

INVISIBLE MUSIC:

Hearing and Listening in the Early Modern World



By Christine Jeanneret*

At Rosenborg Castle in Copenhagen, Christian IV used two of his favourite artforms, music and architecture, to create his invisible music, a sonic technology that left his visitors astonished. This surprising listening experience gives historians and sensory and performance studies scholars the perfect tool to study early modern hearing and listening practices. The dissociation of sound from its source was experienced as a marvellous sound technology. The diffusion of music through sonic vents in the castle created a spatialization of music that required the perambulation of the listeners, creating a full bodily experience. The staging and performativity of this extraordinary listening experience also brings new insights into court and privacy studies.

To Marianne Pade, one of the best listeners in the world.

Invisible music, a particular sound technology created by Christian IV, king of Denmark-Norway (1577–1648), offers historians the perfect tool to study early modern hearing and listening practices, and also reveals a specific sonic strategy designed to display and control power during court ceremonial. At Rosenborg Castle in Copenhagen, the king commissioned the construction of four sonic conduits made vertically to connect the cellar and the Winter Room.¹ His musicians were placed in the cellar, and the music they played could be heard in the Winter Room without the source of the music being visible. Today, with the omnipresence of recording technologies, listening

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¹ Arne Spohr has published on invisible music at Rosenborg Castle and in other locations albeit from a different perspective; I focus here on listening and on the listeners, Spohr 2012; Spohr 2014.

devices, and loudspeakers blasting incessantly, invisible music is common.² The separation of sound from its sources has become a norm, more widespread than attending to a concert or hearing musicians play live. But in early modern listening practices, music was indissociable from its source, and this source was automatically associated with the presence of musicians. Therefore, the removal of the sound source brings an interesting perspective in the listening practices of the early modern world. Sensorial experiences in general and listening practices specifically, for the case of this article, are often hard to track in history, because they are part of a normative behaviour that is rarely evoked and they are tacitly experienced by a community. Therefore, cases that deviate from the norm – such as Christian IV’s invisible music experience – indirectly shed precious light on the otherwise unmentioned and shared normative listening practices. In this article I will explore the case of invisible music as a lens to understand listening strategies. First, I will briefly present the early modern soundscape and contrast it with our post-industrial soundscape from a listening perspective. Next, the description of this experience of invisible music by a French visitor at Rosenborg Castle in the early seventeenth century will be a starting point for studying the dissociation of sound from its source. Then, I will consider the architectonic use of space to create a spatialization of music. Finally, to fully grasp invisible music, it is important to recontextualise it in the performative context of court ceremonial and privacy studies. In this last segment, I will show how the staging and performativity of this extraordinary listening experience brings new insights into privacy studies: the manipulation of sound and bodies of the listeners, the private context of the performance, the invisibility of the musicians and the intimate social setting all shed an interesting light on the notions of access and concealment, as well as sonic presence and hidden bodies.

Early modern soundscapes: sound and listening

Early modern society had a soundscape that was radically different from our current, loud and industrial sonic environment. How did people listen, and how were soundscapes perceived in the early modern world? In his groundbreaking and visionary study, Bruce Smith shows that, in the pre-industrial world the level of ambient noise was much lower than that of our contemporary soundscape.³ The lower volume of noise in pre-industrial societies meant that people could hear a wider array of sounds across a broader geographical space.⁴ Ambient sounds were much clearer to early

² Kassabian 2013.

³ Smith 1999, 49–50; see also Gutton 2000; Garrioch 2003; Cook 2013; Carter 2018.

⁴ This has been demonstrated by Smith 1999, 58 and Garrioch 2003, 8.

modern listeners and they had entirely different ways of listening to, hearing and interpreting their soundscapes. Everyday sounds happening through conversations, the use of craftsmen's tools, speeding horse carriages, quarrels, town criers performances and boisterous street sellers calls all played a major role in the early modern soundscape. Extraordinary events such as wars, fireworks, musical entertainments, street theatres or processions were similarly characterized by their specific soundscapes and must often have been heard before they could be seen.⁵ Sound and space are intrinsically linked; hearing and listening to architectonic spaces allows us to cross the thresholds of physical spaces and gives a new perspective of the notions of inside and outside. Sound travels through space; its vibrations physically reach the listeners. Sound permeates and extends boundaries: the sound of a private quarrel can be heard in the street, but also reversely, an outdoor music performance can be heard inside. Therefore, by taking sound into consideration, we can consider in a new light the traditional oppositions between private and public, indoors and outdoors, sound and noise. The propagation of sound through the air is also a territorial marker, a way of appropriating the space where it resounds. In the case of Christian IV's invisible music, the manipulation of sounds and noises was a display of power and a form of control over court visitors. More generally, sounds also create the rhythms of everyday life and give a sonic identity, or a "soundtrack", to the space in which they resonate and are propagated.

In this understanding of the European early modern period according to which people could hear a much wider range of sounds and noises; listening, hearing, and the symbolic meaning of sounds were interpreted according to diverse standards.⁶ Aurality defines a community and encompasses people of all social classes, along with animals, mechanical and artistic devices, and natural sounds, creating what we call a shared acoustic environment, or a soundscape. People feel unisonance or dissonance: they might hear the same soundscape, but interpret it differently, according to their social background or gender. Soundscapes, in other words, can create a form of exclusion (who is privy to hear a conversation and who is not), but they can also be inclusive

⁵ Jakob Ingemann Parby and Kasper H. Andersen, "Soundscapes of Copenhagen in the Sixteenth and Seventeenth Centuries", conference presentation during the international workshop *Sound, Privacy, and Court Studies*, Rosenborg Castle and Centre for Privacy Studies, Copenhagen University, 24–25 June 2021.

⁶ Such standards are the topic of multiple studies by historians, sociologists and philosophers: Garrioch 2003, 5–6. Among the first to explore the idea of noise and sound as a socio-political topic was Attali 1977; on soundscapes, see Schafer 1977, for a selection of other studies on sonic cultural histories, see Corbin 1994; Bailey 1996 and more recently Gutton 2000; Carter 2002 and Carter 2018; Smith 2004; Erlmann 2004 and Erlmann 2010; Howard & Moretti 2009; Zanovello 2014; Knighton & Mazuela-Angueta 2018.

across social classes. The eyes can be closed; the ears cannot be closed because we do not have earlids. In the context of privacy, it is easier to visually exclude those who should not have access by closing a door, while it is impossible to prevent eavesdropping behind the closed door or to the propagation across space of a loud quarrel.

Invisible music at Rosenborg Castle: dissociation of sound and its source

The use of visual and auditory devices, as well as multimedia performances to display power during court ceremonies was certainly not a novelty at the time of Christian IV's reign. However, the suppression of the visual source of the music was experienced as a miraculous, striking, and extremely uncommon event. The king used it as a cultural display of invention and a political instrument to stage himself in the Winter Room. Several testimonies of the invisible music in the Winter Room have come down to us, all expressing surprise and wonder at this unexpected listening experience.⁷ By far the most detailed and most interesting for our purpose is the description from Charles Ogier (c. 1595–1654), a French envoy visiting Rosenborg in 1634.⁸ His account is noteworthy because it is focused on the listeners perception and their experience:

Illum deinde rex duxit in atrium quadratum, picturis ornatum, subter quo musicos suos collocare solet: iussitque nos convocari: nobisque ingressis, ab eoque rursus pileo salutatis, cum ipse Legatusque tecti essent, atque in medio coenaculo starent, universi continuo musici, tam instrumentis, quam vocibus cecinerunt. Hanc tam subitam voluptatem attenti stupentesque accepimus, cum per diversa spiracula sonitus, nunc propiores, nunc remotiores ad aures nostras pervenirent. Interea legatus regis industriam, qui huius voluptatis inventor fuisset, obsequiosè comiterque laudabat, quod idem nutibus nostris Regi nos identidem respectanti significabamus [...] Exeuntes, atque in rheda positos, sub ipso portae vestibulo, non sine Regis iussu, nos tantisper distinuit subterranea illa invisita, at non ingrata, Musica.

Next the king led him [the ambassador] into a square hall decorated with pictures, below which he used to gather his musicians. He ordered

⁷ All the visitors' descriptions of Rosenborg Castle are given in Hein 2009 1, 141–144. The ones describing the performance of invisible music are by prince Christian II of Anhalt-Bernburg in 1623, the German lawyer Heinrich Meyer in 1642 and the Swedish traveler Nils Rubinus in 1662.

⁸ Ogier was the secretary of the French ambassador Claude des Mesmes. In 1634, they were invited to the wedding of Christian, prince-elect of Denmark, and Magdalena Sibylla of Saxony (Det store Bilager) and visited Rosenborg Castle on this occasion. Ogier later published the diary of his travels in 1634–1636, see Ogier 1656; on the “great wedding”, see Wade 1996, 157–278.

us to convene. When we had entered, and he had greeted us again by doffing his hat (since he and the ambassador had their heads covered and were standing in the middle of the upper room), the whole ensemble of musicians, both instruments and voices, suddenly began to play. We – transfixed and stupefied – experienced this wonderfully unexpected pleasure, as the sound reached our ears from various vents, now closer, now farther. Meanwhile, the ambassador obligingly and courteously praised the ingenuity of the king, who had devised this pleasant invention. By nodding, we indicated the same thing to the king, who was repeatedly looking at us [...] As we departed, even as our carriage passed under the courtyard gate, we were entertained by that unseen but not unpleasing subterranean music, presumably played at the order of the king.⁹

The most prominent feature in this description is the extreme surprise felt by the listeners: it is “unexpected” to hear invisible music and they remained pleasantly stupefied. This astonishment is produced by the dissociation between the music and the musicians. It points to the idea that musical sound had an agency at this time created through maintaining a tactile relationship with its source, “an umbilical continuity”.¹⁰ The dissociation of sound from its source has been coined by ecologist and sound scholar R. M. Schafer as the term “schizophonia” in relation to more recent acoustical and listening cultures of modernity.¹¹ This term perfectly describes Christian IV’s invisible music. The experience of listening without seeing upset the early modern conception of acoustics and confronted listeners with a new form of dissociated perception and sonic spatialization, as we shall see further on. Rosenborg’s setting for invisible music was not a unique case, but the phenomenon was fairly rare and restricted to northern Europe and smaller royal residences or *lysthus* (Lusthaus).¹² Interestingly, Ogier uses spatial terms (*closer, farther*) to actually describe a sonic experience (whereas one would expect a more familiar term relating to volume, like *louder, softer*). Four small vents (ca. 20 x 20 cm) were open between the roof of the cellar

⁹ Ogier 1656, 53–54, translation is mine with the generous help of Eric Bianchi and Johann Ramminger.

¹⁰ Erlmann 2004, 98 and Connor 2004, 158.

¹¹ Schafer 1969, 43–47. The term schizophonia can refer to the separation either in space or, with the use of more recent technologies of sound reproduction, also in time, when the capacities to record and reproduce sounds are developed from the late nineteenth century onwards.

¹² Lusthaus auf dem Jungfernbastei in Dresden and Neues Lusthaus in Stuttgart. In the latter, the staging was different: the musicians were placed above the listening space and not below it; statues were placed over the vents to make it look like the music was produced by the statues. Another example of invisible music is Rondell in Jindřichův Hradec in Bohemia (known as Neuhaus in German Bohemia), see Spohr 2014, 20–26.

and the four corners of flooring in the Winter Room.¹³ The vents are simple excavations in the stone and do not have a special coating. The sound is directly transmitted from the cellar to the room. As a result, the sound source is extremely easy to locate; any listener immediately perceives it comes from below and from the corners. Music travelling through the vents also affects its sonic quality: it comes out as extremely distinct but remote, enhancing this ethereal experience of remoteness.¹⁴ Ogier uses the word *spiraculum* to describe the vent, from “spiro” (to breathe); this establishes a connection between a technological device and its function as a conduit to let the air pass. He visualizes it as a kind of breathing lung – like those of the singers – transmitting sound from one place to the other. Thus, through the terminology he uses, Ogier reconnects the sound with a body as a sound producer. He gives us a precious hint as to how sound was perceived in early modern thinking as indissociable from the body producing it. Hiding the source of music ultimately puts into perspective what Smith calls the “hereness and thereeness” of sound.¹⁵ According to Smith, the thereeness of sound focuses on the sound-producer – the outside quality of sound, and the vibrations in time and space – whereas the hereness of sound relates to the physiological and psychological effects on the listener. The thereeness becomes the hereness in the ear of the listener. By removing the thereeness of sound from the sight of the listener, invisibility created an entirely new listening experience for an early modern audience, due to the remote and particular quality of the music coming from the vents. The absence of the musicians, the trick of exposing the sound but hiding its source is a clear sign of an innovative use of space and sound.

Spatialization and perambulation: a full sensory experience of sound

The spatialization of music is fundamental in this invisible acoustic experience. It is a site-specific installation, literally built into the architecture of the palace. Special sonic vents had to be opened from the cellar to the Winter Room to allow the diffusion of sound from the four corners of the room. Generally, spatialization is associated with contemporary electronic music, but it has a long history. One of the most famous example being Italian polychoral music, where several choirs, *cori spezzati*, were placed on

¹³ Three of them were rediscovered during a recent renovation, Hein 2009 1, 44.

¹⁴ It has been possible to listen to invisible music, thanks to a reconstruction and the diffusion of music through the vents, Peter Kristiansen and Christine Jeanneret, “Visit of Rosenborg Castle with a focus on its soundscapes”, workshop *Sound, Privacy, and Court Studies*, 24 June 2021.

¹⁵ Smith 1999, 7–8.

different balconies in the churches to realize a spatialized sonic experience.¹⁶ In this cases, the musicians were visible. However, with the removal of the musicians' bodies from sight, Renaissance invisible music is truly a precursor to sound surround diffusion – also called quadraphonic sound – through spatialized sources. In Christian IV's invisible music, the same effect would not have been possible by placing the musicians physically in the four corners: the sound would have an entirely difference quality because of the closeness between the musicians and the listeners placed in the same room, and the sound projection would have been much louder and more homogenous. This extraordinary listening experience plays on two senses: the eyes are deprived from their traditional expectations of the musicians' presence and thereby the ears are overstimulated by the removal of the source and the peculiar sonic quality. The physical technology of the sonic vents will eventually led to the complete removal of the musicians and the use of loudspeakers in contemporary electronic practice. The acoustics of the architectural space influences the listener's perception. Reverberation, absorption, and resonance are site-specific and vary according to each venue for spatialized music. In our case, the Winter Room is a large rectangular room occupying the north aisle of Rosenborg Castle. The floor is made of black, white, and reddish marble tiles, which enhances the resonance of the room, whereas the walls are covered in oak panels attenuating the echoes and reverberation. The room is not extremely large, allowing a well-balanced diffusion of the sound through the four corners: preventing the sound from being too dispersed in the space and also making it clearly audible for the listener. Spatialization is based on the ability of the human ear to localize sounds in space by identifying the position of the sound sources and measuring the distance between the listeners and these sources.¹⁷ Spatial hearing plays with this faculty and transforms sound localization into an intrinsic part of the listening experience. Spatialized music thus creates sound trajectories and spatial depth.¹⁸ The multiplicity of the sound sources in four different places in the Winter Room would have given a sense of shaping and dynamics to the projection and the perception of sound. Spatialization gives plasticity to sound by manipulating it, distorting it, and moulding it into new temporal and spatial shapes. It also affects perception by creating a dynamic

¹⁶ Bryant 1981. Interestingly enough, there is no mention of invisible music in the historical surveys of spatialized music, probably because it has been largely neglected by scholars. For studies on electronic music and spatialization, see Nauck 1997; Maconie 2005; Robusté 2014, Ouzounian 2021.

¹⁷ Blauert 1997; Bregman 1990.

¹⁸ As the direction of motion cannot be accurately detected through a monaural listening situation (see Strybel et al. 1989), I assume that the authors of the surviving accounts of the invisible music were of sound hearing capabilities.

form of listening. On one hand, the spatialized diffusion creates multiple sound perspectives. On the other hand, Ogier's description of hearing the music "now closer, now farther" undoubtedly indicates that the king and his two guests were moving around the Winter Room, while listening, making it an enhanced spatialized experience. By moving, the listeners create their own listening experience, being now in the centre of the room, then going closer or farther from the sound sources. As such, listening to invisible music is a full sensorial experience, involving the listeners' bodies and the buildings where the performance took place. Therefore, the perambulation mentioned by Ogier ("now closer, now farther") is an intrinsic part of this aural experience. As it has been noticed in art history, the princely collections of paintings in the early modern period were spaces intended for a combined physical and mental exercise.¹⁹ Viewing art while simultaneously walking through the collection was thought to be beneficial for mental and physical health together with its recreative function. In the case of spatial music, the same happens not with the eye but with the ear.²⁰ The eyes, deprived of the musicians' presence, create a new listening experience involving the motion of the body.

Performativity and invisibility in court and privacy studies

Finally, the performance of invisible music is indissociable from the performance and performativity of court ceremonial practices and it has to be contextualized in this setting to be fully understood. Every moment, every movement, even every utterance of this invisible aural experience are controlled and orchestrated by the king, as evidenced by Ogier's testimony. Like a conductor, Christian IV gives signals to the musicians in order for them to start and stop playing. He also signals to his guests when they should express their opinion and expected positive reactions to this pleasant aural experience. As Szendy puts it in his extraordinary study, "Listening is a matter of words",²¹ it is not just about a listening experience, but about how it is staged and performed by the listeners, not only during the experience itself but also in Ogier's written rendition. During the time of the elective monarchy and before the abrupt establishment of the Danish absolute monarchy by Frederik III in 1660, both Christian IV and his son had to

¹⁹ Gage 2008.

²⁰ Spohr 2012 argues that listening to invisible was a synesthetic experience, since there was a ceiling painting in the Winter Room, that could have been a depiction of Christian IV's Court Musicians, by Francis Clein or Søren Kiær, today preserved in the Queen's Room of Rosenborg. Since it is not clear if it was originally in the Winter Room or not and Ogier's description – or any other visitors' description – does not mention synesthesia, we shall not explore this aspect here.

²¹ Szendy 2013, 136.

simultaneously hold the nobility in check and keep them in their good graces. Against the backdrop of terrible military defeats and a disastrous administration of finances, this was not an easy task for the king. Christian IV is paradoxically remembered as one of the greatest Danish monarchs – notably by his legacy in the arts and his architectonic remodelling of Copenhagen – whereas he left the realm in utter political and economic chaos at the time of his death.²² The king wanted to put Copenhagen on the European map and thus transformed the city from a provincial town to the major centre of power of the kingdom of Denmark-Norway by an extensive cultural, commercial, architectural, military refashioning, inspired by various European models from various cities. Contrarily to the monarchy's finances, administration, and legal matters, which required the approval of the council of the realm (*Rigsrådet*), the king was free to administrate the expenses of court ceremonial independently.²³ It is therefore no surprise that ceremonial culture was one of the main strategies used by Christian IV as a means to assert his power over and to control the nobility. Court is the site *par excellence* for staging and displaying power and sociability.²⁴ Multimedia performances involving the arts are the ultimate means for royal propaganda and elaborate stagings, such as the great wedding of 1634 were precisely served this function on both the national and international levels. The creation of beautiful artefacts and technological wonders was fundamental in establishing and displaying the status and power of rulers in the early modern world.²⁵ However, court studies seldom consider sound and listening strategies and therefore, they rarely take into account the use and manipulation of sound in court ceremonial. I argue that sound played a crucial role in the appropriation, display, and control of power in courtly spaces. Court etiquette strictly ruled access and proximity to the monarch: who had access could also talk to the king and get him to listen, a high privilege granted to an extremely restricted number of courtiers. Speaking or producing sounds at court were ultimately political performances and established protocols of rank, power, access, and distance. Who can access, listen and talk to the monarch – as the French ambassador and Ogier in our case – is therefore highly significant. For example, ambassadors and agents enjoyed the extraordinary privilege of having access to and close contact with the king.²⁶ The question of access and closeness ultimately leads to the notion of privacy. Privacy and access guaranteed the crucial ability to communicate directly

²² Heiberg 1998, 15.

²³ Olden-Jørgensen 2002, 71.

²⁴ Newton 2000; Newton 2014; Sternberg 2014; Cosandey 2016.

²⁵ Koeppe 2019.

²⁶ Raeymaekers & Derks 2016, 2–4.

with the monarch in an intimate setting – as it is exactly the case in the Winter Room during the performance of invisible music. This type of personal interaction was key to the acquisition and exercise of power. In our case, this ritual comprises several aspects: the use of sound technology to manipulate and control space; the elaborate choreography of court ceremonial, the use of music, the private setting, the staged performance and performativity of the participants. The king expected his guests to marvel at his invention, signalling and awaiting their reaction, and they obliged, indulging him with many compliments, as was expected, in order to cement his role as the orchestrator and master of a sonic wonder.

Moreover, in relation to privacy, the notion of hiding or exposing is crucial: the sonic presence of the musicians together with their visual absence creates an unexpected and marvellous turn. Discussing nineteenth-century sound technologies, such as phonography, another and more recent invention implying the removal of the musicians, Szendy rightly argues that it drastically changed the delicate frontier between private and public performance.²⁷ A series of apparatus, such as the telephone, the phonograph and the *théâtrophone* allowed to transmit sound and music in a long distance and invisibly. The social and public setting of the concert was deeply transformed by the possibility of listening to music alone at home and in private in the case of the phonograph. The *théâtrophone* is even more interesting in blurring the private and public divide: it was a telephonic diffusion of theatre and opera, the public would gather in rooms equipped with telephones and listened to the transmission in an isolated and private experience, while the performance was actually taking place in the theatres with an audience participating publicly.²⁸ The telephonic diffusion was stereophonic, and made it therefore also an exercise in spatialisation. In the case of invisible music, we witness an early precursor of this transformation from a public performance to a more intimate setting.

The traditional appropriation and control of space is enhanced in this case by the invisibility of the music source. The sense of displacement and astonishment of the listeners gives us precious insights into early modern listening practices. The staging can only work with a restricted and selected audience, who can freely move around and talk to each other during the performance. It would be utterly impossible, if the Winter Room would be crowded by a large audience or by listeners sitting motionless. A successful performance of invisible and spatialized music requires a limited number of listeners in an intimate context of sociability. This aural experience was

²⁷ Szendy 2013, 83.

²⁸ Van Drie 2016.

intended as a form of media strategy and technological inventiveness. By giving to his visitors a unique sensory experience, with hidden living musicians functioning as a kind of music machine, Christian IV was putting his power on display and taking control of the highly elaborate ceremonial of court visits, by the conjoint use of two of his favourite artforms, architecture and music.

Bibliography

- Attali, Jacques 1977, *Bruits: Essais sur l'économie politique de la musique*, Paris (English translation 1985: *Noise: The Political Economy of Music*, transl.: Brian Massumi, Manchester).
- Bailey, Peter 1996, "Breaking the Sound Barrier: A Historian Listens to Noise", *Body and Society* 2, 49–66.
- Blauert, Jens 1997, *Spatial Hearing: The Psychophysics of Human Sound Localization*, Cambridge MA.
- Bregman, Albert S. 1990, *Auditory Scene Analysis: The Perceptual Organization of Sound*, Cambridge MA.
- Bryant, David 1981, "The 'cori spezzati' of St Mark's: Myth and Reality", *Early Music History* 1, 165–186.
- Carter, Tim 2018, "Listening to Music in Early Modern Italy: Some Problems for the Urban Musicologist", *Hearing the City in Early Modern Europe*, eds.: Tess Knighton & Ascensión Mazuela-Angueta, Turnhout, 25–49.
- Carter, Tim 2002, "The Sound of Silence: Models for an Urban Musicology", *Urban History* 29.1, 8–18.
- Cook, Nicholas 2013, "Classical Music and the Politics of Space", *Music, Sound and Space: Transformations of Public and Private Experience*, ed.: Georgina Born, Cambridge, 224–238.
- Connor, Steven 2004, "Edison's Teeth: Touching Hearing," *Hearing Cultures: Essays on sound, Listening and Modernity*, ed.: Veit Erlmann, Oxford, 153–172.
- Corbin, Alain 1994, *Les cloches de la terre: Paysage sonore et culture sensible dans les campagnes au XIXe siècle*, Paris (English translation 1998: *Village Bells, Sound and Meaning in the Nineteenth-Century French Countryside*, trans.: Martin Thom, New York).
- Cosandey, Fanny 2016, *Le rang: Préséances et hiérarchies dans la France d'Ancien Régime*, Paris.
- Erlmann, Veit (ed.) 2004, *Hearing Cultures: Essays on Sound, Listening and Modernity*, Oxford.
- Erlmann, Veit 2010, *Reason and Resonance: A History of Modern Aurality*, New York.
- Gage, Frances 2008, "Exercises for the Mind and the Body: Giulio Mancini, Collecting, and the Beholding of Landscape Painting in the Seventeenth Century", *Renaissance Quarterly* 61.4, 1167–1207.
- Garrioch, David 2003, "Sounds of the City: The Soundscape of Early Modern European Towns", *Urban History* 30.1, 5–25.
- Gutton, Jean-Pierre 2000, *Bruits et sons dans notre histoire: Essai sur la reconstitution du paysage sonore*, Paris.

- Heiberg, Steffen 1988, *Christian IV and Europe: The 19th Art Exhibition of the Council of Europe Denmark 1988*, Copenhagen.
- Hein, Jørgen 2009, *The Treasure Collection at Rosenborg Castle: The Inventories of 1696 and 1718, Royal Heritage and Collecting in Denmark-Norway 1500–1900*, 3 vols. Copenhagen.
- Howard, Deborah & Laura Moretti 2009, *Sound and Space in Renaissance Venice: Architecture, Music, Acoustics*, New Haven.
- Kassabian, Anahid 2013, *Ubiquitous Listening: Affect, Attention, and Distributed Subjectivity*, Berkeley.
- Knighton, Tess & Ascensión Mazuela-Anguita (eds.) 2018, *Hearing the City in Early Modern Europe*, Turnhout.
- Maconie, Robin 2005, *Other Planets: The Music of Karlheinz Stockhausen*, Lanham MD.
- Koeppe, Wolfram (ed.) 2019, *Making Marvels: Science and Splendor at the Courts of Europe*, New York.
- Newton, William R. 2014, *Vivre à Versailles: Derrière la façade, la vie quotidienne au château*, Paris.
- Newton, William R. 2000, *L' Espace du roi: La Cour de France au château de Versailles 1682–1789*, Paris.
- Nauck, Gisela 1997, *Musik in Raum, Raum in der Musik: Ein Beitrag zur Geschichte der Seriellen Musik*, Stuttgart (Beihefte zum Archiv für Musikwissenschaft 38)
- Ogier, Charles 1656, *Ephemerides, sive iter Danicum, Svecicum, Polonicum*, Paris.
- Olden-Jørgensen, Sebastian 2002, “State Ceremonial, Court Culture and Political Power in Early Modern Denmark, 1536–1746”, *Scandinavian Journal of History* 27.2, 65–76.
- Ouzounian, Gascia 2021, *Stereophonica: Sound and Space in Science, Technology, and the Arts*, Cambridge MA.
- Raeymaekers, Dries & Sebastiaan Derks (eds.) 2016, *The Key to Power? The Culture of Access in Princely Courts, 1400–1750*, Leiden.
- Robusté, Joan Riera 2014, “Spatial Hearing and Sound Perception in Musical Composition”, PhD diss., Averio.
- Schafer, Raymond Murray 1977, *The Tuning of the World*, New York.
- Schafer, Raymond Murray 1969, *The New Soundscape*, Toronto.
- Smith, Bruce R. 1999, *The Acoustic World of Early Modern England: Attending to the O-Factor*, Chicago.
- Smith, Mark M. (ed.) 2004, *Hearing History: A Reader*, Athens GA.
- Spohr, Arne 2012, “‘This Charming Invention Created by the King’: Christian IV and his invisible music”, *Danish Yearbook of Musicology* 39, 13–33.

- Spoehr Arne 2014, “Concealed Music in Early Modern Diplomatic Ceremonial”, *Music and Diplomacy from the Early Modern Era to the Present*, eds.: Rebekah Ahrendt, Mark Ferraguto & Damien Mahiet, New York, 19–43.
- Sternberg Giora 2014, *Status Interaction During the Reign of Louis XIV*, Oxford.
- Strybel, Thomas Z., Carol L. Manligas & David R. Perrot 1989, “Auditory apparent motion under binaural and monaural listening conditions,” *Perception & Psychophysics* 45, 371–377.
- Szendy, Peter 2001, *Écoute: une histoire de nos oreilles*, Paris (English translation 2013: *Listen: A History of Our Ears*, trans.: Charlotte Mandell, New York).
- Wade, Mara R. 1996, *Triumphus nuptialis danicus: German Court Culture and Denmark. The Great Wedding of 1634*, Wiesbaden.
- Van Drie, Melissa 2016, “Hearing through the théâtrophone: Sonically constructed spaces and embodied listening in the late nineteenth-century French theatre”, *SoundEffects - An Interdisciplinary Journal of Sound and Sound Experience* 5.1, 73–90, <https://doi.org/10.7146/se.v5i1.23310>
- Zanovello, Giovanni 2014, “In the Church and in the Chapel: Music and Devotional Spaces in the Florentine Church of Santissima Annunziata”, *Journal of the American Musicological Society* 67.2, 379–4.