

## Resonances of Bells in the Domains of Speech, Ethnomusic, and *I Ring This Bell* (2022–2024) by Aistė Vaitkevičiūtė

**Abstract.** The current artistic-research study focuses on the sound of a bell as a cross-cultural and interdisciplinary trigger, having a rich historical, cultural, and creative background. The author of the paper has endeavored to further explore this sonic phenomenon not only through theoretical inquiry but also through creative practice, culminating in a twenty-minute musical composition entitled *I Ring This Bell* (2022–2024), featuring five female vocalists, an instrumental ensemble, and a bell installation. The work integrating both research and art is mutually enhancing and has brought up certain questions and problems throughout the creative process. One of the major quests was how to efficiently connect three distinct sonic domains—bells (or bell-like objects), vocals, and instruments. The search for points of interrelation brought up contexts from the linguistic and ethno-related domains. Firstly, vocal imitations of bells in the linguistic sphere, known as onomatopoeia, were invoked as a source for creating and exploring the multilingual tapestry of the composition. Applying a spectromorphological approach and drawing on Ambrazevičius’s research (Ambrazevičius 2011; Ambrazevičius and Balsienė 2010), a sonic network was created linking the spheres of bells, vocals, and instruments according to their spectromorphological characteristics. Secondly, the specific phenomenon called *Schwebungsdiaphonie* was invoked reflecting the rough quality of a bell’s sound in the musical practices of several ethnic regions (the Balkans, Lithuania, and others) (Messner 2013; Ambrazevičius 2014–2016; etc.). This specific practice provided the impetus for the organization of pitches based on intervals characterized by a rough quality. The theoretical and creative exploration of the mentioned phenomena aims to showcase how the specific spectromorphological properties of a bell resonate across cultures and times via certain ethnic-grounded practices (linguistic onomatopoeia or musical *Schwebungsdiaphonie*) and continues to reverberate in contemporary musical contexts spanning the range of micro- to macro-morphologies.

**Keywords:** bell, onomatopoeia, *Schwebungsdiaphonie*, spectromorphology, contemporary music.

### Introduction

Without question, a bell is among the most evocative sound objects in existence, resonating across cultures around the world. Depending on the context, it can carry emotional or spiritual meanings such as awe, purification, mourning, warning, etc., which allude to multifaceted cultural entanglements with this unique acoustic phenomenon. It comes as no surprise that the bell has also been a recurring reference in the domain of Western art music since its early history. These allusions may relate to the distinctive motifs of bells in regard to rhythm or mode, or they may refer to the resonance of a bell in itself. Focusing on the latter, it is especially evident in piano music literature (or its close relatives, such as the harpsichord).<sup>1</sup> This can readily be explained by the similarity of the sound characteristics of a bell and its keyboard-evoked counterparts: the initial impulse gives rise to a natural resonance until the gradual fade-out, while the depth of sound may be reinforced by the manipulation of harmonic density. Meanwhile, technological advancements of the 20th century have had a crucial impact on the knowledge of sound, permeating its interior constitution at the microscopic level—and the bell is no exception. This has given rise to acoustically informed contemplations of bells, with the most notable exponents being referred to as manifestations of spectral music.<sup>2</sup>

Despite the richness of the bell’s historical, cultural, and creative background, its sound continues to inspire further exploration of its acoustic and cultural resonances. It has stimulated my personal efforts as a researcher and composer to delve into the inexhaustible potential of this sonic phenomenon. These endeavors could be most accurately characterized as artistic research. The “research” part has included inquiries into the sonic properties of a bell, spectromorphological analysis, cultural references, and their reflections in the linguistic domain as well as in musical ethno-practices. The “artistic” part has materialized in the form of a

<sup>1</sup> We can recall such masterpieces as Ferenc Liszt’s “Les cloches de Genève” (The bells of Geneva) from *Années de pèlerinage I* (Years of pilgrimage), S.160 (c. 1837–1838), Maurice Ravel’s “La vallée des cloches” (The valley of bells), the fifth movement of *Miroirs* (Mirrors) (1904–1905), Claude Debussy’s “Cloches à travers les feuilles” (Bells through the leaves) from *Images*, Book 2 (1907), Arvo Pärt’s *Für Alina* (1976), among many others.

<sup>2</sup> The most prominent examples of this kind are Tristan Murail’s *Gondwana* for large orchestra (1980), where the beginning is based on an orchestrally synthesized bell (Fineberg 2000, 107), Jonathan Harvey’s *Mortuos Plango, Vivos Voco* (I mourn the dead, I call the living) for eight-track tape (1980), based on interpolation between sounds of the tenor bell at Winchester Cathedral and the voice of the composer’s son (Harvey 1981), or *Speakings* for orchestra (2007–2008) by the same composer. Also, among Gérard Grisey’s sketchbooks, a draft was found with the written phrase “Bell Strasbourg Cathedral,” providing a sketched transcription of the compound sound (may be dated around 1994–1996), indicating the composer’s deep interest in this sound and perhaps its reflections in his work (Cross 2018, 3).

twenty-minute musical composition entitled *I Ring This Bell* (2022–2024), featuring five female vocalists, an instrumental ensemble, and a bell installation.<sup>3</sup>

The cohesive nature of the work integrating research and art has proven to be mutually enhancing and has posed certain questions and problems throughout the creative process. One of the major quests was stipulated by the line-up of the composition: how can three distinct sonic domains—bells (or bell-like objects), vocals, and instruments—be efficiently connected and, even more, approximated in their spectromorphological properties? The search for points of connection between them has brought up contexts from linguistic and ethno-related domains. The most universal, let's say, “cross-substance” association in regard to a bell was firstly identified in the linguistic area—in the phenomenon known as onomatopoeia. This, in turn, opened up space for artistic exploration of a multilingual tapestry as a playground of sound qualities, as well as their interrelation with the instrumental domain. Another phenomenon featuring the mentioned cross-substance association was identified in the particular musical practices of distinct ethnic regions, characterized by the specific psychoacoustic property called *Schwebungsdiaphonie*. Unlike the former, the latter originates from the domain of musical practice.

My investigation will seek to showcase how the specific spectromorphological properties of a bell resonate across cultures and times via certain ethno-grounded phenomena (linguistic onomatopoeia or musical *Schwebungsdiaphonie*) and how it continues to reverberate in contemporary musical contexts spanning the range of micro- to macro- morphologies.

### 1. “How they clang, and clash, and roar!” The spectromorphological nature of the sound of a bell

Given the multifarious emotional responses evoked by the auditory stimulus of a bell within diverse cultural contexts, it is noticeable that the prevalent thread among them is in one or another way related to the sense of awe.<sup>4</sup> The choice of the term is not coincidental; it amalgamates the sentiments of fear with those of reverence, respect, and admiration—elements that are inherently intertwined with the connotational cluster of the bell. Or to quote the well-known lines by Edgar Allan Poe, “How they clang, and clash, and roar! / What a horror they outpour ...” (Poe 1903, written in 1848).<sup>5</sup> The most relevant inquiry within the scope of this paper is to discover what specific properties of the sound of a bell may give rise to such resounding affects.

Before delving into this, it is important to delineate the scope of the concept of a bell itself. Indeed, if we look up *The New Grove Dictionary of Music and Musicians*, a wide array of objects can fall under the “bell” category (Price, Rae, and Blades 2001). The diversity is evident when we review the distinct properties that characterize a bell:

- *regarding shape and material:*
  - in a broad sense, a hollow object, usually metal (but also clay, wooden, or glass);
  - in a more conventional sense, a bell would refer to a cup (known as an “open bell”) or a hollow sphere (referred to as a “crotal”) shape.
- *regarding production of sound:*
  - struck by an inner clapper or external hammer;
  - as all idiophones, when struck a bell emits “a sound by the vibration of most of its mass;”
- *regarding size:*
  - sizes of the types of bells may range from tiny pieces of metal (e.g., a sleigh bell) to huge church bells.<sup>6</sup>

It should not be difficult to imagine the wide range of objects that the listed characteristics would encompass. The composition *I Ring This Bell*, which will be discussed in detail shortly, expands this concept even

<sup>3</sup> The piece was performed at the Music Autumn (Vilnius) music festival, 2024 October, by the Melos New Vocal Music Collective and the Vertixe Sonora ensemble.

<sup>4</sup> Awe is defined as “a feeling of fear or dread, mixed with wonder or fear, typically as inspired by God or the divine. Subsequently: a feeling of reverential respect, mixed with wonder or fear, typically as inspired by a person of great authority, accomplishments, etc., or (from the 18th century) by the power or beauty of the natural world” (*Oxford English Dictionary* 2024).

<sup>5</sup> It is interesting that Poe’s poem covers a wide spectrum of situations and emotional responses associated with bells. They are even linked to the material from which the bells are made: silver bells are associated with Christmas merriment, golden—with wedding, brazen—with alarm, and iron—with moaning (Poe 1903).

<sup>6</sup> The list is compiled based on the information provided in the chapter of *The New Grove Dictionary of Music and Musicians* titled “Bell (i)” (Price, Rae, and Blades 2001).

further by including homemade bells from recycled materials.<sup>7</sup> It is therefore incorrect to talk about a uniform, general sound of a bell—they can vary from soft chimes shimmering in the wind to tremendous sounds summoning people to church or warning of danger. We will address the various types later in the text, but for now, let us concentrate on the latter—the large bell, widely referenced in folklore, poetry, and other literature. At this point, a polemic discourse on the nature of their sound has to be touched upon. As described by Price, Rae, and Blades (2001), historically, bells were ascribed a social function rather than a musical one for a long time. The change in this respect has also altered the perception of the ideal sound of a bell. It is noted that as the bell became increasingly used in musical contexts, its sound quality, or timbre, was also adjusted. In short, the tuning of the bell became more and more harmonious, sacrificing its turbulent quality. In this way, the bell can better function in musical contexts at the expense of its outstanding extra-musical effect. The current paper, however, turns attention back to that awe-inspiring, turbulent bell's quality as the primary subject of interest, instead of exploring the possibilities provided by a clear sense of pitch.

For this representation, we will analyze the sound produced by the customized bell made from a recycled gas cylinder that is used in the composition being discussed.<sup>8</sup> In the spectrogram (figure 1), we can see a spectromorphological profile rather typical for a large metal cup-shaped bell, with the characteristic phases, which are as follows: (a) a sharp attack, incited by impulsive strike of a hammer (sometimes also a clapper), bearing the highest concentration of inharmonic partials which determines the momentous noisy quality; (b) the phase of decay features shifting content of the partials causing perception of unstable pitch; when the majority of the partials fade out, (c) a sustain phase may be detected with only the hum tone present, which then finally (d) turns into silence.<sup>9</sup> In summary, what we call a bell's sound—some sort of unity—appears to us as a processual phenomenon. In the timeframe of its resonance, the sound shifts from a rich compound to a single-component quality. This process evokes an ambiguous sense of both unity and dissociation, providing a space for compositional manipulation.<sup>10</sup>

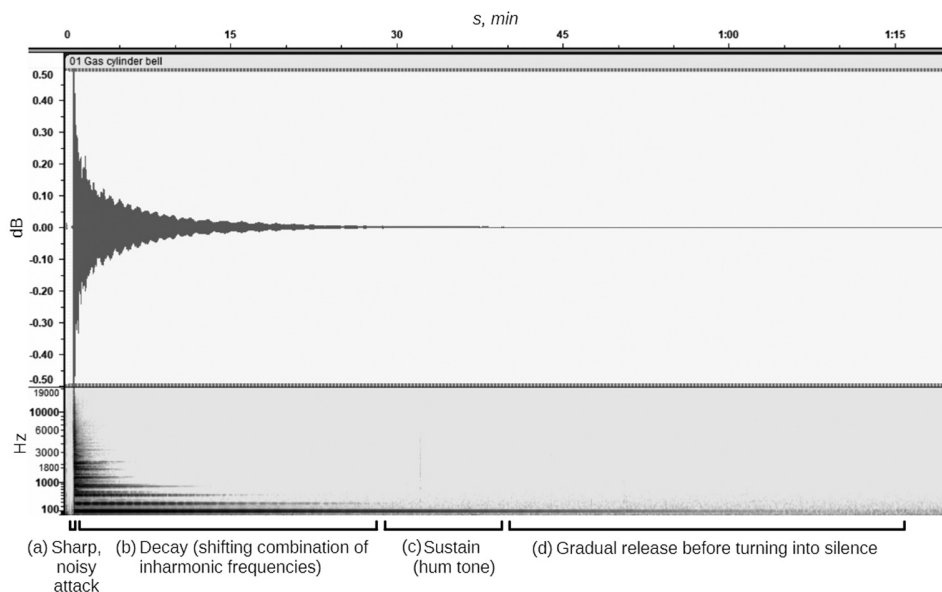


Figure 1. Multiple view of the waveform and spectrogram of a bell-like sound produced by a gas cylinder bell, used in the composition *I Ring This Bell* by Aistė Vaitkevičiūtė

<sup>7</sup> The piece was part of the project *Old Things Resonate New*, the idea of which was to revive old objects, giving them a new life. Therefore, most of the bells used in the composition were repurposed from everyday items, such as flower cups, bowls, wooden and metal sticks. One bell was repurposed from a large gas cylinder.

<sup>8</sup> Despite its somewhat individual characteristics, the sound is quite close to the classic large cup-shaped bell.

<sup>9</sup> This is an obvious attempt towards the classical ADSR model representing the waveform, which is enriched with the dynamics of spectromorphological aspects.

<sup>10</sup> The dialectical perception of a sound, both as a category and qualitative continuum, is thoroughly investigated in the doctoral artistic research by the author of the current paper. Applying this theoretical framework to the current subject, our cognitive habitude categorizes the whole sound continuum as a single “bell sound,” although a qualitative change throughout its resonance is being perceived. For more, see Vaitkevičiūtė (2022).

It is quite evident that phases accumulating the more or less dense collections of inharmonic partials are most likely to be associated with the aforementioned emotions of awe, threat, etc. Firstly, the attack phase features the highest intensity of inharmonic frequencies, which results in the most discordant quality—a pronounced noise element. It is precisely this point that researchers describe as the most attention-arresting factor (Price, Rae, and Blades 2001). It is no coincidence that this aspect is given special attention in the composition under discussion (more in section 2). The second phase, the initial decay, indicates the stage when most of the initial partials fade away, while others fade more slowly at different times, thus creating ambiguity in the sense of pitch. It should also be added that the larger the bell, the more pronounced the sensation of inharmonic processes. Therefore, it is not surprising that awe-inspiring associations were most often associated with large bells of great local significance. The analyzed gas cylinder bell has become the source and model profile for both micro- and macro- morphologies in the composition under discussion. Further on, we will delve into how individual phases are explored in *I Ring This Bell*, as well as how they relate to the vocal and instrumental domains.

## 2. Connection of the bell's spectromorphological properties with the vocal and instrumental domains: traces of onomatopoeia and *Schwebungsdiaphonie* in Aistė Vaitkevičiūtė's *I Ring This Bell*

It is widely known that the particular characteristics of the bell sound have been invoked not only in professional music but in other fields of humanity too. The two phenomena that reflect the acoustic features of the bell's sound has informed the composition *I Ring This Bell* significantly. The first of these, which was employed to generate textual and sonic material, reflects the acoustic properties of the bell in the phonetic domain, which is referred to as onomatopoeia. The second one draws on the specific psychoacoustic effect that occurs during the clash of inharmonic frequencies and is called *Schwebungsdiaphonie*. We will discuss how each of them functions in the composition under discussion and how they end up intertwining with each other.

### 2.1. Reflections of onomatopoeia in the vocal material and its interrelation with the instrumental parts

It is probably safe to say that the sound of a bell is among the most common figures in the context of onomatopoeia. If taken straightforwardly, onomatopoeia refers to the formation of words that reflect environmental sounds by imitating them with voice and phonetic configurations. However, especially in poetry, the process can also be reversed: accidental words resembling particular sonic phenomena may be employed, while the semantics of the word may have nothing to do with the sound that is imitated.<sup>11</sup> The subject becomes even more intricate when we come to the onomatopoeic expressions of particular sounds across different languages.<sup>12</sup> These intricacies have become points of interest and are deliberately employed as textual and sonic material in the piece under discussion.

One of the initial phases of the creative process of the piece involved collecting words somehow relating to “a bell” (also, “ringing of the bell”, “I ring this bell”, and so on)<sup>13</sup> and variations of these (e.g., substituting bells with chimes) in different languages. It was soon observed that some of them are of particularly onomatopoeic origin, some of them are of unclear origin, but still resemble the sound of a bell, and some have nothing to do with the sound of a bell at all. The deliberate selection included words of onomatopoeic origin or words that resemble the sound of a bell. The collection of the selected words is provided in table 1. The procedure has made it possible to both acknowledge and examine the interrelationships and differences among languages for the same or similar sound objects.

<sup>11</sup> As Bredin observes, onomatopoeia encompasses a wide array of relations between sounds and words: imitating, echoing, reflecting, resembling, corresponding to, sounding like, expressing, reinforcing, having a natural or direct relation with (Bredin 1996, 555).

<sup>12</sup> The quote by Ernst Gombrich aptly illustrates how similar things are imitated differently in various languages: “To me, at least, the cock says not ‘cock-a-doodle doo’ as he calls to the English in the morning, not ‘cocorico’ as he says in French, nor ‘kiao kiao’ as in Chinese, but still ‘kikeriki,’ as he says in German” (as quoted in Bredin 1996, 558).

<sup>13</sup> The title of the composition, *I Ring This Bell*, is an excerpt from the Sanskrit mantra chanted while ringing the bell (skt. *ghanta*) to signify the invitation of divine forces and the removal of negative ones.

Table 1. A list of phrases in multiple languages used in *I Ring This Bell* by Aistė Vaitkevičiūtė (2022–2024)

Language	Words or phrases containing the word “bell” (words originally based on non-Latin alphabets are provided in transliterated versions)
English	ring this bell
Greek	<i>to koudouni</i> (the bell)
Thai	<i>rakhang dang khun</i> (the bell rang)
Sanskrit	<i>ghanta</i> (bell)
Tibetan	<i>dril-bu</i> (handbell)
Hungarian	<i>harangszó</i> (bell, chime); <i>cseng a csengő</i> (the bell is ringing)
Lithuanian	<i>žvanga žvangučiai</i> (jingles jingling)
Latvian	<i>es zvana zvans</i> (I ring the bell)
Tajik	<i>man zang mezanam</i> (I ring the bell)
Ukrainian	<i>dzvonyty u dzvin</i> (ringing the bell)

Further analytical procedures involved an examination of words from the perspective of their acoustic characteristics. Ambrazevičius’s research on the acoustic features of the onomatopoeic expressions of bells was employed as the analytical framework (Ambrazevičius and Balsienė 2010; Ambrazevičius 2011). After investigating both traditional Lithuanian vocal imitations of bells as well as nonsense syllables raised during imitation experiments, Ambrazevičius distinguished the most common features of the vocal imitations of bells and drew connections between them and the acoustics of bells. The findings are summarized in table 2.

Table 2. Summary of research on the characteristics of vocal imitations of bells (Ambrazevičius and Balsienė 2010; Ambrazevičius 2011). Phonetic symbols left as in the original papers

Initial phonemes (reflecting the attack phase)	Further on phonemes (reflecting the continuation of sound following the attack)		
	Single vowels / first in syllables	VV (vowel–vowel) diphthongs	VC (vowel–consonant) diphthongs
• Voiced plosives (most common).  E.g.: <i>d</i> (most common), <i>b</i> , <i>g</i> (less common).	• Back vowels for large bells.  E.g.: <i>a</i> (most common), <i>o</i> .	• More commonly decreasing in intensity.  E.g.: <i>au</i> , <i>ai</i> .	• VC diphthongs with nasal consonants.  E.g.: <i>an</i> , <i>im</i> .
• Unvoiced plosives (considerably less common).	• Front vowels for small bells.  E.g.: <i>i</i> (most common), <i>e</i> .	• More commonly decreasing in frequency.  E.g.: <i>au</i> .	

Let us make a brief examination of the selected words in table 1 through the scope of the framework based on Ambrazevičius’s research. Although we can hardly find exact exemplars of the provided model in the list, some tendencies are apparent. Plosive consonants at the beginning of the word or a separate syllable are present in words such as *bell*, *dril-bu*, *rakhang*, *koudouni*, *ghanta*. VC diphthongs dominate the majority of these words (*rakhang*, *žvanga*, *zvans*, *dzvin*, etc.), but there is a lack of examples containing VV diphthongs. However, what is immediately noticeable is the significantly greater variety of consonants (including an initial phoneme). As mentioned earlier, the starting consonant corresponds to the beginning of the bell sound—an attack phase. In the given framework, we notice the initial consonants are almost limited with the voiced plosives [d], [b], or [g],<sup>14</sup> or unvoiced plosives (indicated as less common). However, the greater variety of initial consonants was seen as an additional potential for both associative and compositional exploration.

<sup>14</sup> As Ambrazevičius explained, “the prevalence of the voiced plosives is probably caused by the continuance and dominance of the ‘tonal’ components in the bell spectrum (i.e., the component of noise is negligible and there are no gaps of silence” (Ambrazevičius and Balsienė 2010, 12–13).

Starting from the attack phase in general, there is consensus among psychoacousticians for its significance in the identification of the sound source.<sup>15</sup> It seemed, then, that such variety in initial consonants among words as being related to onomatopoeic origin is not a coincidence.<sup>16</sup> A more specific association between the different types of bells (including size, shape, and material) and certain consonants seemed to be a decent inquiry into the creative process of a piece. While making associations between particular consonants and the types of bells, attention was mostly focused on the noise–pitch balance in the sound and range of frequencies, as well as the internal dynamics of these and other parameters. On the basis of these factors, specific correlations between the initial phonemes and particular bells or bell-type sound objects were drawn.

As already mentioned, voiced plosives [d], [b], [g] are considered the most common initial consonants for the vocal imitations of bells. However, in my exploration (also confirmed by Ambrazevičius’s research), they mostly correspond to large or medium metal bell sounds. The reason for this is most likely the presence of the relatively strong pitch content in the sound (Ambrazevičius 2011): the pitch appears immediately after the short noisy attack in the case of a metal bell, and, according to Chen (2020), the vocal cords start to vibrate even slightly before the consonant is released. Similar dominance of pitch may also be observed in the case of medium or large clay bells, which can also correlate with voiced plosives.

However, different sorts of bells feature different spectromorphological characteristics. For example, the auditory experience as well as a spectrogram representation of wooden chimes bear different characteristics than do cup-shape metal bells: with the former there is a considerably shorter duration of resonance, also, there is a greater proportion of noise compared to pitch content in the sound. Consequently, the phonetic association should be different too. The mentioned characteristics of wooden chimes bear a stronger resemblance not to the voiced, but rather unvoiced plosives [p], [t], [k], because of the stronger noise element in the latter. It should be noted that different levels of aspiration can be initiated while pronouncing unvoiced plosives, which also affects the sonic characteristics. See figure 2 for a comparison of the sound of wooden chimes, different manipulations of aspiration while pronouncing [t], and pronunciation of [d]. An aspirated [t] possibly approximates the sound of wooden chimes most closely.

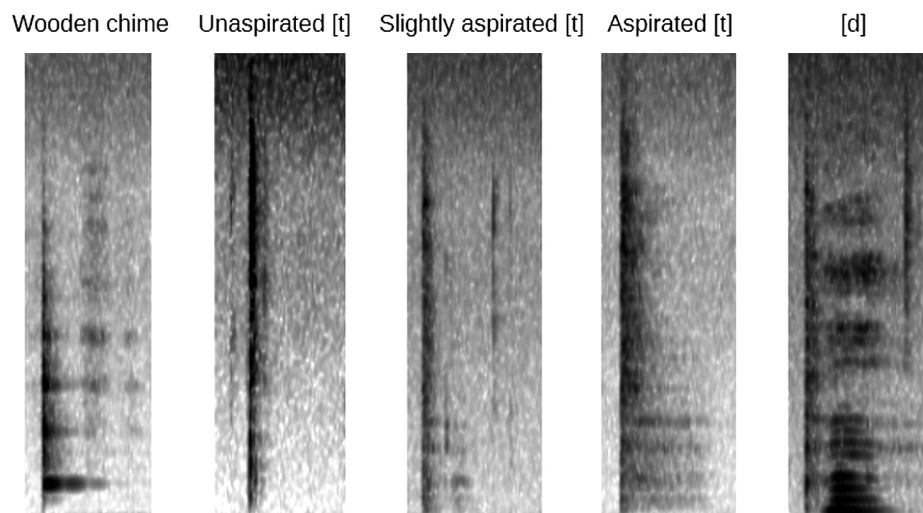


Figure 2. Comparison of spectrograms of wooden chime, differently aspirated [t], and [d].  
Time spans of the excerpts ~0.5 s, spectral range 0–20 kHz

Another case worthy of discussion concerns potential phonetic associations with small metal chimes. The dominant sonic characteristics that distinguish small metal chimes from the sound of medium to large bells are their high frequency range and shorter duration. However, one additional factor should also be

<sup>15</sup> An overview of the impact of attack on the identification of musical instruments is provided in Ambrazevičius (2012, 9–10).

<sup>16</sup> As mentioned above, some of the words are definitely ascribed as having onomatopoeic origin, while others lack this clear association. However, the greater variety of initial consonants may be observed among onomatopoeic words of bells beyond this list, e.g., the English “dingle,” “tinkle,” “jingle,” “ringing.”

taken into account. In practice, we often encounter collections of chimes, i.e., we experience constellations of sounds of higher or lower density instead of individual sounds. Consequently, within the perception dimension, the aggregate characteristics of the group are of greater importance than the sound of an individual chime. The group of such sounds contains a comparatively high quantity of noisy attacks, meaning the sum effect is a noisier quality in general compared to the individual sound of a single bell. These characteristics (the sum quality of noise together with the high frequency range) have made assumptions for associating metal chimes with voiced fricatives [z], [ʒ] and affricates (mostly with voiced like [dz], [dʒ], but at times an unvoiced [tʃ] was also added). The reason for this correlation lies in the following features of the phonemes: strong turbulent noise, combination of both pitch and noise content, domination of high frequencies in the case of voiced fricatives and most of the similar features in the case of affricates (Chen 2020); high frequencies in the case of unvoiced affricates. Moreover, it seemed reasonable to initiate the collections of phonemes in the textual tapestry of the composition to resemble the constellations of sounds in the case of metal chimes. For this purpose, short phrases where voiced fricatives and affricates are dominant were chosen; other consonants present in the phrases were unvoiced affricates and nasals. You can see the juxtaposed spectrograms of the metal chimes used in the composition and one of the pronounced phrases<sup>17</sup> in figure 3.

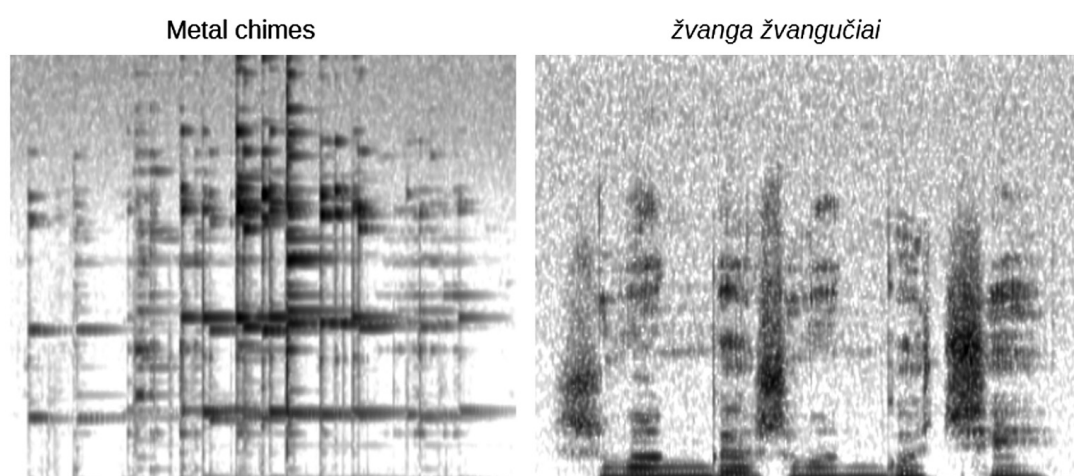


Figure 3. Comparison of spectrograms of metal chimes and the Lithuanian phrase *žvanga žvangučiai* (jingles jingling).  
Time spans of the excerpts ~1.5 s, spectral range 0–24 kHz

In addition to drawing parallels between specific types of bells and certain phonetic items, the progressive disposition of sound objects over time was also under compositional consideration. The chosen elaborative strategy was a slow progression from the least resonant, noisy, short-term sounds to the most resonant, tonal,<sup>18</sup> sustained sounds, followed by their fading dispersion. This process of elaboration involved all parties in the composition: bells, vocals, and instruments. An overall trajectory was drawn going through five qualitative stages, each featuring certain dominant spectromorphological characteristics: a) short term, limitedly resonant sounds with the noise element dominating; b) slightly resonant noisy sounds infused with tone quality; c) moderately resonant sounds of medium range tone quality infused with noise; d) highly resonant sounds with a wide range of complex frequencies; e) slightly to moderately resonant sounds of a high-frequency range; tone quality infused with noise. All parties of the composition were meant to approach the dominant characteristics of each stage as closely as possible. Figure 4 presents the overall map of how the indicated spectromorphological characteristics were implemented in each party of the performance.

<sup>17</sup> In the composition, the Lithuanian *žvanga žvangučiai* (jingles jingling), Latvian *es zvana zvans* (I ring the bell), Ukrainian *dzvonity u dzvin* (ringing the bell), and Hungarian *cseng a csengő* (the bell is ringing) were used.

<sup>18</sup> The word “tonal” is used in an opposite sense to “noisy.”

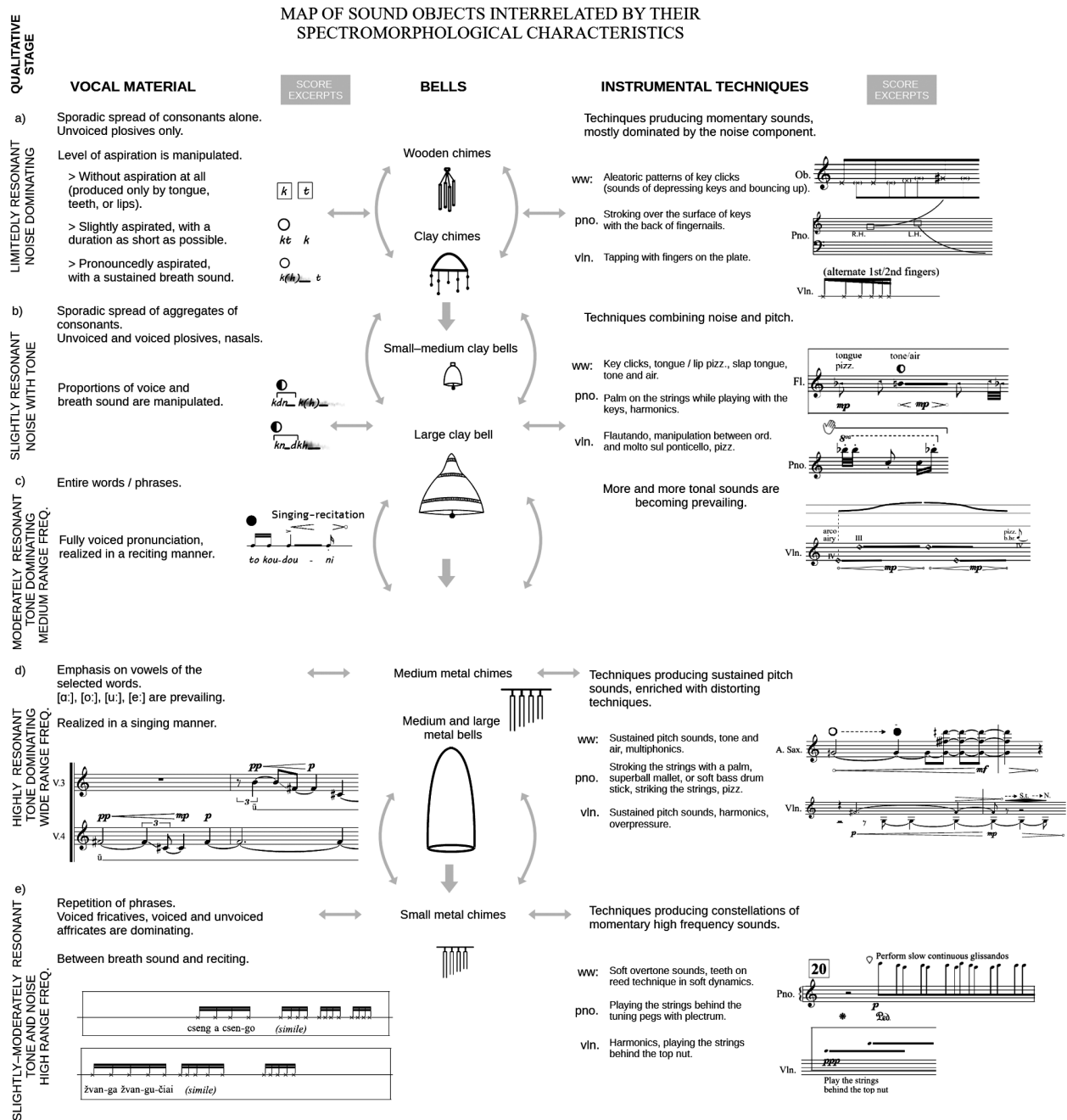


Figure 4. Map of sound objects interrelated by their spectromorphological characteristics in *I Ring This Bell* by Aistė Vaitkevičiūtė

A brief discussion of the implementation of each qualitative stage is provided below.

**a) Short-term, limitedly resonant sounds with the noise element dominating.**

In the first qualitative stage, the noisiest part of the sound, which is concentrated in the initial attack of a bell sound, is explored. This conceptual approach is realized through all the parties of the composition. The bell collection consists of wooden chimes, the least resonant type of bell, whose sound features the largest proportion of the noise-element.<sup>19</sup> These are later complemented by small clay chimes, featuring a short duration of resonance, but giving a little more tonal quality. The vocal part is limited to sporadic utterances of unvoiced plosive consonants alone. Their production is manipulated in great detail: the range of pronunciation covers all levels of aspiration (from a complete absence of aspiration—where only the tongue, teeth, and

<sup>19</sup> The wooden chimes used in the composition are homemade from wooden sticks and lack a clear pitch.

lips are used—to an exaggerated level of aspiration). The instrumental parts use techniques that allow them to approximate the spectromorphological characteristics of bells and vocals, which are as short as possible in duration and dominant in noise (e.g.: key clicks in the woodwinds, including sounds of a key being pressed down and released; tapping the soundboard of the violin; stroking the surface of keys with the back of fingernails on the piano; etc.).

b) Slightly resonant noisy sounds infused with tone quality.

The continued a) stage soundscape is enriched by the addition of medium-sized clay bells, which introduce a more tonal quality to the arrangement. In the vocal part, the collection of unvoiced plosives is complemented by voiced plosives and nasals. The qualitative manipulation also includes altering the proportions of breath sound and voice. Techniques that allow for combinations of noise and tonal sounds are employed in the instrumental parts (e.g.: voicing of consonants are included in key clicks textures for woodwinds; tapping the fingers on the strings of the violin; producing harmonic sounds on the piano; etc.).

c) Moderately resonant sounds of medium range tone quality infused with noise.

In this stage, there is a shift not only in terms of spectromorphological characteristics, but in the semantic level of the vocal material too. While collections of consonants alone were utilized in the first two stages, as the process progresses, the formation of entire words becomes evident. These are realized in a fully voiced reciting manner. As previously mentioned, the words possess onomatopoeic characteristics reminiscent of a bell sound, concurrently conveying the semantic meaning of “bell,” “ringing of a bell,” or similar, pronounced in different languages. The large clay bell introduced into the soundscape exhibits characteristics approximate to those of a standard metal bell. An increasing level of tonal quality is extended to the instrumental parts, where techniques for brief, noisy sounds are combined with those for sustained and more tonal sounds (e.g.: techniques combining pitch and breath sound in woodwinds; transitions between soughing sounds and harmonics on the violin; playing notes with strings damped with a palm on the piano; etc.).

d) Highly resonant sounds with a wide range of complex frequencies.

This stage focuses on the resonance phase of the bell sound, the process that extends to all parties of the composition. The resonance of large metal bells is reflected in the vocals in several ways. From the phonetic perspective, the focus is drawn not on the consonants as in previous stages, but on the vowels, especially [a:], [o:], [u:], [e:]. The fully-voiced quality is even more exposed by the transition into a singing manner, as compared to previous speech or recitation modes of performance. The tonal qualitative nature is also reinforced by instrumental techniques producing sustained tones, however, the distortive nature of the bell sound is reflected by distorting techniques in the instruments too (e.g.: multiphonic sounds in woodwinds; the over-pressure technique on the violin; stroking the strings with a superball mallet on the piano; etc.). The structural aspects of the pitch domain require a separate discussion, which is provided in section 2.2.

e) Slightly to moderately resonant sounds of a high-frequency range; tone quality infused with noise.

After the humming nature of the d) stage, a process of reduction follows. The resonance of sounds grows shorter and shorter, and the range of frequencies becomes limited to high frequencies. The phrases characterized by the presence of dominant fricatives and affricates in the vocals, integrating breath quality and recitation, reflects the aggregation of high-frequency sounds reminiscent of metal chimes. These are extended to the instrumental parts by producing iterative high range sounds (e.g.: teeth-on-reed technique for oboe and a. saxophone, whistle tones for flute; playing behind the top nut on the violin; playing the strings behind the tuning pegs on the piano; etc.).

Returning once again to stage d), which reflects the decay phase of the bell's sound, the importance of the presence of inharmonic partials was emphasized. In the context of form, it marks a significant shift in focus from the phonetic domain to pitch relations. This is where the concept of *Schwebungsdiaphonie* was invoked, thus, a special discussion is developed in the following section.

## 2.2. Traces of *Schwebungsdiaphonie* in the pitch domain of the composition

As mentioned above, all the designated stages, except d), have emphasized applying the onomatopoeic principle in both the vocal and instrumental domains, which implies a primary compositional focus on the timbre parameter. Although stage d) shifts the focus to the pitch parameter, it is important to note that the overall intention remains unchanged—to reflect the sound of a bell in various qualitative manifestations. It is instead a transition from manipulation within the scope of an individual sound to the quality emerging through the interaction of sounds.

Here we can recall the phenomenon referred to as *Schwebungsdiaphonie*. It was coined by ethnomusicologists for traditional multipart singing practices, where the rough quality emerging because of the interaction between sounds at certain intervals is intentionally obtained. It should come as no coincidence that the ideal sound in these practices is often likened to the sound of a bell.<sup>20</sup> There is no strict consensus on the exact interval determining the desired quality, but it is agreed that it is somewhat around an untempered second. While Messner’s research indicates intervals of about 80–165 cents, Ambrazevičius, who investigates *sutartinės* (a Lithuanian type of *Schwebungsdiaphonie*), denotes the ideal interval as approximately 1.7–1.8 semitones (Ambrazevičius 2014, 58–59; Ambrazevičius 2014–2016).

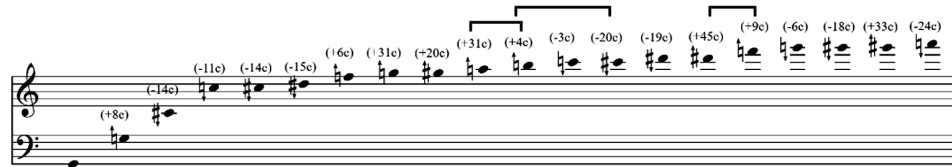


Figure 5. Transcribed version of the spectrogram of a gas cylinder bell. The markings indicate the distances between partials, which are close to the rough quality specified in *Schwebungsdiaphonie* practices

Now, if we return to the gas cylinder bell (figure 1), among many inharmonic partials, we can definitely find the intervals that approximate the distances referred to in *Schwebungsdiaphonie* in its spectrum. Figure 5 presents the transcribed version of the same spectrogram, with the corresponding distances marked. At the current point of the composition, the vocal line develops as if exploring different variations of the second, starting with a quartertone and gradually expanding them. The local climax in the vocal part is reached when the distance becomes approximately two-thirds of a major second, i.e., very close to the rough quality identified by Ambrazevičius in the case of Lithuanian *sutartinės* (figure 6).



Figure 6. The local climax in the vocal part, when the interval between two voices reaches approximately two thirds of a major second; intensification is further increased via instrumental multiphonic sounds. Excerpt from *I Ring This Bell* (bars 44–47)

<sup>20</sup> “Do They Sound Like Bells ... ?” is an exemplary excerpt from the title of the monograph by Gerald Florian Messner, the author of the term *Schwebungsdiaphonie* (Messner 2013).

After this point, the intensification of the development passes to the instrumental parts by implementing multiphonic sounds and other distorted qualities (figure 6). The choice of multiphonics is not accidental: it is a technique where several frequencies are brought up in the sound, often resulting in untempered intervals. When obtained by one instrument, in a perceptual domain, they tend to create an effect as if it were a single sound rather than a composite one. Thus, it can be stated that roughness obtained by the clash of several voices transforms into the uniform rough quality within a single sound obtained by one sound source—just like in the case of a bell. In other words, vocal *Schwebungsdiaphonie* transforms into instrumental *Schwebungsmultiphonie*.

Further on, the material accumulates towards the final culmination by initiating interactions among all the parties—vocals, instruments, and bells. The soundscape expands not only in terms of musical parameters, but also in terms of physical space. The bells are installed in various locations around the room, and the performers are instructed to distribute themselves throughout the space and to move the bells while performing their vocal or instrumental parts. Ideally, all sound emitters should surround the audience, creating the perceptual effect of being inside a large, sonorous bell.

### 3. On the overall *morphopoiesis* of the composition

The spectromorphological profile of a bell (see figure 1) served as a source for an overall *morphopoiesis*<sup>21</sup> (Kokoras 2005) of the work. It was like looking through a microscope at the different phases of its resonance. As mentioned above, the attack phase is the densest in terms of its constitution, characterized by the highest noise element. The variation of this tiny (in the context of the overall sound) component, however, has a strong perceptual effect, which can affect our tendency to attribute sound to one or another source. Moreover, due to the strong noise element, the attack brings us very close to the realm of phonetics, or, in other words, the domain of speech. Not incidentally, it was precisely the exploration of the attack phase that was linked to the linguistic expressions reflecting the sound of a bell (the onomatopoeic sphere). The initial soundscape of the most multifarious sonic objects has gradually progressed towards more connected constellations, in parallel to the increasing presence of the pitch element. The process of integration reached its peak in the d) phase, when qualities began to be obtained not within the scope of individual sounds, but through their interaction. This culminated in the compositional realization of the sound of a bell, which, at the same time, is uniform and multi-layered. The processual nature of the work can be expressed in the scheme presented below (figure 7).

SPECTROMORPHOLOGICAL PROTOTYPE:	from attack phase towards resonance.
COMPOSITIONAL REALIZATION:	from speech to singing in vocal domain; from noise-dominated to tonal techniques in instrumental domain.
CULTURAL IMPLICATION:	from diversity to unity.

Figure 7. Scheme illustrating the *morphopoiesis* of the composition derived from the spectromorphological prototype (the sound of a bell)

Thus, the all-encompassing transformation (or *morphopoiesis*) is based on the spectromorphological prototype of the bell sound and creates balance between two oppositional poles of the composition: dispersion of individual multifarious sonorities at the beginning and a coalescence of macro-sonority at the climax. It is like a symbolic representation of cultural diversity, connected by a universal sound object—a bell.

### Concluding remarks: universal sound resonating through cultural diversity

The artistic research presented above reveals how the same object—an awe-inspiring sound—can evoke a multitude of expressions, reflecting both ethnic specificities and a certain universality of sound. The sound of the bell was examined from a spectromorphological approach, exploring its (psycho)acoustic manifestation

<sup>21</sup> The concept of *morphopoiesis*, proposed by the composer and researcher Panayiotis Kokoras, “refers to music that concentrates its interest on changes in the intrinsic and extrinsic attributes of the sound in the flux of time” (Kokoras 2005, 66). *Morphopoiesis* is contrasted with other foundations of form as focusing on the parameter of timbre rather than rhythm, harmony, or melody.

down to the smallest nuances. These, in turn, were linked to linguistic expressions—the sphere of onomatopoeia. The framework of bell imitations described by Ambrazevičius was applied, but also was supplemented with a greater variety in terms of the attack phase (or initial phonemes), discovered during compositional exploration. The phenomenon of *Schwebungsdiaphonie* was also incorporated into the compositional fabric, interspersed with instrumental *Schwebungsmultiphonie*. All these procedures are united by the spectromorphological profile of the sound of a bell, which manifests as an overall *morphopoiesis* of the composition.

The concurrence of diversity and universality thus became an underlying idea of both the composition and the current paper. In *I Ring This Bell*, linguistic diversity is integrated into the textual and sonic tapestry, where the reflections of the bell's sound come from different languages through onomatopoeic expressions. Onomatopoeia itself, as a phenomenon, combines both a universal element—a common sound object—and the specificity of a particular language. When the pitch parameter begins to dominate over timbre, linguistic diversity begins to be unified by musical universality. *Schwebungsdiaphonie*, as discussed, is a marker of specific ethnic practices (as in the Balkans, Lithuania, and others), but also refers to the universal quality of sound (maximum roughness). At the climax of the piece, the sound merges into a unified macro-sonority, as if forming a large bell, unanimously resonating the abundance of cultural diversity.

### References

- Ambrazevičius, Rytis, and Renata Balsienė. 2010. "Imitations of Bells: Correspondence between Bell Acoustics and Onomatopoeic Texts." *Journal of Interdisciplinary Music Studies* 4 (2): 1–16.
- Ambrazevičius, Rytis. 2011. "Varpų pamėgdžiojimai: akustinės asociacijos ir stereotipai" [Imitations of bells: acoustic associations and stereotypes]. *Studies about Languages* 19: 70–77.
- Ambrazevičius, Rytis. 2012. "Tembras muzikos psichologijoje" [Timbre in the psychology of music]. *Lietuvos muzikologija* 13: 6–21.
- Ambrazevičius, Rytis. 2014. "Psychoacoustical issues of dissonance in Lithuanian *Sutartinės*." *Principles of Music Composing: Sonorism* 14: 54–61.
- Ambrazevičius, Rytis. 2014–2016. "Dissonance/roughness and tonality perception in Lithuanian traditional *Schwebungsdiaphonie*." *Journal of Interdisciplinary Music Studies* 8 (1–2): 39–53.
- Bredin, Hugh. 1996. "Onomatopoeia as a Figure and a Linguistic Principle." *New Literary History* 27 (3): 555–569.
- Cross, Jonathan. 2018. "Introduction: Spectral Thinking." *Twentieth-Century Music* 15 (1): 3–9.
- Chen, Hsueh Chu. 2020. *The Spoken English Corpus of Chinese and Non-Chinese Learners in Hong Kong*. The Education University of Hong Kong. [https://corpus.eduhk.hk/english\\_pronunciation/](https://corpus.eduhk.hk/english_pronunciation/).
- Fineberg, Joshua. 2000. "Guide to the Basic Concepts and Techniques of Spectral Music." *Contemporary Music Review* 19 (2): 81–113.
- Harvey, Jonathan. 1981. "Mortuos Plango, Vivos Voco": A Realization at IRCAM." *Computer Music Journal* 5 (4): 22–24.
- Kokoras, Panayiotis A. 2005. "Morphopoiesis: Towards a Creative Process of Structuring Form." *Principles of Music Composing: Creative Process* 5: 64–73.
- Messner, Gerald Florian. 2013. *Do They Sound Like Bells or Like Howling Wolves?: Interferential Diaphony in Bistritsa: An Investigation into a Multi-Part Singing Tradition in a Middle-Western Bulgarian Village*. Peter Lang GmbH. *Oxford English Dictionary*. "awe (n.1), sense 1.b." September 2024. <https://doi.org/10.1093/OED/3332559558>.
- Poe, Edgar Allan. 1903. "The Bells." *The Works of Edgar Allan Poe*, Lit2Go Edition. Accessed November 22, 2024. <https://etc.usf.edu/lit2go/147/the-works-of-edgar-allan-poe/5222/the-bells/>.
- Price, Percival, Charles Bodman Rae, and James Blades. 2001. "Bell(i)." In *The New Grove Dictionary of Music and Musicians*, edited by S. Sadie and J. Tyrrel. Macmillan Reference; Groves Dictionaries, online version.
- Vaitkevičiūtė, Aistė. 2022. *Kategorijų regimybė tembriniame kontinuumo: kompozicinės potencijos* [Perceiving categories along the timbral continuum: compositional potentials]. Artistic Research Project, Lithuanian Academy of Music and Theatre.

### Varpų rezonansai kalboje, etnomuzikoje ir Aistės Vaitkevičiūtės kūrinyje *I Ring This Bell* (2022–2024)

#### Santrauka

Meninio tyrimo pobūdžio straipsnyje varpo skambesys nagrinėjamas kaip tarpkultūrinis ir tarpdisciplininis impulsas, turintis turiningus istorinį, kultūrinį ir kūrybinį kontekstus. Straipsnio autorė siekia šį garsinį fenomeną tirti ne tik teoriniu, bet ir kūrybinių lygmeniu. Pastarąjį įkūnija straipsnio autorės kompozicija *I Ring This Bell* (2022–2024), skirta penkiems moterų balsams, instrumentiniam ansambliui ir varpų instaliacijai. Teorinis ir meninis aspektai komponuojant veikė abipusiai – kūrybinė praktika kėlė naujus klausimus ir problemas, o teorinės išvalgos formavo struktūrinę kūrinio koncepciją. Vienas pagrindinių kūrybinio proceso siekių buvo rasti būdą, kaip efektyviai susieti tris skirtingas garsines sferas – varpus (ar varpams artimus objektus), balsus ir instrumentus. Ieškant jų sąveikos taškų, buvo pasitelkti lingvistiniai ir etninės muzikos tyrimai.

Lingvistiniu aspektu tyrinėtoms vokalinėms varpų imitacijoms, įvardijamos kaip onomatopėjos, tapo kūrinio daugiakalbio garsinio audinio formavimo šaltiniu. Remiantis spektromorfologiniais principais ir Ryčio Ambrazevičiaus tyrimais (Ambrazevičius 2011; Ambrazevičius ir Balsienė 2010), suformuluota skambesio sąveikos koncepcija, jungianti varpų, balsų ir instrumentų sferas pagal jų spektromorfologines savybes.

Antras tyrimo aspektas siejamas su specifiniu reiškiniu, vadinamuoju *Schwebungsdiaphonie* – tam tikrose tradicinėse vokalinės muzikos praktikose aptinkamas šiurkštus skambesys, neretai siejamas su varpo skambesio specifika (Messner 2013; Ambrazevičius 2014–2016 ir kt.). Ši praktika tapo impulsu nustatant garso aukštį, įtraukiant šiurkštumu pasižyminčius netemperuotus intervalus.

Pasitelkiant lingvistinius ir etnomuzikologinius kontekstus, straipsnyje atskleidžiama, kaip specifinės varpo skambesio sąvybės rezonuoja skirtingose kultūrose ir epochose per tam tikras praktikas – onomatopėjas ar *Schwebungsdiaphonie* reiškinį. Teorinės ir kūrybinės priegų derinimas leido atrasti konkrečias perspektyvas, kuriomis minėti reiškiniai galėtų toliau skleisti šiuolaikiniuose muzikiniuose kontekstuose įvairiais struktūriniais lygmenimis – nuo *mikro-* iki *makro-* morfologinių darinių.