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# The Use of the Church Bell: From Signaling Device to Musical (Percussion) Instrument

The first use of bells for musical[1] purposes was recorded in 1,000 BC in China. They used stationary bells that hung on a framework and used hammers to play them. They soon developed a standard bell tuning, and in the fifth century BC bells were part of the Chinese national orchestra, which played at Confucian rituals. In medieval Europe, two methods of bell ringing were distinguished: *pulsare*, in which hammers were struck against the bells, and *nollare*, in which sound was produced with a clapper struck against the sound bow[2]. The *pulsare* technique was performed on an instrument known as *cymbala*[3] in medieval Latin: a set of small bells played using hammers. These bells were used by monks during church services and for teaching music, in which this instrument was an "excellent medium for demonstrating the relationships between pitches and numbers"[4]. A depiction of these bells in the initial from Psalm 80 showing King David playing the cymbala with hammers was well known and frequently used. From the twelfth century there is also the first depiction of a woman playing the bells: there is a carved stone figure of a woman playing the bells at Chartres Cathedral, France.[5]

The first bells used for signaling the worship service were small. Larger forms of bells, which, as tower instruments, became part of European bell towers, began developing from the fourteenth century onwards. At that time, bell makers also began seeking better acoustic properties for the instrument (i.e., changing the bell's profile in order to gain as many partials as possible) and intervallic tuning of the bells hanging in one bell tower also developed. In tuning the bells, one of the conditions for making music was fulfilled; the only thing that remained was to rhythmically organize the bell sound. This could not be achieved through ordinary bell ringing because the bells

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[1]The function of bells is divided into four groups: apotropaic, signaling, ritual, and musical (cf. Lehr, cited in: Finscher 1998: 1421). These functions are often combined.

[2] See Price, Percival (1983): *Bells and Man*. Oxford, Oxford University Press: 190.

[3] Isidore of Seville (died in 636) and Honorius of Canterbury (died in 653) listed *cymbala* and the *tintinnabulum* (hand bells with clappers) among the most frequently used musical instruments of that time (Price 1983: 184).

[4] See Price, Percival (1983): *Bells and Man*. Oxford, Oxford University Press: 188.

[5]For the image example see Édouard Jeauneau, *L'âge d'or des écoles de Chartres*, 2000, p. 69.

move with different velocity: the smaller ones move faster, and the larger ones more slowly. Therefore, even today the signaling function remains the primary function of bell ringing. However, there are examples in England (known as *change ringing* method) and some places in Italy in which the velocity of the bell swings in manual bell ringing is controlled by stopping the bell in the upper position[6], thus achieving the desired rhythmic harmony of the ringing bells.[7] This type of bell ringing (called balanced bell ringing) was once also typical of the manual bell ringing in Slovenian churches; however, in today's automated systems the bells are also balanced.

It is even easier to achieve rhythmic harmony or diversity by striking the clapper or hammer against the rims of stationary bells in a controlled manner. A further advantage of playing stationary bells is that, by using levers, one individual can manage several bells at a time, whereas manual bell ringing requires at least the same number of people as there are bells.

## The historical development of bell chiming

European historical sources testify that even before mechanized church clock chiming began to be widely used in the fourteenth and fifteenth centuries, sextons announced the time every hour by chiming the bells manually and used hammers to strike the bells in order to enhance the acoustic variety.[8] Bell chimers in towns that would chime the hour by striking hammers against the bells were prominent persons; they were usually members of the town guard and wore its uniforms. In the late middle ages, these chimers were already said to chime more than one bell, which enabled them to chime short melodies. They played parts of church melodies, folksongs, and short improvised fragments of secular melodies that were

[6] See example **Error! Main Document Only.**: Video footage of the Italian technique *Sistema Bolognese* (Chiari, 29. 4. 2007, Italia; performed by Unione campanari Modenesi).

[7] A particular bell-ringing technique depends on the construction of the bell tower and the set of bells. Certain techniques require a specific number of bells or a specially designed system of bells. For example, in rotational bell ringing, the bell is swung by a rope that runs over a wheel attached to the headstock. One of the widely spread forms of this type of bell ringing is the British *change ringing*, which is based on the permutation combinations (or *changes*) of the order of the ringing bells. These are normally tuned to a diatonic major scale and are swung around 360 degrees by pulling the rope in the ringing chamber below the bell chamber. Various methods of rotational bell ringing are also used in Italy and are known as *suono a ditesta, sistema Veronese*, *sistema Ambrosiano*.

[8] See Morris, Ernest (1951): *Bells of All Nations*. London, Robert Hale: 16.

otherwise performed by street musicians[9]. The automation of tower clocks then adopted a similar system; where the number of bells allowed it (especially in the Netherlands, Belgium, and Germany), short melodic sequences typical of a specific town[10] were and still are played on the full hour (for example, bell chiming at Westminster Palace, known around the world as the chiming of Big Ben[11]). Where there are fewer bells, the larger bell usually assumes the role of chiming the full hour, and the smaller one chimes the quarter-hours. Chiming at quarter-hours in the form of a simple audio signal can also be heard in Slovenian bell towers, whereas melodic hour chiming is hardly ever used in Slovenia.[12]

The *pulsare* method (performing with hammers) has been preserved in automated form in tower clocks and some local traditions, whereas the *nollare* method (performing with clappers) has been preserved and developed in parallel to ringing techniques in individual European countries in various ways. In addition to the advantages of the *nollare* technique over bell ringing mentioned above (i.e., the possibility of controlled rhythmic and melodic performance on bells, and the smaller number of required performers), Percival Price also believes that the *nollare* technique is safer in terms of preserving the construction of the set of bells and the bell tower.[13] Certain bells were played by pulling a rope tied to the clapper even at a time when churches did not yet have bell towers. This practice later spread throughout Europe;[14] however, this type of music-

[9] See Price, Percival (1983): *Bells and Man*. Oxford, Oxford University Press: 173.

[10] The musical motif that we then hear regularly gradually becomes part of an acoustic landscape (or soundscape) of a specific town and loses the quality of a musical work (Harrison 2002).

[11] The tune used by the set of clock bells in the clock tower at Westminster Palace in London to strike the quarter-hour is known as the *Westminster Quarters.* Among others, this tune is also offered by today's producers of clock chiming mechanisms as part of their programs. The tune is also widely popularized by having its introductory sequence broadcast live before the BBC radio news.

[12] At the chapel on Mount Sveta in the Central Sava Valley (Sln. *Zasavska Sveta gora*), the hour is chimed by a tune of the hymn "Zvonovi zvonijo" (The Bells are Ringing) from Lourdes; since Slovenia presided over the EU in 2008, a recording of the European anthem performed on bells has been played at the Ljubljana City Hall at noon every day.

[13] Russians were said to scoff at the western style of bell ringing because they thought it was nonsensical to swing the heavy bells in order for the light clappers to strike against them instead of making the light clapper strike against a stationary bell, as it was the custom in Russia. See See Price, Percival (1983): *Bells and Man*. Oxford, Oxford University Press: 190.

[14] In addition to Christianity, bells are also used for religious purposes in Taoism and Buddhism. The worshippers play the larger bells, hung in the vestibules of temples, by

making was perfected the most in the Russian Orthodox Church through a technique known as *zvonit*.[15]

**Figure 1: Direct bell chiming**

My research shows that the *nollare* technique is still widespread in Europe. In most cases, only one bell chimer plays the bells in this manner. Price believes that this technique has never developed into group performance, such as the practice developed by the Russians[16]; however, this can be rejected because group performance is part of both the Slovenian bell-chiming practice as well as some other European bell-chiming practices (although to a lesser extent), whereas the Russian bell-chiming technique of *zvonit* is often performed only by a single individual. Price also supports the evolutionary theory of the development of bell-chiming techniques and believes that the bell-chiming technique is a bridge between playing the bells with hammers and (according to him) more highly developed bell-playing using a keyboard or the carillon.[17] However, Manfred Bartmann, a German bell-chiming researcher, doubts Price's theory because both techniques continue to be widely practiced today.[18] In general, one

striking the clapper against the bell; with large bells they even use tree trunks to strike the outer sound bow of the bell.

[15] See See Price, Percival (1983): *Bells and Man*. Oxford, Oxford University Press: 106.

[16] Ibid.: 200.

[17] Similarly, the Dutch campanologist André Lehr believes that the carillon developed from the "medieval performance on *cymbala*, in which hammers were used, and bell-chiming on large church bells." See Lehr, André (1998): *Glocken und Glockenspiele (Geschicht ab Mittelalter)*. Die Musik in Geschichte und Gegenwart: Allgemeine Enzyklopädie der Musik, vol. 3: 1474; see also Price, Percival (1983): ibid.: 200.

[18] See Bartmann, Manfred (1991): *Das Beiern der Glocken in der Grafschaft Bentheim, Denekamp (NL) und Ostfriesland. Bewegung und Klang*. Ludwigsburg, Philipp Verlag: 287.

can find all of the developmental stages in today's bell towers: from chiming directly on the bells (Figure 1), chiming using levers (Figure 2), pedals, and simpler forms of keyboards (Figure 3), to complex lever connections between the keyboard and the bells (Figure 4).

**Figure 2: Chiming with levers;**

**Figure 3: A simple keyboard**[19]

Individual techniques depend on the number and size of the bells and their position in the bell tower. Direct bell chiming is thus more frequently used in places where three bells are used on average, whereas with a larger number of bells these must be connected with levers, which only enable a limited number of bell-chimers to man them. When more than five bells are used, they are usually worked from a keyboard. It is quite clear that the development of all techniques has the same starting point, whereas their simultaneous existence is connected with several factors, among which the economic factor can be placed at the forefront. For example, the carillon is used primarily in the bell towers of town churches, whereas in the countryside the tradition of playing a smaller number

[19] Padovani (2007–2008). Published with the permission of the Associazione Italiana di Campanologia.

of bells continues to be practiced. Even the instrument's name, derived from the Latin word *quatrinion*, denoting a group of four, proves that the original carillon included fewer bells. In present day Switzerland, the *carillon traditionnel*[20] (traditional carillon) refers to a set of three to eight bells, which are played directly or using simple levers (i.e., ropes and chains) by striking the clapper against the sound bow, whereas the *carillon avec claviers mécaniques* (carillon with a keyboard) denotes a considerably larger set of chromatically tuned bells.[21]

**Figure 4: A carillon[22]**

Today, performances using this type of carillon can be heard in the form of professional concert performances, especially in Belgium, the Netherlands, and France. In the Netherlands, this kind of a set of bells is called a *Klokkenspel* or *Beiaard*, and in the German-speaking countries it is known as a *Glockenspiel*. In the nineteenth century, the English took over the name *carillon* or *carilyon* from the French. Some define the *Glockenspiel* as a smaller set of diatonically tuned bells and the carillon as a larger set of chromatically tuned bells, whereas others equate the term *Glockenspiel* with the English *chime*, which includes up to twenty-five bells, and *carillon*, which includes more than twenty-five bells in two chromatically tuned octaves.[23] Even on the basis of the few examples presented here, one can establish that

[20] The Swiss Guild of Carillonneurs and Campanologists distinguishes between the traditional, automatic, and keyboard carillon. This classification is based primarily on the performance technique and not the number of bells because it is evident from the list of carillons that in some cases the keyboard and the traditional carillon have the same number of bells (cf. *Guilde des carillonneurs et campanologues suisses* [s. a.])

[21] The German Guild of Carillonneurs (*Deutsche Glockenspielvereinigung*) defines the carillon as a set of at least twenty-three chromatically tuned bells connected through a mechanical playing device (*Was ist ein Carillon*, 2002–2008). However, in the Rhine Valley, some performers refer to both the method of playing a smaller number of bells and the method using a simple keyboard as *Beiern*.

[22] Ryan (2000–2008). Published with the permission of the author.

[23] Morris, Ernest (1951): *Bells of All Nations*. London, Robert Hale: 55.

the use of terminology in campanology is not uniform at all and that translations into other languages are often inconsistent.

## Bell chiming in Europe today

By focusing on the technical aspect and discussing merely the methods in which sound is produced by striking the clapper or hammers against the sound bow of a stationary bell, and by highlighting the rhythmic component of bell playing from the musical standpoint (what excludes carillion method), it can be determined that even this aspect alone includes many bell chiming methods practiced in Europe. Here are the names of only some of them: the Slovenian *pritrkavanje,* the Spanish *repiques*,[24] the Italian *bataglia di corde*, *suonata a cordette battagliare, scampanio* or *scampanotata*, *toccos* and *repiccos*,[25] the *kimning*[26] method practiced in Sweden, Denmark, and the Faroe Islands, the French *coptée campanaire*, the Swiss *carillon traditional* ali *carillon valaisan*, the Belgian *tribolédje* or *trippetraien*, the German *Beiern*, and the Croatian *luncijanje*, *kampananje*, and *slavljenje*. In the book *Glockenbeiern in Rheinland*[27], Alois Döring also places individual sites, such as Holy Sunday Church in Sofia, the Church of the Holy Sepulcher in Jerusalem, and the Basilica of the Nativity in Bethlehem, among the countries where *Beiern* is practiced in addition to the Scandinavian countries, Switzerland, Italy, Belgium, and Slovenia.[28] Morris mentions a simil-

[24] For more information see Llop i Bayo, Francesco (1998): *Bells in Spain: Restoration, Research and New Ensembles of Bellringers*. Campaners de la Catedral de Valencia, http://campaners.com/php/textos.php?text=1044. Retrieved 7 February 2009; see also Bartmann, Manfred (2004): Das Glockenschlagen auf El Hierro als integrierter Bestandteil der inseltypischen Prozessionsmusik. *Studia instrumentorum musicae popularis* 12: 109–124.

[25] Although Italians use a variety of bell-ringing techniques, it was very difficult to obtain detailed and relevant information on individual techniques and the data were often very inconsistent. I found some information in professional literature (cf. Barbarossa, Cristina (2006): *Campane e campanari nella Liguria di levante*. Chiavari, Grafica Piemme; *Suoni di cempane. Raccolta dei sistemi di suono traditionali italiani ed europei* (2004). Bologna, Gruppo Campanari Padre Stanislao Mattei.), whereas other information was given by performers and researchers on the Internet (I logged onto the forum of the Italian Campanology Association at http://www.campanologia.org/) or through e-mail correspondence. The explanations and audiovisual recordings of various bell-ringing techniques sent by some Italian researchers and performers of individual techniques as well as the Internet sites of the local organized groups of bell ringers furnished with a variety of audiovisual recordings of bell-ringing and bell-chiming techniques were also extremely helpful.

[26] See Bringéus, Nils-Arvind (1958): *Klockringningsseden i Sverige*. Lund and Stockholm, Nordiska museet: 57–60.

[27] Döring, Alois (1988): *Glockenbeiern in Rheinland*. Cologne, Rheinland-Verlag.

[28] Ibid.: 11.

ar method being used in Malta, and at St. Nicholas' Church and Holy Trinity Church in Athens.[29]

With small changes in the technique and the methods of making music, this activity can thus be defined as a wider European phenomenon; however, due to the lack of research or international connections between researchers, knowledge about this remains within national, regional, or even local frameworks.[30] Often these techniques are merely a part of historical, sociological, and campanological studies and do not include an ethnomusicological perspective, which is why they do not contain much information on the musical content of these bell-chiming methods. The lack of literature and in some cases also the linguistic barrier prevent me from studying all the possible bell-chiming methods in Europe, and my understanding of them without doing my own field research would in any case be incomplete. I am well aware that due to the specific nature of the bell-chiming performing practice, it is insufficient to interpret a musical piece merely on the basis of a musical analysis of audio or written material. It is also necessary to include the visual insight, from which one can distinguish the key parameters that determine the ultimate sound of a bell-chiming tune,[31] and the perspective of the performers themselves.[32] Examples

[29] See Morris, Ernest (1951): *Bells of All Nations*. London, Robert Hale: 139-140.

[30] In his article "Essai sur la coptée campanaire en Europe occidentale" (2008), Achim Bursch presents a shorter comparative study of bell-chiming-related techniques used in some European countries. His article also includes Slovenia and his study is also a result of our joint research and discussions on the use of bell chiming in Europe. See Bursch Achim (2008): *Essai sur la coptée campanaire en Europe occidentale.* Le Bulletin Campanaire (Association Campanaire Wallone) 53(1): 27–35.

[31] In bell-chiming studies, musical content is often ignored or incorrectly interpreted; even in the case of a notably rhythmic method of bell ringing it is often defined as melodic bell ringing (due to not paying enough attention and the lack of musical expertise of the authors). Manfred Bartmann highlights the same problem in the studies of the German form of bell chiming, which many researchers have placed within the frameworks of melodic making of music, and believes that this kind of classification merely reflects the auditory interpretation of the sound and the researchers' lack of interest in understanding the musical-cognitive processes of the bearers of this tradition. See Bartmann, Manfred (1991): *Das Beiern der Glocken in der Grafschaft Bentheim, Denekamp (NL) und Ostfriesland. Bewegung und Klang*. Ludwigsburg, Philipp Verlag: 35.

[32] In some cases (e.g., in Germany, Croatia, and Italy), I was able to understand the tunes based on my own field experience, through which I also got to know the contextual aspect of the musical practice, whereas in other cases I only used the visual and audio recordings in order to interpret the tunes. I obtained these recordings either from the researchers of specific bell-ringing techniques or their performers, in which online communication, campanology forums, and especially the YouTube website were of great help.

from my own field studies are used below to show the connection between the musical and technical parameters of bell-chiming practices, in which differences are defined according to the relation between the number of performers and the number of bells, as well as the method of performing (i.e., with hammers, directly with the clappers, or using levers).

## Musical and technical characteristics of selected examples

In Slovenia, one most often comes across bell-chiming practices in which the number of bells is the same as the number of performers. The usual number of bells in Slovenian bell towers is three. This results in a specific formation of bell-chiming tunes in terms of the musical structure. Individual strikes on bells are divided into main strikes and response strikes (strikes that "respond" to the main strikes and build the basic thematic unit of a tune together with them), and thickening strikes (strikes filling in the gap between the main and response strikes, and are most often performed in a syncopated rhythm on the smallest bell). An individual performs a rhythmic part (made of one or several strikes) that does not represent independent musical material in itself; bell chimers only create a comprehensive chimed tune with the rhythmically coordinated performance of all the participants. This type of technique is called interlocking and can also be found in certain other world musical practices (e.g., the *kotekan* technique used by the Bali gamelans).[33]

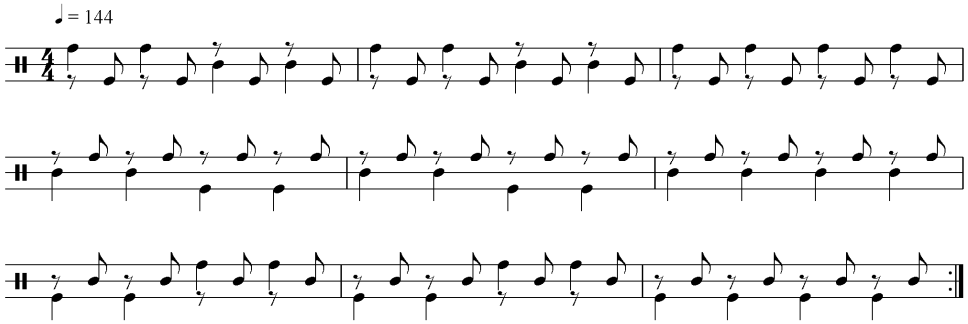


**Figure 5: An example of musical notation of Slovenian bell chiming (*Dva, štiri krožna*, Tolmin, 15 August, 2007, Prim.)[34]**

[33] See example 2: Video footage of Slovenian technique *pritrkavanje* (*Dva, štiri krožna*, Tolmin, 15 August, 2007, Prim.)

[34] The notes in the notations thus denote an individual role of a strike and not the true pitch and duration of a tone. The main strikes come on the first beats in a bar and are notated

In Germany (specifically, in the Rhine Valley), there were more frequent examples in which only one or two performers chime the (usually three) bells, although there were sufficient bell chimers available. In this way, the roles of strikes are divided into two parts: (1) the larger bell plays the main role, whereas rhythmic patterns are performed on the smaller two bells in a random order (in Rheinbrohl these are performed on the *Melodieglocken*[35]); or (2) the main tune is performed on the two larger bells and the third bell chimer that plays the smallest bell assumes the role of thickening and ornamentation (Example 4).

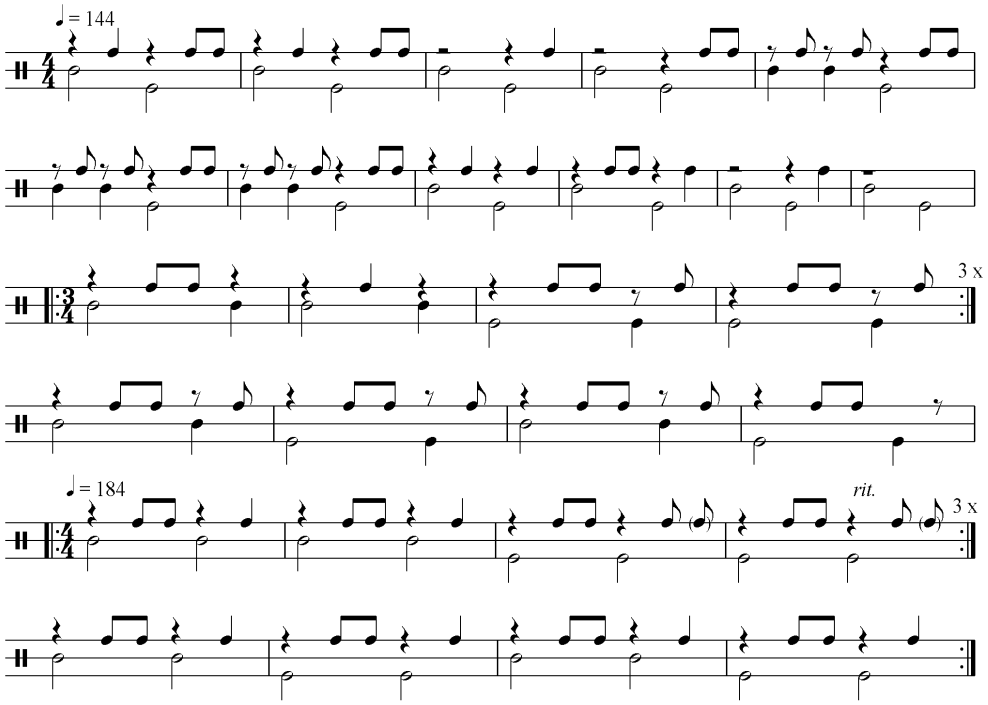


**Figure 6: Example of musical notation of German technique *Beiern* (*Der Durcheinander*, Brenig, 7 April, 2007, Rheinland, Germany)**

with a quarter note with the stem facing down; the response strikes are also notated with quarter notes with stems facing down; and thickening is notated with eighth notes with stems facing up.

[35] See example 3: Video footage of German technique *Bammschlagen* (*Die Grosse Bemm*, Rheinbrohl, 9 April, 2007, Rheinland, Germany)

In Croatia (Dalmatia), the majority of churches have two bells and thus the bell chiming is considerably more rhythmic. There is only one bell chimer, which is why he has complete freedom in selecting the rhythmic patterns:[36]

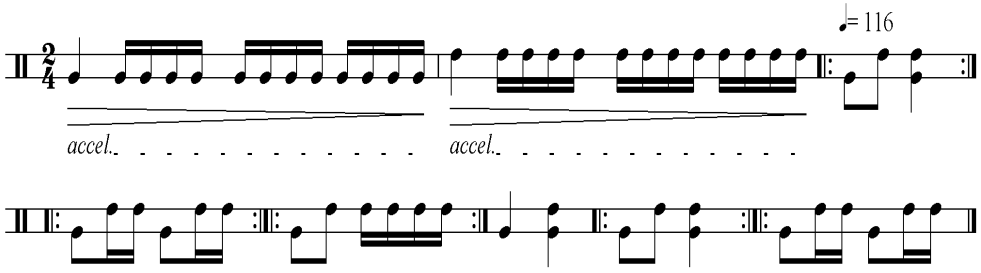


**Figure 7: Example of musical notation of Croatian technique *luncijanje* (the island of Žman, 1 November 2006, Zadar region, Croatia)**

In Slovenia, bell chimers use the tonal specifics of a bell if there are too few bells available and produce different pitches by striking the hammer against different parts of the bell. This bell-chiming technique is very interesting from an ethnomusicological perspective because it produces a unique musical construct; however, from the viewpoint of campanology, this technique is extremely damaging to the bell metal and it causes many bells to crack or chip at the edges.[37] When there is a larger number of bells, the tendency to play melodically prevails over rhythmic performance. In this case, bell chimers usually copy the melodic models of songs and instrumental pieces (as in carillon method). If only one bell chimer performs on several bells, he must use a well-thought-out system of levers, which activate the strike of a clapper against the sound bow. In Italy this is known as *a cordette* technique; the bells in this case are smaller and thus easier to man, and the musical structure they produce is more melodic.[38]

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[36] See example 4: Video footage of Croatian technique *luncijanje* (the island of Žman, 1 November, 2006, Zadar region, Croatia).

[37] See example 5: Video footage of bell chiming with hammers.

[38] Despite the smaller number of bells in Slovenian bell towers, one can observe that bell chimers lean towards creating a melodic tune when the tuning of the bells reminds them of an introductory sequence of another tune or when a larger number of bells is available (e.g., more than three). See example 6: Video footage of Italian technique *a cordette* (Chiari, 29 April, 2007, Lombardy, Italy).

Given the abundance of various methods of creating bell-chiming tunes, and bell-chiming techniques, I am not able to study all of them and thus develop a more complete understanding of individual specific features of the bell-chiming techniques. I am pleasantly surprised by the resourcefulness of bell-chimers and the great variety of musical expressions on an instrument that generally produces so few notes, but would like to establish better cooperation with researchers from other countries, which would bring together all the findings and create a common European cultural history of the methods of using bells.

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