



Karina Grömer, Kayleigh Saunderson and Beate Maria Pomberger

Metallic idiophones 800 BCE to 800 CE in Central Europe: their function and acoustic influence in daily life

Introduction

Metallic idiophones, such as bells, pellet bells and clinking or rattling jewellery, have played an important role in burials and as dress accessories throughout history. Archaeological research has paid little attention to metallic idiophones and their roles in past societies, although they were an important part of everyday life in the past and still are today. This project investigates the archaeological contexts and acoustic effects of metallic idiophones as well as their interplay with textiles and clothing. The aim is to investigate the functions and impacts of metallic idiophones in central Europe in the Iron Age, the Roman Empire and the Early Medieval period (800 BCE to 800 CE). Sound objects are being analysed through psychoacoustics, metallurgy, and the textiles attached to them.

Goals and methods

The project aims to collect new information concerning the use, societal impact, and influence on past peoples' lives of metallic idiophones. An interdisciplinary approach will employ research methods from archaeology, metallurgy, acoustics, ethnomusicology, and psychology, supported by experimental archaeology, as well as studies of written and iconographic sources. This research not only covers the function, typology, date, and metallurgical data, but also includes the sounds of idiophones: the frequency ranges, their timbre, volume, and up to what distance they can be heard (fig. 1). Psychoacoustic aspects will also be investigated in addition to the psychological and physical effects of the sounds on

the people who hear them. Psychological studies have shown that listening to appropriate music or sounds at specific times can have stress-reducing effects and increase well-being. The opposite can create a stress-increasing effect.

The textile evidence offers information on the way the sound objects were worn. Metallic idiophones were recreated for the project, as well as whole ensembles of garments in an experimental archaeological approach, using information from textile fragments found in graves together with contemporary pictorial and written sources. This demonstrated how sound objects might have been worn on the body and tested their interplay with movement. In psychoacoustic studies, these recreations are used to investigate the sound effects of the idiophones worn on the body, such as sharpness, roughness, brightness, tonality, and loudness.

This report on work-in-progress provides two case studies of metallic idiophones worn on garments – rattling jewellery from the Hallstatt period in Býčí skála (Moravia) and bells/pellet bells from the Avar period in Komárno (Slovakia).

Idiophones

Idiophones can be worn as accessories, carried as pendants or attached to garments. Metal dress components with rattling pendants and caged pellet bells are common in elite women's burials, especially in the Hallstatt culture (Pomberger et al. 2020, 229). Rattles such as pellet bells, for example, make sounds indirectly by means of a loose item, such as a pebble, on the inside. Bells are percussion vessels that are

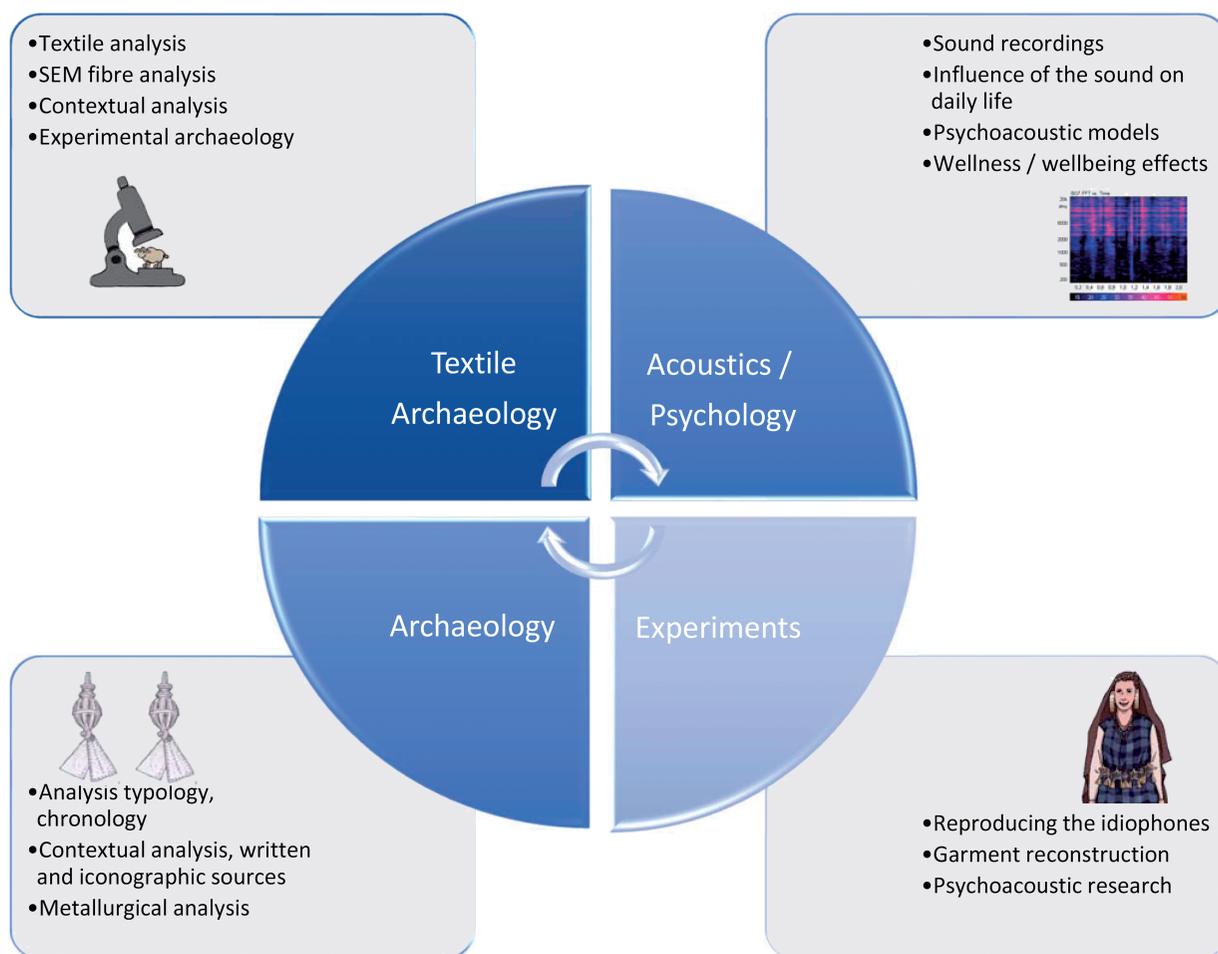


Fig. 1: The interdisciplinary approach of the research project *Metallic idiophones*. Here the focus is on the textile research within the project (Image: Karina Grömer)

beaten directly by a clapper on the inside or a hammer on the outside (MIMO 2011, 5–6).

These items create a specific sound-environment, or sound field, within their society. Each sound field is created from a sound source and its spatial expansion.



Fig. 2: Mineralised textile on an early medieval pellet bell from Zillingtal, Austria (Image: Alice Schumacher, Natural History Museum, Vienna)

They create acoustic fields which have impacts on their environments and people’s listening habits. The effects of wearing metallic idiophones can be intrinsic as well as extrinsic: they may be worn for oneself only or for others in the community. Specific acoustic social codes produce acoustic identities which can represent a person’s social status. Early Iron Age rattling jewellery could be used to communicate signals or have a representative significance. Some bells and pellet bells may have been connected to apotropaic beliefs since the most vulnerable members of society, such as children and women, have been documented as wearing sounding amulets in antiquity (Pomberger et al. in print).

Research regarding textiles and clothing

Metallic idiophones were often worn on pieces of clothing making the question of how the sound object and the garment interact an important one. The

remains of mineralised textiles found on the idiophones in burial contexts were analysed to identify the raw materials, and their quality, structure, and production technique. Using this data, it is possible to work out the effect of the cloth on the sound of the idiophones. The analyses of the textiles (fig. 2) were carried out using a digital microscope (DinoLite) with up to x250 magnification, a light microscope (Zeiss SteREO Discovery.V20), and a scanning electron microscope for fibre analyses (Grömer et al. 2015, 51–83). These textile analyses answer such questions as: what is the quality of the textiles worn together with sound objects – coarse or fine? What was their influence on the sound?

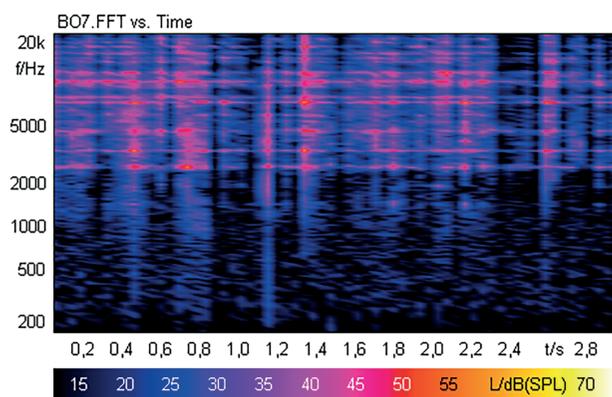
To gain a better understanding of the metallic idiophones' context, it is necessary to determine the function of the textile to which it is attached. The exact position on or around the body of the deceased is important, and the stratigraphy of multiple organic layers can offer further information about this. The specific position of the sound object alone can affect the sound it makes (for example, if it is worn on the ankle versus around the neck), as well as the way it is worn (for example, dangling from a string on a belt or sewn onto a garment). Determining the kind of sounds these objects made when the person is moving is an important objective of case study 1.



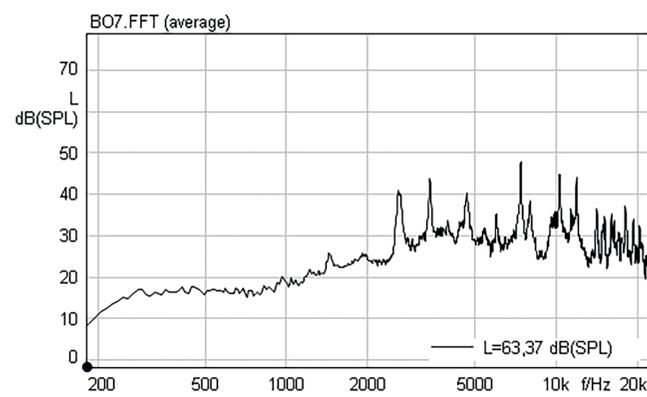
a



b



Bommel 7



c

Fig. 3: Finds from Býči skála-cave dated to 600 BCE: a – the rattling plates; b – a recreation of a Hallstatt Period garment with the sound jewellery worn on the belt; c – visualisations of sound recordings including a spectrogram of the sound (Images: Alice Schumacher, Beate M. Pomberger, Jörg Mühlhans)

Case study 1: Early Iron Age pendants – Býčí skála cave

A total of 14 pendants with rattling plates were found from the Hallstatt period (800 BCE to 450 BCE) at Býčí skála cave, Czech Republic (Pomberger et al. 2020). They were probably worn on garments, perhaps on ribbons, and produced sounds while the wearer was moving (fig. 3). Using the results of the analyses of the metallic idiophones, experimental archaeology was conducted using reconstructed clothing of the period. Certain movements that are visible in contemporary illustrations were recreated to consider the sound

objects which were attached to the garments. These metallic idiophones, together with other pieces of clothing, represented specific visual codes, which could be read and understood by other members of the community. A video of these garments in motion is available on YouTube (see internet sources below).

Case study 2: Avar pellet bells – Komárno, Slovakia

Bells and pellet bells seem to have played an important role in the early medieval Avar period (568 CE to approximately 820 CE). In burials, they have been found on those perceived to be the more vulnerable

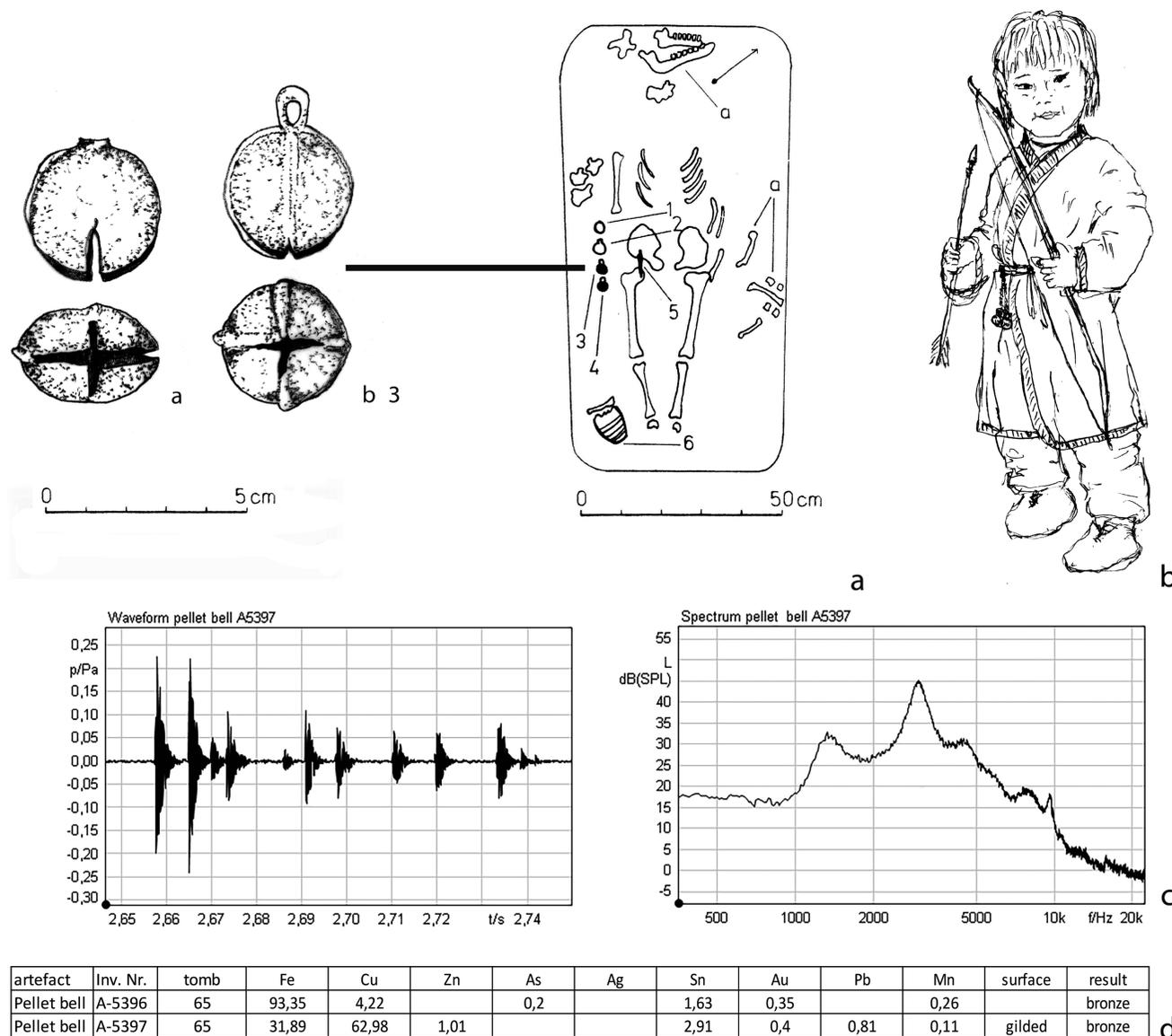
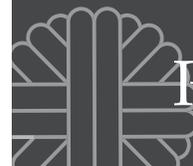


Fig. 4: Komárno, burial 65: a – pellet bells and positions in grave; b – reconstruction with the pellet bells in wear; c – sound recording of the pellet bell A 5397; d – chemical analyses of both pellet bells (Images: B. M. Pomberger; a after Trugly 1987, 13: 19, 20, fig. 7: 1; b Jörg Mühlhans; c Jan Tírpak)



members of society (women and children) but also on horse trappings. An initial overview of the textiles and clothing in the context of pellet bells at the Avar cemetery in Komárno has been produced (Pomberger et al. 2021). They derive from 15 burials: five of children and ten of horses (buried with men).

The sound level of these pellet bells can provide information about their function: for example, one had a hollow, quiet sound, which could be appropriate for an amulet, whereas others had a brighter, sharper sound, which may indicate their use as signalling objects, with which parents could perhaps locate their child.

The children's pellet bells were found near the hands, hips and upper thighs (fig. 4). This suggests that they could have been attached to ribbons, chains (on belts), sewn onto sleeves or carried in small bags or belt pouches. The pellet bells in the equestrian graves were located around the skull, the chest and the spine. Many of these had been subject to grave robbery, making the exact original locations of the pellet bells uncertain. It can be assumed that they were attached to the horse's tack. Future experiments will investigate metallic idiophones on horses as well as humans including the sounds created through various gait movements.

Further perspectives

Studies in the interplay of dress, idiophones attached to it as accessories, and movement are of great interest. As far as is currently known, sounding jewellery is only found in the graves of the elite. The sound fields they created might be markers in the social hierarchy. However, it is important to note that the idiophones did not create any sound in the grave. Were they therefore worn in daily life or merely as part of the burial. Dress as a way of communication includes sight, sound and other aspects of body movement. Investigation through the lens of a specific kind of movement – dance – may bring further new insights into the cultural and sociological effects of dress and its attached jewellery in prehistoric societies.

The project is led by archaeo-musicologist Beate Maria Pomberger, in collaboration with Karina Grömer. It

also involves students from the University of Vienna, including master's research on Avar period textiles, clothing and the metallic idiophones attached to them by Kayleigh Saunderson. It is funded by the Austrian Science Fund FWF, based at the Natural History Museum, Vienna, Austria and runs from January 2020 to the end of 2023.

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Authors:

karina.groemer@nhm-wien.ac.at
kayleigh@saunderson.at
beatemaria.pomberger@gmail.com