs to be *extremely short*. With *tremolato*, the

feasibility of multiphonics at the usual harmonics locations is high, because the continuous repetition of the string's excitation allows for an unnoticed correction of the touch pressure. The *pizzicato* does not need to be released, because it does not damp out the vibrational modes producing the other perceived pitch of the sound. However, to approximate the timbre of the pedal tone in these sounds to that of the pedal tone alone, the string needs to be less damped than in conventional *pizzicato*—denominated *light pizzicato* (the sounds of a single pluck last longer). This makes the upper pitch much louder than the pedal tone, for which, for a balanced sound, the string needs to be touched with *extremely*

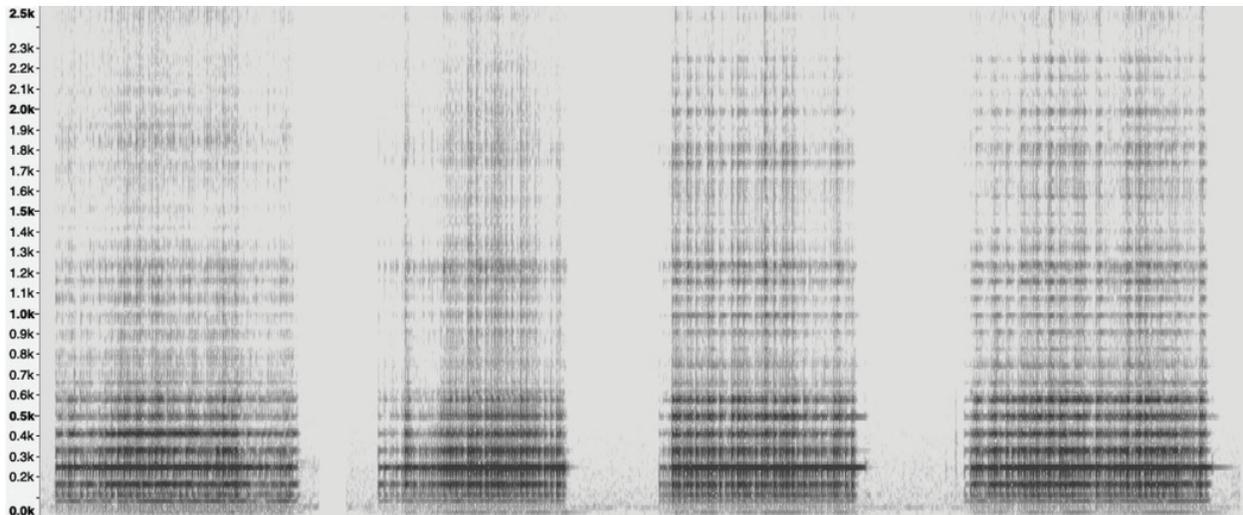


Fig. 3. Spectrograms of the pedal tone (on the left) and of sounds of multiphonics produced on string 6 by exciting it in *pizzicato* at the usual location near the rosette with *tremolato* using a plectrum. For the sounds of multiphonics, the string is touched at fret VII with different pressures; the playing conditions from left to right are: *pizzicato*, very light touch pressure; *light pizzicato*, very light touch pressure; *light pizzicato*, extremely light touch pressure (FFT settings: window size/type: 4096/Hann; zero padding: 1). (© Rita Torres)

light pressure. Figure 3 provides spectrograms of sounds of multiphonics produced at a usual harmonics location with the different above-mentioned playing conditions, as well as a spectrogram of the pedal tone alone; the sounds can be found in Audio Example 2 of the online supplemental materials.

After I tried all of this over and over with the (index) fingernail playing the *tremolato*, my fingernail was worn out. I decided then to use a plectrum. This allowed for an improvement of the sound's balance and brightness, especially in the low dynamics that was desired for the pedal tone. The factors influencing the sound are the plectrum's characteristics, its angle with the string and the direction of the plucking movement. The latter is opposite to the

conventional direction. That is, the downward movement heads toward the sound hole instead of toward the bridge (the movement's angle with the string is about 45°). This is because it causes less noise, which is related to the angle of the string's winding. Figure 4 shows the orientation of the plectrum in each of these movements respectively. In regard to the movement's third dimension, this is parallel to the soundboard, to maintain the sound's balance. The plectrum is mostly at an angle with the string between zero and 45°. This not only ensures a smooth *tremolato* playing but also avoids the release noise and the bright sound produced by the plectrum at zero degrees (especially in what concerns the pedal tone). Nevertheless, the plectrum should not be too stiff nor its edge too wide, to ensure a strong presence

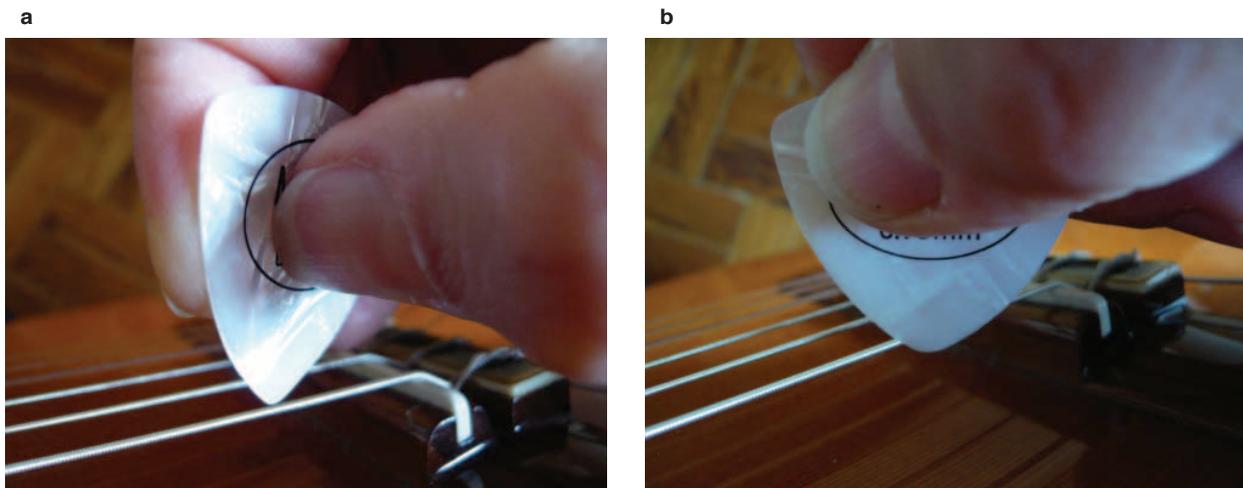


Fig. 4. (a) Plectrum orientation required in the author's new form of usage of multiphonics (downward movement toward the sound hole). (b) Conventional plectrum orientation (downward movement toward the bridge). (© Rita Torres)

Fig. 5. Notation of the author’s new form of usage of multiphonics (p.s.p.: *poco sul ponticello*; t.p.: touch pressure). Reprinted from *Si amanece, nos vamos* by Rita Torres [31]. © Rita Torres

of the higher partials of the unusual multiphonics sounds. The video in the supplemental materials shows this new form of usage, and Fig. 5 the corresponding notation. I notated the touch locations between frets with an accidental with an arrow and a fraction as well as with the numeral of the lowest fret in parentheses (being redundant, this is merely an aid)—in Fig. 5 the touch location is thus situated halfway between frets IX and X. I based this notation on that of Criton and Delume for twelfth-tones [27]. Before I developed this notation, I had planned to use accidentals from Sabat and von Schweinitz’s *Extended Helmholtz-Ellis XI Pitch Notation* [28] but found these too complicated to memorize [29]. The pitches in parentheses—other than that of the fundamental frequency—are those of the main partials in the highest loudness category

stemming from the results of my research experiment [30] for a time segment right after the attack; the partials in other categories are not expected to be perceived.

CONCLUSION

My research has introduced a new form of usage of multiphonics, which has contributed to narrowing an existing gap concerning the variation in the beginning and/or end of the sounds. Relative to their conventional form of production (pluck the lightly touched string with a single stroke and let ring), this form presents variation in both. Moreover, it presents an innovative way of overcoming the short-sustain problem of the guitar and of playing multiphonics at the usual harmonics locations.

Acknowledgments

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References and Notes

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- 2 Rafael Andia, “How to Write for Guitar: An Explanation for Non Guitarist Composers” (1983). Available at: www.rafaelandia.com/en/commentecrire.html (accessed 9 August 2018).
- 3 For example, when we play harmonics at fret XII (the middle of the string), all odd vibrational modes are damped out; not taking into account the nonexcitation of the vibrational modes that have nodes at the excitation location, the mode numbers of the sound’s partials are then 2, 4, 6, 8, 10, 12, 14 . . . The sound’s main partial has mode number 2—that is, the more easily perceived pitch is the octave of the open string tone (heard as the first sound of Audio Example 1 in the online supplemental materials). When we play multiphonics at that same fret, the lowest odd vibrational modes are not damped out—up to which of them depends on the exact touch pressure, which nevertheless has to be *extremely light*; the mode numbers of the sound’s partials are then, for example, 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 14 . . . The sound’s main partials have mode numbers 1 and 2—that is, the more easily perceived pitches are those of the open string tone and the usual harmonics tone (heard in the second sound of Audio Example 1 in the supplements).
- 4 An example is found in the third sound of Audio Example 1 in the online supplemental materials.
- 5 John Schneider, *The Contemporary Guitar* (Berkeley, CA: University of California Press, 1985; Lanham, MD: Rowman & Littlefield, 2015, revised and enlarged edition).
- 6 Jonathan Leathwood, *Some Notes on Writing for the Guitar* (Jonathan Leathwood, 2010).
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- 8 Julio Gimeno, “Armónicos,” in Francisco Herrera, ed., *Enciclopedia de La Guitarra: Suplemento* (Valencia, Spain: Piles, 2011) pp. A49–A83.
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- 13 Martin L. Vishnick, *Sculpting Sound on the Classical Six-String Guitar*, Vol. 2 (CreateSpace Independent Publishing Platform, 2015).
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- 15 Rita Torres and Paulo Ferreira-Lopes, “The Sound World of Guitar Multiphonics,” in Mine Doğantan-Dack and John Dack, eds., *Music and Sonic Art: Practices and Theories* (Newcastle upon Tyne: Cambridge Scholars Publishing, 2018) pp. 78–94. Available at: www.ritatorres.eu.
- 16 Shortly before the final resubmission of this article, *Tempo* published a special issue dedicated to string multiphonics, but it does not address the classical guitar.
- 17 See Torres [14] pp. 50–64. The following scores were not covered by this review: José M. Lopes, *Estudo Numerus Nove* (Lisbon: AvA Musical Editions, 2009 [composed 1989]); José M. López López, *Impresiones y Paisajes* (Valencia: Piles, 2011); Alex Jang, *A Gray, Bent Interior Horizon* (Victoria, B.C.: the composer, 2016); Diogo Carvalho, *Reveal* (Gainesville, FL: the composer, 2016); Yesid Fonseca Aranda, *1+1 et non franchement 2* (Bern, Switzerland: the composer, 2017 [composed 2016]).
- 18 Rafael Nassif, *Silhuetas de uma Dança Imaginária* (Stuttgart: the composer, 2010; revised 2011) pp. 2, 3, 11, 19, 20.
- 19 See Lopes [17] p. 8.
- 20 Willian Lentz, *Flageoletts* (Curitiba, Brazil: the composer, 2014) pp. 6, 7.
- 21 Rita Torres, *Cyrano-Szenen* (Karlsruhe, Germany: the composer, 2004) part VI.
- 22 Horatiu Rădulescu, *Subconscious Wave* (Vevey, Switzerland: Lucero, 1985) p. 2.
- 23 Lentz [20] p. 6.
- 24 Uroš Rojko, *Passing Away on Two Strings* (Milan: Ricordi, 1984) pp. 1, 3.
- 25 For a reproduction of the print, search “Si amanece, nos Vamos” at www.museodelprado.es/coleccion.
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- 29 See Torres [14] pp. 103–106.
- 30 See Torres [14] pp. 75–93.
- 31 Rita Torres, *Si amanece, nos vamos* (Karlsruhe, Germany: the composer, 2015) p. 3.

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