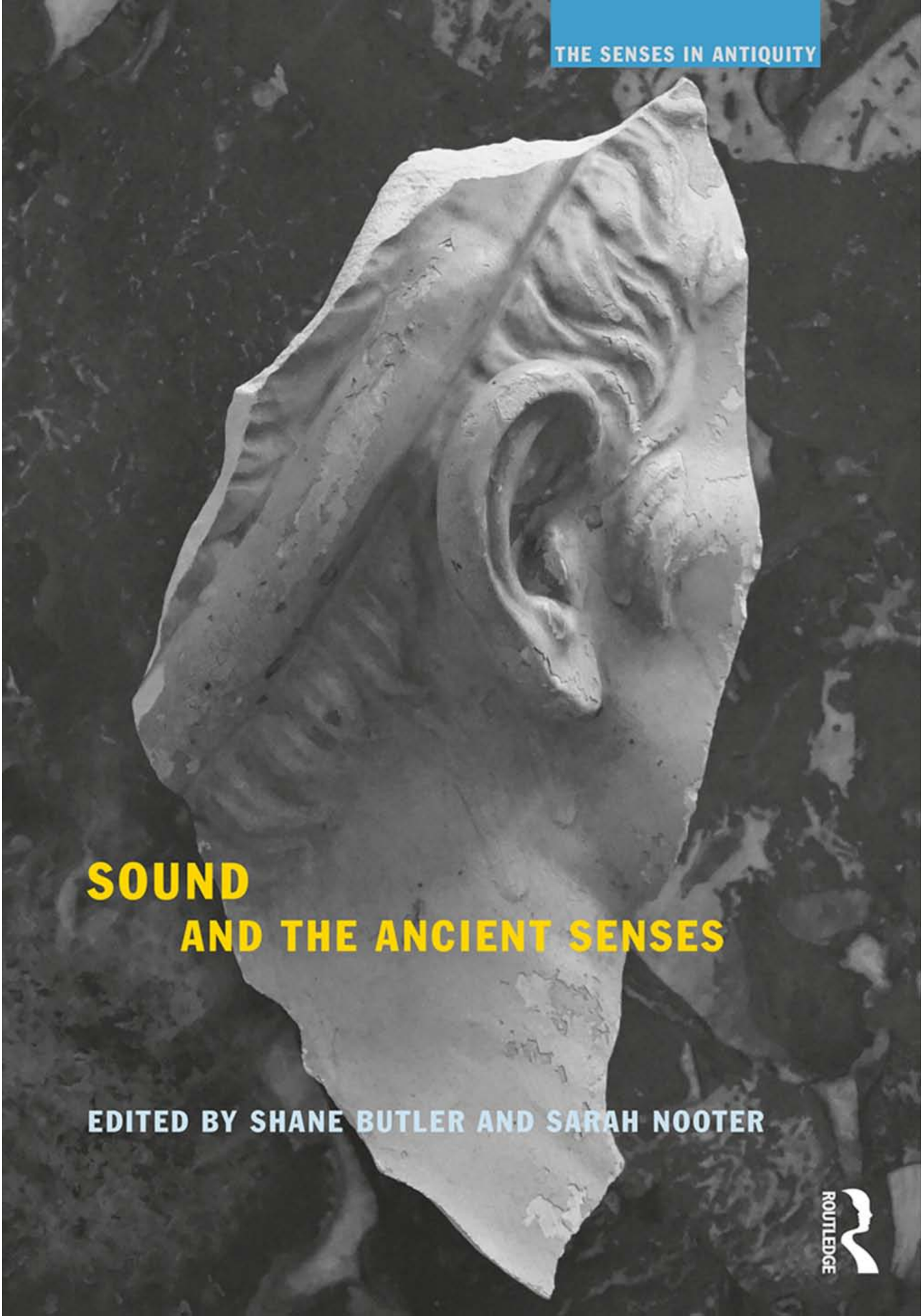
THE SENSES IN ANTIQUITY
SOUND
AND THE ANCIENT SENSES
EDITED BY SHANE BUTLER AND SARAH NOOTER
ROUTLEDGE

SOUND AND THE ANCIENT SENSES

Sound leaves no ruins and no residues, but it is experienced constantly. It is ubiquitous but fleeting. Even silence has sound, even absence resonates. *Sound and the Ancient Senses* aims to hear the lost sounds of antiquity, from the sounds of the human body to those of the gods, from the bathhouse to the Forum, from the chirp of a cicada to the music of the celestial spheres.

Sound plays so great a role in shaping our environments as to make it a crucial sounding board for thinking about space and ecology, emotions and experience, mortality and the divine, orality and textuality, and the self and its connection to others. From antiquity to the present day, poets and philosophers have strained to hear the ways that sounds structure our world and identities.

This volume looks at theories and practices of hearing and producing sounds in ritual contexts, medicine, mourning, music, poetry, drama, erotics, philosophy, rhetoric, linguistics, vocality, and on the page, and shows how ancient ideas of sound still shape how and what we hear today. As the first comprehensive introduction to the soundscapes of antiquity, this volume makes a significant contribution to the rapidly growing fields of sound and voice studies and is the final volume of the series, *The Senses in Antiquity*.

Shane Butler is Nancy H. and Robert E. Hall Professor in the Humanities and Professor and Chair of Classics at Johns Hopkins University, USA. He is the author, most recently, of *The Ancient Phonograph* (2015), and editor of *Deep Classics: Rethinking Classical Reception* (2016). He is also co-editor, with Mark Bradley, of this series, as well as being co-editor, with Alex Purves, of its first volume, *Synaesthesia and the Ancient Senses* (2013).

Sarah Nooter is Associate Professor of Classics, and of Theater and Performance Studies, at the University of Chicago, USA. She is the author of *When Heroes Sing: Sophocles and the Shifting Soundscape of Tragedy* (2012) and *The Mortal Voice in the Tragedies of Aeschylus* (2017).

THE SENSES IN ANTIQUITY
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SOUND AND THE ANCIENT SENSES

Edited by Shane Butler and Sarah Nooter

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Acoustic impression of a speech by Cicero delivered from the Rostra to the Comitium (in Latin), from the perspective of an audience member standing in the Comitium at a distance of 20 m. Speaker: Adriano Evangelisti. Auralization: Christoph Böhm, Felicitas Fiedler, Stefan Weinzierl.

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3

SOUNDING OUT PUBLIC SPACE IN LATE REPUBLICAN ROME

Erika Holter, Susanne Muth and Sebastian Schwesinger[1]

The contemporary shift in humanities towards the senses, meaning their historical and situational specificity on the one hand and the sensory embeddedness of both knowledge and conceptual understanding on the other, has focused attention on the sensory dynamics of spatial configurations. As early as 1985, the French philosopher Michel Serres wrote on the interaction of sound, space and the senses, arguing that we are disposed to be attuned to our surroundings. Sensory perception, Serres argues, is the necessary prerequisite without which specific symbolic, that is, meaning-producing systems, cannot evolve: "Potential becomes actual, the sensible becomes sense, a single note emerges from the din".[2] Phenomenological theory, in connection with the sound and soundscape studies that originated in the late 1960s and that have proliferated in the humanities since the beginning of the twenty-first century, has shown not only that sound and auditory perception are shaped by cultural propensities, but also that sound perception itself shapes our situational awareness.[3] That means that the sense of sound plays an integral role in shaping and constructing a spatial situation.

Sound does this in two ways: on the one hand as a sound object, on the other as a dimension of space itself. We encounter the former in public spaces as functional sounds that serve to inform or warn us of certain events (e.g. car horns, bells) or to indicate the results of certain actions (e.g. the high-pitched beep emitted when a ticket is validated with an electronic punching machine). Mostly the product of elaborate sound design, these audio signals help us navigate through our daily routines. They guide us to rush, stop, repeat, step back or duck. However, sound can also be regarded as the mediator of what Barry Blesser and Linda-Ruth Salter have named "aural architecture", the architecture of a space as perceived through listening

1 The authors are principal investigator (Muth) and research associates (Holter, Schwesinger) at the Cluster of Excellence "Image Knowledge Gestaltung" in the project "Analog Storage Media – Auralizations of Archaeological Spaces". The research and findings presented in this chapter are an outcome of the interdisciplinary research collaboration that the authors represent. The project group is headed by Christian Kassung (Department of Cultural Theory and History, Humboldt-Universität zu Berlin), Susanne Muth (Department of Classical Archaeology, Humboldt-Universität zu Berlin) and Stefan Weinzierl (Department of Audio Communication, Technische Universität zu Berlin). Research associates in the project are Christoph Böhm, Erika Holter, Una Schäfer and Sebastian Schwesinger.

2 Serres (1985: 119).

3 Schulze (2014).

to the interactions between sound sources and spatial elements.[4] Sound is, therefore, a dimension in which we experience space – its unique shape and scale – that gives form and meaning to all sonic events that occur within a given architecture. It would be misleading to attribute the corresponding acoustic design solely to modern concert halls, theatres or clubs. Regardless of whether or not the acoustics of a space are orchestrated intentionally, sound proves to be a constitutive factor of public culture, one in which sonic affordances entangle us in situations to which we, by moving and making sounds, are also contributing. For example, public fountains have been shown to have a very strong impact on how people perceive public places and how they behave in them.[5] They are not only attractive because they are places of refreshment or visual pleasure, but also because they provide an oasis of aural calm within the cacophony of urban noise. In this case, calm has to be understood relatively, as the noise of the fountain masks the surrounding city din almost perfectly and provides at the same time an ideal spot for private conversation that cannot easily be eavesdropped on.[6] This one example already illustrates how architectural interventions often have acoustic consequences for the use of urban spaces even when they might not have been designed to do so. Especially when considering public culture as a space of interaction and communication, the importance of sound as a medium of spatial functionality grows. In addition, we have to take into account how, along with the material parameters already mentioned, immaterial ones such as education, law or emotional regimes[7] also play a part in the construction of a public auditory *Lebenswelt* ("lifeworld").[8]

When taking this understanding of sound into account, it seems surprising that the most famous and important public spaces in antiquity, such as the Forum in Rome, have been investigated almost exclusively with a focus on their visual function as spaces in which individuals or groups display and experience their collective or personal identities and status.[9] Approaches such as these often fail to take the full range of experiences in these public spaces into account. These spaces were characterized by a multitude of activities that engaged all the senses, not only the visual: for example,

4 Blesser and Salter (2007); for an introduction to the concept of aural architecture as developed in their book, see especially 1–11.

5 Garza et al. (2016); Cox (2010).

6 Although Gabrun and Ali (2013) show that not all fountains are suitable for this function, they acknowledge that fountains are nevertheless used for this purpose.

7 First coined by Reddy (2001: 112–37), and expanded upon by Rosenwein (2006: 17–25) (although she prefers the term emotional communities), emotional regimes is a term used to describe historically specific cultural or political norms of emotional expression.

8 Edmund Husserl (1986) conceived of this word as a central concept in his phenomenological philosophy; the term is intended both as a reclamation of the foundation of positive science and an attempt to move hermeneutics beyond interpreting subjective intentions. The term is used here to refer to the fundamental embeddedness or participation of humans within an intersubjective primordial sphere within which their experience is rendered meaningful (Schütz and Luckmann 2003).

9 See for example the at-the-time innovative work by Paul Zanker on the Roman Forum (Zanker 1972 and Zanker 1990: 79–82) or Tonio Hölscher on the collective memory on display in the Roman Forum (Hölscher 2006). A new approach to the Roman Forum as a space of experience, in this case focusing on the built architecture itself as a medium for experience, is exemplified in Muth 2014a and serves as the basis for the following considerations. For more information on the Roman Forum in general, see in addition Coarelli (1983), Coarelli (1985), Freyberger (2009) and Filippi (2012).

bustling markets, civic assemblies, public speeches and law courts, processions (including funerals, on which see Hope, this volume) and festivals. The following chapter presents a case study in which we specifically focus on the sense of sound by studying speech comprehension during public addresses in the Roman Forum, to serve as an example of how a specific soundscape of these public spaces was generated and how we can use the reconstructions and simulations of such sonic events in order to fully understand the multivalent experience of these spaces. This case study is a result of the interdisciplinary collaboration between classical archaeology, cultural history and audio communication. We hope, by bringing together the various research methods of our different disciplines, to develop a research instrument for audiovisual experience in antiquity.[10]

Simulating audience experience: architectural reconstruction and auralization

The first step towards any reconstruction of a sensory experience is the reconstruction of the built, architectural space of the sensory environment. When using simulations in order to study historical, no longer extant spaces, a digital model supported by as much scientific evidence as possible is a necessary prerequisite. Our case study on public addresses and assemblies in the Roman Forum begins therefore with a (digital) reconstruction of this ancient public space, provided by the ongoing research project Digital Forum Romanum. The goal of the project is to create a diachronic digital reconstruction of the Forum from the Archaic period until Late Antiquity and the Early Middle Ages that is intended to go beyond the function of simple visualization in order to provide a new tool for further research.[11] In keeping with this goal, the project has reviewed and analysed all the evidence – archaeological, literary and architectural – for the different structures in the Roman Forum, considering very carefully the reliability of these disparate sources when reconstructing the different phases of this constantly changing public space. Each decision we make during the reconstruction of each individual building is being documented and will be made available publicly in order to foster a discussion around the reconstructions, allowing other researchers to profit

10 Foundation for this research project is the digital model developed by the "digitales forum romanum", a research project at the Humboldt-Universität zu Berlin in cooperation with the Cluster of Excellence "The Formation and Transformation of Space and Knowledge in Ancient Civilizations – TOPOI" led by Susanne Muth that is creating a diachronic digital model of the Roman Forum for use as an innovative research tool. Project Head: Susanne Muth; Head of 3D Modelling: Armin Müller; Project Coordination: Erika Holter and Jessica Bartz; Contributors: Dirk Mariaschk, Nikolaus Dietrich, Ulfert Oldewurtel, Jana Beutler, Lukas C. Bossert, Georgia Bousia, Dana Drüen, Henriette Engel, Maria Heine, Sophie Horacek, Maria Kames, Mai Kuginuki, Franziska Lehmann, Ilyas Özsen, Julia Preis, Rolf Sporleder, Eric Stephan and Dorothee Zombronner. Results of the project can be viewed on the website www.digitales-forum-romanum.de (English version available at www.digitales-forum-romanum.de/?lang=en).

11 For more information on the project, its approach and its goals, see Dietrich and Muth (2014); Muth (2015); Bartz, Holter, and Muth (2016). Currently the following seven phases dating to 200 BCE, 100 BCE, 14 CE, 96 CE, 150 CE, 210 CE and 310 CE are available as reconstructions and can be viewed at www.digitales-forum-romanum.de (English version www.digitales-forum-romanum.de/?lang=en).

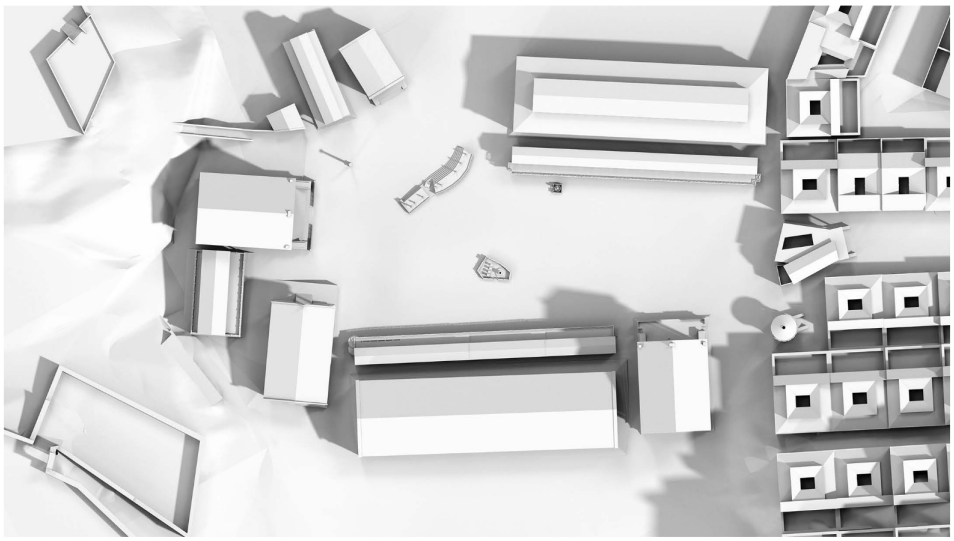

Figure 3.1 Digital reconstruction of the Roman Forum in the Late Republican period

from the existing reconstructions and critically analyse results obtained using these models, such as the simulations presented here.[12]

The case study presented in this chapter focuses on the auditory experience of participants in public assemblies in the Forum in the Late Republican period (Figure 3.1).[13] We would therefore like first to take a look at the architectural reconstruction of the different locations in the Forum that have come down to us as the venue for public speeches and assemblies during this period. The oldest of these is the Comitium (Figure 3.2), the open area situated in front of the Curia (senate house), where the *comitia*, the decision-making assembly of all Roman citizens, met.[14] Curia and Comitium constituted an architectural complex together with the very first speaker's platform on the Forum, called the Rostra ("ships' beaks") for the naval rams attached to it after the Roman naval victory in Antium in 338 BCE, which was located on the south side of the Comitium.[15] Although the organization of the area of the Curia, Comitium and Rostra is attributed by much later literary sources to the kings of Rome, the archaeological situation for this period is murky. At the latest, the beginnings of the Comitium and Rostra as a functionally developed space can be traced to the foundation of the Early Republic and its attendant Republican

12 The research behind the reconstructions of several of the buildings on the Roman Forum is already available online: Temple of Antoninus and Faustina (Kames 2014), Columnae rostratae Augusti (Sporleder 2014), Temple of Saturn (Holter 2014) and Temple of Caesar (Holter 2016).

13 See Muth (2014a: 303–10); Muth and Schulze (2014); Muth (2015); Bartz, Holter, and Muth (2016: 208–11).

14 For the Curia, Comitium and Rostra, see in general Gjerstad (1941), Gjerstad (1960: 217–59), Krause (1976), Coarelli (1977), Coarelli (1983: 119–74), Coarelli (1993: 309–14), Ammerman (1996), Carafa (1998), Muth and Schulze (2014: 8–10), Muth (2014a: 304–10). A summary of the research on the Curia, Comitium and Rostra, with a complete list of the literature as well as a discussion of its reconstruction, can be found in Bartz (2014).

15 Livy, *History* 8.14.11; Pliny, *Natural History* 34.11.

Figure 3.2 Digital reconstruction of the Curia–Comitium–Rostra complex in the Late Republican period

political structures, although the space itself shows signs of human intervention at an earlier stage.[16] Although newest research proposes bringing the date of its organization backwards to the Regal period, the first built structures of the speaker's platform must have been established by the beginning of the Early Republican period, a step that underlined the new political importance of the public assemblies gathered here.[17] Speaking from this platform, the speakers were able to address the citizens gathered in the Comitium. The continued importance of this space for the political self-image of the Roman people can be shown by the increasing placement in the mid fourth century BCE of honorific statues and monuments in the area of the Comitium and on the Rostra, such as the ships' beaks from Antium in 338 BCE mentioned above. At some time during the third century BCE, the Rostra was rebuilt as a curved structure, with steps leading up to it from the north.

A break with tradition occurred for the first time in the middle of the second century BCE, when the speakers from the platform turned their backs on those assembled in the Comitium (and, by extension, turned their backs on the senate house) in order to face the crowds gathered on the other side of the Rostra, in the central Forum. The place of public assembly appears therefore to have moved from the Comitium to the

16 Cicero attributes its construction to Tullius Hostilius, the third king of Rome (710–640 BCE): Cicero, *Republic* 2.17.(31). On the archaeological situation, see Coarelli (1983: 119–60), Coarelli (1985: 11–38, 87–123, 196–98, 233–57), Ammerman (1996: 124), Carafa (1998), Ammerman and Filippi (2000: 35–7), Cifani (2008: 113) and Hopkins (2016: 48–53, 88–9). If the erection of various monuments on and around the Rostra as conveyed by the literary sources are any indication, the ancient texts also support the existence of these structures in the Early Republican period: e.g. the Twelve Tables, set up in 442 BCE (Diodorus Siculus, 12.26.1) or the ships' beaks from the battle of Antium added in 338 BCE (Livy, *History* 8.14.11; Pliny, *Natural History* 34.11).

17 Muth (2014a: 296–7).

Figure 3.3 Digital reconstruction of the Temple of Castor in the Late Republican period

Forum proper, a change that is not reflected in the architecture or material remains of this space and is only passed down in literary tradition.[18]

In the second century BCE, a further area of the Forum became increasingly important as a place of public assembly: the Temple of Castor (and Pollux) on the opposite side of the Forum, which had undergone a renovation in the early second century BCE, when a speaker's platform was attached to the temple podium.[19] The temple podium itself could possibly have been used earlier for this purpose, with the renovation indicating an increased need for the architecture to conform to this new function; literary sources, however, first mention speeches and public assemblies in front of the Temple of Castor starting in the mid second century BCE.[20] A further restoration of the temple by Lucius Caecilius Metellus in the late second century BCE, which restored the temple in the monumental, Hellenistic style of architecture and is the form of the temple used in the simulations, also included a platform on the temple podium from which to address the public (Figure 3.3).[21]

For the most part, interpretations of these spaces focus on their visual, symbolic potential. One scholarly interpretation investigates the buildings on the Forum representing "monumental history" as places of collective memory or as places of self-display: in this vein, the Comitium–Curia complex, with its architectural form unchanged

18 Cicero, *On Friendship* 96; Plutarch, *Caius Gracchus* 5.3. Further discussion and sources below.

19 Although this renovation is not mentioned in literary sources, it can be dated to the second century BCE due to the use of *opus caementicium*. On the pre-Metellan renovation of the temple with the addition of a tribunal and a discussion of its dating, see Nielsen and Poulsen (1992: 80–6).

20 The first is that of Scipio Aemilianus, probably held in 142 BCE (Fest., 362L). Other examples include the passing of Caesar's first agrarian law (Cassius Dio, 38.6) and a *contio* by Octavian (Appian, *Civil Wars* 3.41.).

21 See Nielsen and Poulsen (1992: 87–117) on the Metellan temple; for the temple in the Late Republican period, see Sumi (2009: 169–73). For a general introduction to the Temple of Castor and a more detailed account of its reconstruction with a list of relevant literature, see Muth (2014b).

until the first century BCE since its first construction, reflects the enduring Republican tradition of the Senate.[22] Similarly, the Temple of Castor functions as a victory monument for the Roman people, because its original construction commemorated the victory over the Latins. Still other interpretations examine the building projects on the Forum solely through the lens of ideological motivation.[23] During the Conflict of the Orders, the Temple of Castor therefore became a symbol of patrician identity, because the Dioscuri, like the patricians, were considered *equites* ("horsemen") and thus signified the patrician dominance of the Forum. However, interpretations focusing on the symbolic nature of architecture often fail to take into account that architecture serves, first and foremost, a functional purpose.[24] The speaker's platforms were intended to provide an ideal space for giving speeches to public assemblies, raised up for optimal visibility and comprehension of the speaker. Space is not just the visual area represented by images, like those generated by architectural modelling, but a nexus of multiple experiences. Our case study focuses on one of the central experiences of the Forum: public speech and assembly, creating a space of political communication. Our central question is how well the design of this space for this purpose actually worked.

From the very beginning of the Republic, political communication in public spaces, based on oral interchange as opposed to written media, was a central aspect of Roman society. Public assemblies met in the Forum in *contiones*, meetings convened by a magistrate to discuss political and legal matters, often meant to provide the citizenry with information and explanations regarding pending votes.[25] The *contio* itself did not make a decision; instead, it was a necessary precursor to the *comitia*, the public assembly in which the citizens voted in elections or on other legal issues. In addition, the *contiones* were the appropriate platform from which to make public announcements, proclaim victories in battle and report on senate resolutions, all events in which the people could experience themselves as part of a (victorious) whole. And it was at these public assemblies that the *plebs* and *nobiles* met and communicated, an activity essential for creating a cultural consensus that could lead to a passing of even controversial legislation. *Contiones* continued to play an important role in the Late Republican period and are known to have been held in each of the architectural spaces mentioned above.

As a result, the functional importance of the Forum cannot be understood solely by its architectural design and symbolic context. Although measures undertaken to alter its architectural appearance can be used as a first indicator for underlying functional transformations, an in-depth analysis of the Forum as a space for political

22 For some examples of this kind of approach, see Zanker (1972), Hölscher (2001), Knell (2004) and Hölscher (2006). This idea is often pushed to the extreme when interpreting Caesar's renovation of the Curia and relocation of the republican Rostra: although both continue to exist, albeit in different form and different location (although always on the Forum), the focus is on the disappearance of Republican structures in favour of Caesar and his own political aims (Zanker 1972: 7, Coarelli 1985: 234, Kolb 1995: 254, Kissel 2004: 314, 318–19; Knell 2004: 31, Freyberger 2009: 55–6 and Sumi 2011: 209–10).

23 For example, Kolb (2002: 243–9).

24 See Muth (2014a) for an in-depth discussion of this functional aspect of architecture, specifically for the Roman Forum.

25 On the *contio*, see Taylor (1966: 13–38), Pina Polo (1996), Mouritsen (2001: 38–62), Morstein-Marx (2004: 7–11) and Tiersch (2009).

communication like the one we pursue here is greatly enhanced by the simulation of these assemblies by means of digital media. In particular, we compare the three different speaking positions known to have been used in the Republican Forum: from the speaker's platform towards the Curia, from the speaker's platform towards the Forum itself, and from the Temple of Castor. In addition to populating the Forum with crowds and recreating the point of view of a listening person, the auditory experience itself needs to be reliably recreated. The methods of virtual acoustics can be used to reconstruct a reasonably objective aural experience beyond a historical soundscape composition.[26]

The experimental research set-up provided enables us to take advantage of the fact that sound qualities change dramatically when various parameters of the space, such as architectural construction or audience noise level, are modified. Simulating different configurations of these parameters allows us to compare the functional capacity of these spaces, in this case in terms of their capability for speech transmission. By analysing the differences in sound quality, we can assess what influence various parameters have on auditory comprehension (e.g. how soft does the speaker's voice have to get before no one can understand him anymore; when addressing a tumultuous crowd, at what distance does it no longer matter how loudly the speaker can deliver his speech) and in which configuration of parameters auditory comprehension is optimized. Our method is dynamic, simultaneously simulation and experiment.

Within virtual acoustics, four important elements must be considered in order to create a scientific reconstruction of aural experience. The first of these is the pure signal: in our case, the delivered speech itself. Among the most famous speeches known to have been given during a *contio* are Cicero's second and third oration against Catiline, fulfilling the function of the *contio* by informing the Roman people of imminent danger to the state. We chose an excerpt from the third speech against Catiline for our auralizations and hired a trained orator of similar age to Cicero at the time to record it, asking him to project himself into a speech scenario in which he is required to address as many people as possible, since the content of this speech is so crucial. His speech signal was recorded in an "anechoic" studio, the architecture of which diffuses almost all soundwaves so that the recorded speech signal includes virtually no reverberations.

The second element consists of all acoustically relevant infrastructure, which, in the words of Brian Larkin, contributes "a powerful mediating force that produces new modes of organizing sensory perception, time, [and] space".[27] Any produced speech sound has to pass through a filtering structure of humans, buildings, air, etc., before a listener perceives it. The importance of this filter for a specific listening situation cannot be underestimated since, in general, 90 per cent of an aural impression is characterized by reflected and not direct sound. The architectural reconstructions of the Digital Forum Romanum project, sketched above for each of the relevant venues, form the basis of the virtual model used in the simulation of the Forum's "room

26 For an introduction to virtual acoustics and auralization techniques, see Vorländer (2008). Weinzierl et al. (2015) shows in a concrete example how these methods can be used in historical simulations.

27 Larkin (2004: 291). Although he develops his definition of infrastructure with reference to piracy, his general concept of infrastructure is useful in this context as well because it integrates much of the earlier writings that have touched on infrastructures from specific perspectives, such as Lefebvre (1991) and Graham and Marvin (2001).

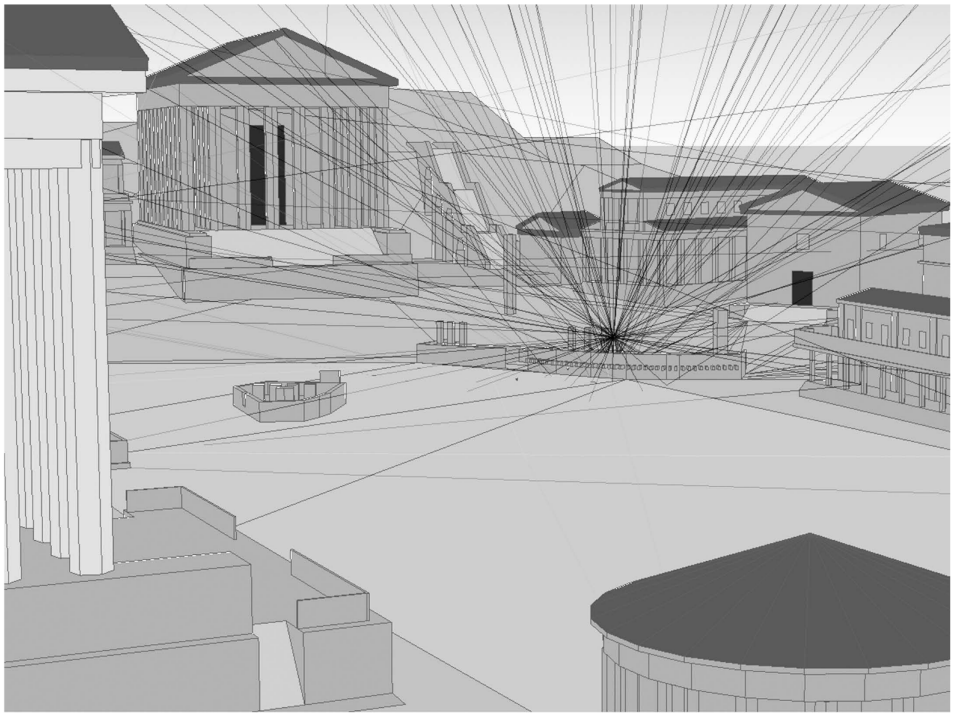

Figure 3.4 Visualization of the auralization process, with sound rays travelling from the speaker's position on the Rostra into the space of the digital model

impulse response".[28] Up to twenty million sound rays were sent out from the various speaker's positions into the virtual model of the Digital Forum Romanum (Figure 3.4). The acoustic properties of the source, the audience, the built space, as well as the air were considered in the simulation. These properties combine to form a specific acoustic fingerprint that each ray develops on its way through the virtual space, made up of level, colouration and time delay. In other words, any such transmission path can be characterized by how much sound power the speech signal has lost on its way, how it has been specifically distorted by the architecture and how long it took the speech signal to arrive at a specific point. All the sound rays that reached – either directly or via reflection – the head of a virtually placed listener were taken into account for the auditory impression at this spot. At this point the third element of the equation comes in, namely the listener's head position and its physiognomy. The speech signal as filtered through the surrounding infrastructure is split into a right and a left ear impression that can, in the experimental set-up, change in real time when the user's head is turned.

The final element of an auralization is the noisescape that simulates the plausible background noise of whispers, air movement and rustling. The noise floor used in the

28 The room impulse response, which serves as the basis for interpretations of room acoustics, records the reaction of a certain architectural configuration to an excitation with an ideal impulse. It displays the specific decay of energy over the course of time of an incoming signal mirroring the individual acoustic fingerprint of a specific space for a certain position (Vorländer 2008: 93). The following description specifies only one of the main methods in use to calculate a room impulse response. These methods are usually combined in acoustics software (Ahnert and Tennhardt 2008: 244–8).

auralization presented here is taken from St Peter's Square in Rome as recorded during the traditional Sunday Angelus prayer of the Pope. The number of people, the architecture and the attentiveness of the crowd assembled are comparable to the listening experience simulated in this case study.

All these elements of the signal path were processed by auralization software, making them available for an aural impression.[29] It is important to mention that in addition to this digital simulation, real ears are needed to determine the speech's comprehensibility. To this effect we have created a listening station that, for each test scenario, pairs the aural impression obtained at different locations in the Forum with a static image generated out of the digital reconstruction of the view from the audience at that specific location. A tracker attached to the headphones allows the simulation to adapt to the turning of the listener's head. This configuration highlights our approach, in which we test and document hearing impressions to evaluate the results and calibrate parameters iteratively. The following section summarizes the results of the listening test in order to illustrate the difference between studying sensory experience from the point of view of architectural display, as opposed to an audiovisual approximation from an audience perspective. These will show that the different speaker's platforms diverge in their acoustic qualities, leading to a renewed focus on the influence changing the venues for public assembly may have had on political participation.

Results[30]

The primary intention of our simulations cannot be to capture and reconstruct the historical reality of public addresses in the Forum. The speaker's loudness, that of the listening audience, as well as further external noises would have varied considerably; climatic conditions would have additionally influenced the acoustic situation. When it comes to the acoustics of public assemblies, these considerations lead to a broad spectrum of differing historical realities. Therefore, the goal must be to recreate specific ideal situations as defined within a simple framework, allowing us to create a basic approximation of the conditions of communication. Studying in particular the distinct spatial situations known to have been used for public address enables a comparison of the acoustic qualities of each. Consequently, although the simulations fail to deliver a conclusive historical reconstruction for each acoustic situation individually, their juxtaposition allows us to draw conclusions about the utility of any particular space for political communication relative to another.

Within our simulations, we have defined two ideal scenarios: on the one hand, a "best-case" scenario, in which every member of the audience is trying to be as quiet as possible in order to hear; on the other hand, a merely adequate scenario, whereby the audience remains relatively attentive, keeping disruptive conversations and catcalls to a minimum. We know, however, that this was decidedly not always the case:

29 A sample auralization of Cicero's speech (in Latin) is available for download at www.routledge.com/9781138481664 under the heading 'eResource' for readers to listen to themselves. The speech can be heard from the perspective of an audience member standing in the Comitium at a distance of 20 m. Please note that the auralization is tailored to individual perception, so use headphones when listening to the file.

30 Earlier publications of the research results can be found in Muth (2015) and Bartz, Holter, and Muth (2016: 208–11).

Figure 3.5 Speech comprehensibility during public address from the Rostra facing the Curia in the Late Republican period

the crowds were known to routinely interrupt the speaker with loud boos, applause and shouts, and to generally disturb the proceedings, especially as the Late Republic progressed.[31] Cicero for example describes how the followers of Clodius disturbed a speech by Pompey, and how Clodius was shouted down in turn.[32] A gifted orator, on the other hand, was said to bring a crowd to silence.[33] So while the images and results presented in this chapter will show the maximum number of people who could hear the speaker, we must assume that this was often not the case. However, because we are focused primarily on the relative comparison between the three different scenarios for public address, the actual number of people who could hear the speaker is less important. Let us now turn to the first scenario in the Comitium, when the speaker addressed the crowds standing between the Rostra and the Curia (Figure 3.5).

The results of the acoustic simulation are represented here as a graphic: the darker area indicates the space in which a listener would have been able to understand very well; the lighter area includes the space in which the listener would still be able to understand, albeit only with intense concentration. In the first case, the area amounts to a total of 2650 m²; in the second, 4750 m². Allowing for four persons per square metre, this means that a speaker in the Republic would have been able to reach approximately 10,600 people easily and, under ideal conditions, an audience of approximately 19,000 people. It appears, therefore, that a speaker speaking from the Rostra towards the Curia could fill the whole area with sound well, and the central area of the Comitium very well. In addition, the general framework regarding visual communication appears advantageous (Figure 3.6): the speaker, standing on a platform that was about two metres in height, was visible to many members of

31 Mouritsen (2001: 47–8) and Morstein-Marx (2004: 119–59).
32 Cicero, *Letters to his Brother Quintus* 2.3.2.
33 Valerius Maximus, *Memorable Doings and Sayings* 3.7.3, 6.2.3; Cicero, *Letters to Quintus* 2.3.2.

Figure 3.6 View of the speaker from an audience member standing in the Comitium at a distance of 40 m

the audience, even those standing further away, as the audience was gathered in an area inclining upwards from the platform. Modern studies have shown that auditory comprehension is closely related to visual perception of the speech signal:[34] for the listener in antiquity, being able to see the speaker well must have gone hand in hand with being able to understand his speech better. The communication framework on display appears, therefore, ideal for a place of public assembly in Rome of the Early and Middle Republic, as well as the beginning of the Late Republic.

When the speaker turns around to face the central area of the Forum itself, the situation changes. Although the open space of the Forum was able to accommodate a larger number of people than before, so that the speaker could theoretically reach a much greater audience than previously in the Comitium, there was, in comparison to the earlier situation, surprisingly no improvement in the acoustic or visual conditions. On the contrary, the space in which a speech is easily comprehensible has actually decreased to 2300 m² (Figure 3.7). With the change, approximately 9200 people of the assembly can understand a speech without great effort, approximately 1400 people fewer than in the earlier Republican situation. When we look at the space in which it is generally possible to understand a speaker if the audience concentrates, we can see that the number of people who can theoretically be reached has more or less remained the same, with a total space of 4790 m² in

34 Most famously with the discovery of the "McGurk effect", where the combination of the audio signal of one syllable with the visual articulation of another is perceived by listeners as a third, different syllable, thereby proving the existence of a connection between hearing and seeing during speech perception (McGurk and MacDonald 1976). Studies arising out of this finding that speech comprehension has both an audio and a visual component focus mainly on the improvement to speech comprehension provided when a listener can see the speaker's face and facial movements; see for example Macleod and Summerfield (1987), Grant and Seitz (2000), Munhall et al. (2004), Schwartz et al. (2004) and Ross et al. (2007).

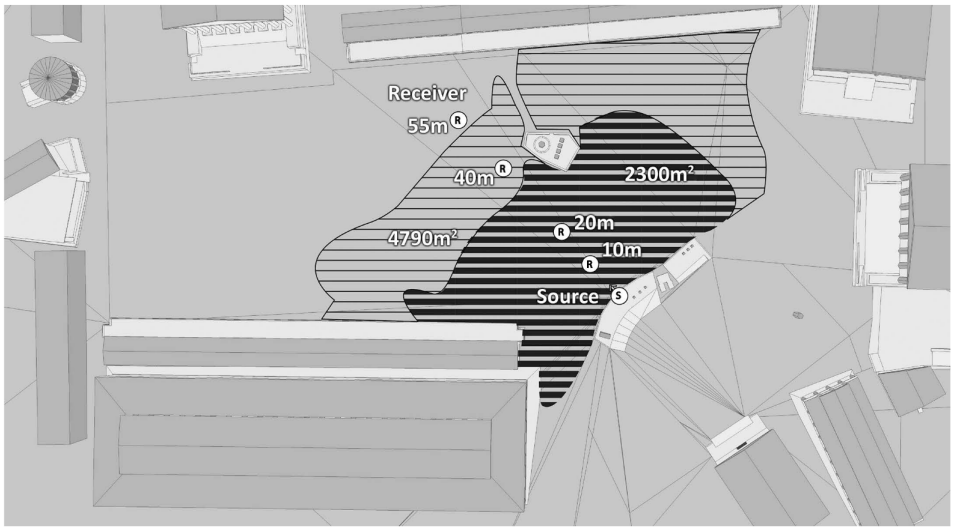

Figure 3.7 Speech comprehensibility during public address from the Rostra facing the Forum proper in the Late Republican period

Figure 3.8 View of the speaker from an audience member standing in the Forum proper at a distance of 40 m

which 19,160 people can stand. Similarly, the conditions for visual communication did not improve noticeably (Figure 3.8). Owing to the downward inclination of the ground directly in front of the speaker's platform in the Forum, the speaker, standing on a platform of about two metres in height, was only easily visible to those located in the front of the audience; the visibility of the speaker deteriorated considerably for audience members standing farther in the back. In comparison

with the earlier venue of the Comitium, this situation represents no enhancement in either audio or visual perception of the speaker. The reason why this position was nevertheless considered more attractive is probably to be found in the fact that a significantly larger audience could assemble, even if fewer people could hear or see the speaker well.

The first act of turning towards the central area of the Forum to address the assembly, a practice that began in the mid-second century BCE, is assigned by ancient writers to several different people. Cicero attributes the beginnings of this practice to Gaius Licinius Crassus, tribune of the plebs in 145 BCE, who wanted to introduce a bill that, although tailored to curry favour with the general assembly, was objectionable to the senatorial elite.[35] However, in what is generally considered an erroneous attribution, Plutarch considers Gaius Gracchus the first to make the change and explicitly connects this to a "democratization" of the political process, whereby Gracchus faces the people as opposed to the Senate.[36] What is important is that, in both cases, the implication is that turning towards the Forum was intended to address a greater number of people, and explicitly those people who were not considered members of the oligarchy.[37] This was more than simply a symbolic gesture of turning his back on the Senate: a speaker could make his speeches accessible to a greater number of people, if only because of the amount of space now available for the audience to occupy and from which they could listen.[38] If the *contio* is to be examined solely through the lens of a staged "party-event", in which the most important persuasive element of the *contio* is to impress with the size of the crowd of supporters one can gather,[39] then in terms of sheer audience numbers, the new venue represented an improvement over the old. However, the decrease in comprehensibility shows that this solution to the need to address a greater number of people could not have been considered ideal, if the audience was meant to directly comprehend the contents of a speech. The emerging importance of the Temple of Castor as a venue for public assembly suggests that there was indeed a demand for a space in which a larger audience could not only assemble, but also be communicated with.

Taking the Temple of Castor into account reveals a completely different picture. Unlike those public addresses from the Rostra towards the open space of the Forum itself, this new position was considerably more efficacious in terms of acoustic and visual communication (Figure 3.9). The area where an audience could stand to hear and comprehend a speech increases to an area of 2950 m² for easy understandability to 5900 m² for general comprehension; translated into audience numbers, this encompasses a range of 11,800 up to 23,600 people in the best-case scenario. Independently

35 Cicero, *On Friendship* 96. Cf. Taylor (1962: 25).

36 Plutarch, *Life of Caius Gracchus* 5.3. Cf. Pina Polo (1996: 146).

37 Although Cicero later uses the resulting set-up as a metaphor for the primacy of the Senate, as the Curia watches over the Rostra: Cicero, *For Flaccus* 57.

38 Taylor 1966 (23–5) conjectures that, despite the evidence of Cicero and Plutarch, the speaker never spoke towards the Comitium and Curia, because the people only had enough space to assemble in the Forum itself. The results of the auralization prove her concern inconsequential, as similar numbers of people could assemble in both cases in order to actually hear the speeches given.

39 As in Mouritsen's (2001: 38–62) description of the *contio* in the Late Republic.

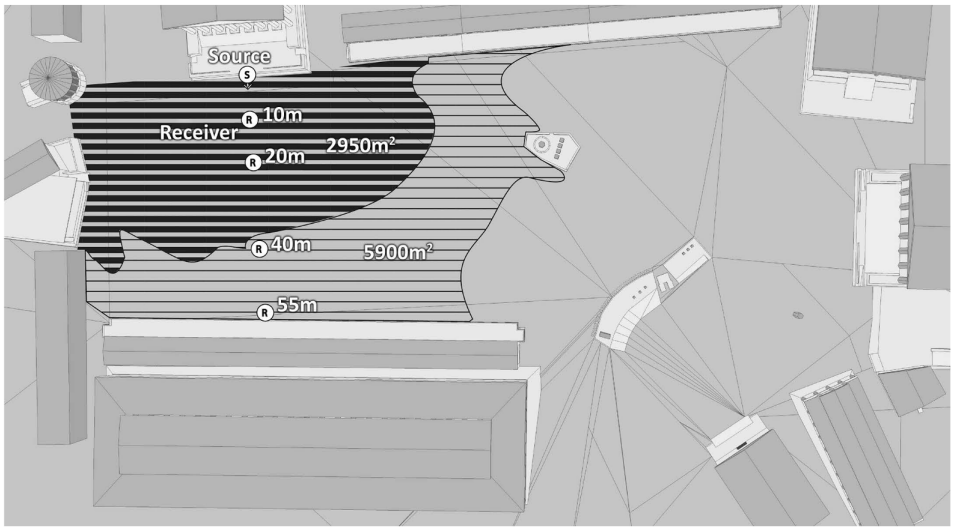

Figure 3.9 Speech comprehensibility during public address from the Temple of Castor in the Late Republican period

Figure 3.10 View of the speaker from an audience member standing in front of the Temple of Castor at a distance of 40 m

of the absolute value of these numbers, they clearly show that this third place of public assembly represents a significant increase in the number of potential listeners who could perceive the content of the speech as compared to the number a speaker from the Rostra facing the Comitium or the central area of the Forum could reach. Visual communication likewise undergoes a significant improvement (Figure 3.10). The speaker stood on a much higher platform measuring three metres from the ground, causing him to be in view of a much larger portion of the audience. Optimizing the

visibility of the speaker in this manner must in turn have had a positive impact on the comprehensibility of his speech.[40]

These results are especially interesting when considered within the historical context of the Late Republic. Starting in the mid second century BCE the *contio* became more and more contentious, with consensus less and less likely to be reached. (This is around the same time that the Temple of Castor is increasingly cited as a place of public assembly, although, as mentioned above, it may have been used for this purpose before the time period indicated by literary sources.) Literary sources detail the violence and riots that began to surround public assemblies, which could conceivably be understood as a breakdown of communication between the senatorial elite and the people. Our acoustic results show, however, that this breakdown would have happened at same time that the greatest number of people could be reached. Within the historical context of the Late Republic and its increasing reliance on *contiones* and audience participation, the acoustic analysis shows a significance in the move towards the Temple of Castor that would otherwise go unrecognized if looking solely at the literary sources.

The results supplied by the simulations for these three venues for giving speeches to a public assembly provide a new foundation on which the role of oratory in political communication in the Late Republic can be considered. Most often, the assumption is that a speech was audible to a very small audience: Mouritsen, for example, speculates that the crowds gathered for the *contiones* could never have been much larger than those that gathered in the original meeting spot of the Comitium because more people than that could not have heard the speeches anyway.[41] If the ability to communicate specific contents to the assembled people is considered a prerequisite for political participation, the inability of the audience member to hear gains in importance, and Mouritsen thus concludes that the *contio* was only a means of political communication in terms of rallying one's followers and intimidating opponents through the staging of support.[42] Our results show, however, that the successive venues used represent a comparative disparity in terms of their ability to facilitate political communication as the Late Republic progresses. This perhaps indicates a desire of the Romans to improve the conditions for speech comprehension, and therefore shows how important it was for the contents of the speeches themselves to be communicated to a large audience.[43]

In our chapter we have shown how, through acoustic analysis and auralization of these speaker's platforms, it is possible to expand explanations of functional and structural changes observed in the architecture of the Forum by taking the auditory

40 The performative aspect of ancient rhetoric should not be forgotten in this context: the Late Republican rhetorical treatise *Rhetorica ad Herennium* for example details hand gestures to be used while speaking (3.26–7). Although never explicitly referred to as a means of increasing auditory speech comprehension, the connection between audio and visual perception mentioned above (n. 34) makes this an interesting avenue for further research. For more on the role of gesture and performance in ancient Roman rhetoric, see Aldrete (1999: 3–43), Hall (2004), Corbeill (2004: 109–16, 128–33) and Morstein-Marx (2004: 270–3).

41 Mouritsen (2001: 25–6). See also for example Millar (1998: 223–4).

42 Mouritsen (2001: 38–62).

43 As Morstein-Marx (2004) suggests.

characteristics of these spaces into account. This in turn allows us to reassess our interpretations of key social and political changes in ancient Rome in light of the reconstructed sensory experience. For us, the method of simulation used here to reconstruct ancient experience is intended to be an iterative one. We see the results presented here as a jumping-off point for further research with which the simulation itself can be adjusted, tested and re-evaluated. For example, the simulation can be expanded to study the influence of visibility on speech comprehensibility, and the role that gestures and movements played in ancient rhetoric.[44] Our understanding of the sensory experience of the Forum in the Republican period can thus be extended to include, *inter alia*, a deeper awareness of the abilities of audiences to hear their speakers and the lengths to which speakers went to be heard.

44 Corbeill (2004: 131–2) for example concludes in his study of gesture in the public space of the Forum that it was not necessary to hear a speaker in order to be persuaded by him.