

‘A Mysterious Music in the Air: Cultural Origins of the Loudspeaker’  
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Kyle Devine  
Department of Music  
City University London  
A129 College Building  
Northampton Square  
London EC1V 0HB  
+44 (0)20 7040 8283  
kyle.devine.1@city.ac.uk

**Bio**

Kyle Devine is Lecturer in Music at City University London and a consultant to the Music and Digitization Research Group at the University of Oxford. This is the second in a suite of three articles on the musical and cultural history of loudness. The first, a critical history of the ‘loudness wars’, appeared in *Popular Music*. The third, on the intellectual history of the decibel, is forthcoming. He is also co-editing two books: *Living Stereo: Histories and Cultures of Multichannel Sound* (Bloomsbury) and *The Sociology of Music Reader* (Routledge).

# A Mysterious Music in the Air: Cultural Origins of the Loudspeaker

*Loudspeakers are everywhere in the built environment. Indeed, music, sound, and listening today are arguably defined by their apparently inevitable mediation by an electronically amplified loudspeaker. But it wasn't always so. When and how did that transformation take place? What was its musical and cultural significance? Whereas popular and historical accounts tend to emphasize the concentricity of the loudspeaker and rock music, this article roots such developments in an essential but under-researched prehistory, showing how the loudspeaker went from an incredible novelty to a predictable ubiquity between 1915 and the 1930s. I sketch the loudspeaker's early history and offer an assessment of its role in twentieth-century musical and acoustic culture. I suggest that the loudspeaker needs to be understood as cultural technology in a broader history of sound, and that it played a central role in the formation of modern listening.*

Keywords: loudspeaker; sound reproduction; loudness; volume; amplification; public address; listening formation; sound studies; cultural history

## Introduction

From the phonograph to the MP3, sound recording is now considered ‘arguably the most significant change to have affected music in the twentieth century’ (Clarke 2007: 47). Undeniably, the ability to record sound and play it back — phonographic mediation — has influenced not only how music is bought and sold, but also how music is composed, performed and heard, and how it works to foster senses of community and self (Attali 1985; Martin 1995; Frith 1996; Kenney 1999; Born and Hesmondhalgh 2000; Sterne 2003; Frith and Marshall 2004; Cook et al. 2009; Maisonneuve 2009). As a concept, ‘phonography’ is virtually its own subgenre of cultural theory (Eisenberg 1987; Mowitt 1987; Adorno 1990; Rothenbuhler and Peters 1997; Engh 1999; Kittler 1999; Gitelman 2000; Lastra 2000; Sterne 2003; Middleton 2013). Phonography has even generated philosophical dispute about music’s very being (Talbot 2000; Born 2005; Kania 2008; Matheson and Caplan 2011). Clearly, the significance of phonographic mediation should not be underestimated.<sup>1</sup>

Yet underlying a century of shifting phonographic recording formats, playback devices and media systems (and cutting across the original–copy and recorded–live distinctions that have informed theoretical debate around these issues<sup>2</sup>) there has been a remarkable constant: the electronically amplified loudspeaker. Whether or not listeners are reflexively aware of this reality, the inevitability of the loudspeaker has shaped the aesthetics and experiences of twentieth-century music and sound, from gramophones to ringtones and concert halls to dance floors (Théberge 2001; Gopinath 2013; Thompson 2002; Henriques 2003). The loudspeaker has also quietly but profoundly influenced the development of music industries and media systems, in terms of both technological infrastructure and professional expertise (Gomery 2005; Wurtzler 2007). It has played a central role in reconfigurations of domestic space and the workplace,

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<sup>1</sup> However, for a critique that the historiography of sound reproduction has over-emphasized phonographic mediation, see Devine (2013).

<sup>2</sup> For details of these critiques, including also the common media–instrument and transmission–storage distinctions, see Sterne (2003; 2007; 2012).

architecture and urban planning (Keightley 1996; Korczynski and Jones 2006; Thompson 2002; Bijsterveld 2008). Loudspeakers are also implicated in the politics and ethics of listening, in the construction — and obstruction — of acoustically mediated forms of identity, whether individual or collective, public or private, imagined or assembled (Johnson and Cloonan 2008; Goodman 2010; Cusick 2013). Indeed, around the world and through the seven seas, the loudspeaker has played a vital role in sculpting the cultural geography of an uneven but global acoustic modernity (Lee 1999; Dolan 2008; Hirschkind 2006; Radovac 2011; Sewald 2011; Eisenberg 2013; Shiga forthcoming). The ubiquity of the electrically amplified loudspeaker — its centrality in mediating so many relationships with sound and music — suggests that this technology defines the twentieth century as a listening experience.

It is striking, then, that in most histories of music, sound and media the loudspeaker is taken for granted, ‘made invisible by its own success’ (Latour 1999: 304). However, in going back to the earliest days of the loudspeaker it becomes apparent that most of what is now taken for granted about electronically amplified sound was at first unclear to professionals, musicians and audiences. For example, when in 1915 Peter Jensen demonstrated some of the first amplification systems, the Magnavox loudspeaker was astonishing: there are reports of incredulous investors refusing to back the apparently impossible invention, of navy sailors dancing to a seemingly sourceless and therefore ‘mysterious music in the air’, of innocent bystanders who ‘thought the world was coming to an end and scrambled for cover’ (Jensen 1975: 90-92; Klapholz 1984: 33; Coodley 2007: 57).<sup>3</sup> Incidents such as these serve as reminders that the loudspeaker and its listening practices are not natural but, rather, became naturalized through processes of history and culture.

For most commentators, though, it is the rock era, not the early twentieth century, that is the more obvious place to begin the work of assessing the loudspeaker’s historical and cultural significance. Sound engineer Stephen Court (1984: 72): ‘If any doubt exists as to just how popular music began’, he says, ‘look at the history of music sound reinforcement and consider that the start of it represents the beginning of rock music as we know it’. Indeed, the mythology of rock suggests that the salience of the amplified guitar in 1950s rock ‘n’ roll marks the moment when music ‘became electric’ (Lydon 1974). From this perspective, the mass appeal of guitar groups then had a crescendo effect in musical culture: amplified bands allowed for larger venues, which had larger and therefore noisier audiences, which led to louder bands and still larger venues, which eventually called for the amplification of drum sets and the re-amplification of electric guitars, and so on.<sup>4</sup> By the 1970s, loudspeakers were powerful and sophisticated enough to facilitate huge outdoor music festivals such as Woodstock, new genres such as arena rock, and new connections between loudness and ‘authenticity’ in heavy metal and punk (Waksman 2009: *passim*; Percival 2011). Loudness had become firmly a part of rock aesthetics and ideology, and the business of amplification equipment was booming (Majeski 1990; Duncan 1996). Indeed, the

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<sup>3</sup> Although not the focus of this article, accounts of astonishment in relation to modern technology cannot be taken at face value. Gunning (1989), for example, has argued that early cinema audiences were not naively terrified by the realism and credulity of film, but knowingly amazed by its artifice and incredibility. Something similar was surely going on in the case of the loudspeaker.

<sup>4</sup> For a critique of such whiggish models of the history of loudness, see Devine (2013).

research team studying the history of live music in the UK has argued that pre-1970s musical culture was characterized by an ‘absence . . . of ancillary industries’ such as live sound equipment and engineering, and that such industries only became professionalized in step with the rise of rock (Frith et al. 2010: 5, 7).

The histories of rock music and the loudspeaker do share a special aesthetic, social and economic centrality. However, rock-centred accounts not only overlook the centrality of the loudspeaker in a variety of other mid-century musical cultures, from reggae (Henriques 2011) to the avant-garde (Piekut 2011). They also downplay various ways in which the uses of the loudspeaker in rock can be seen as extensions of previously established technological, cultural and aesthetic conventions, as the case of Jensen’s Magnavox suggests.

As a challenge to rock mythology, then, and as a complement to scholarship focused on mid-century developments, this article shows how the loudspeaker went from an incredible novelty to a predictable ubiquity between about 1915 and 1940. The reason for telling the story of when this old technology was new (Marvin 1988) is partly to fill a gap: unlike other key twentieth-century musical instruments, sound technologies and media systems (Théberge 1997; Waksman 1999; Pinch and Trocco 2002; Wurtzler 2007; Downes 2010; Osborne 2012; Sterne 2012), there is no detailed musical and cultural history of the loudspeaker. More specifically, though, I want to examine how the loudspeaker became so prevalent, how uses of and attitudes toward the loudspeaker took shape. Technological innovations tend to create turbulence in music history (Pinch and Bijsterveld 2003) and the introduction of the loudspeaker exposes some deeply held but unspoken values in musical culture. The early history of the loudspeaker thus instances the co-formation of music technology and musical culture, and opens a window onto a time when the contemporary acoustic environment was taking shape. This article recovers some of the cultural, musical and epistemological processes through which the loudspeaker became central to twentieth-century music and modern listening.

I begin by historicizing and theorizing the loudspeaker as a technology of sound reproduction. I then move on to describe the various uses of public address systems through the 1920s, especially in the context of political campaigns and questions about the loudspeaker’s potential to reconfigure listening formations at the level of the national ‘acoustic community’. Finally, I sketch the loudspeaker’s rise to ubiquity in musical culture through the 1930s, focusing on the jukebox, the PA and the electric guitar in the world of popular music, and also touching on the experimental art music collaborations between Leopold Stokowski and Bell Laboratories. As with the pre-rock establishments mentioned above and explored below, the Stokowski episode can be seen as a foundational set of negotiations that prefigured later technological, aesthetic and cultural settlements surrounding the loudspeaker in the musical avant-garde. The work of this article thus calls for an approach that welcomes the insights that can be gained when popular music is studied alongside various forms of art music and acoustic mediation, as overlapping phenomena in a shared history of sound and listening. My conception of popular music studies is therefore open, and the discussion that follows will freely draw the field into conversations with musicology, sound studies, media studies, cultural sociology, and science and technology studies.

## **The Loudspeaker as a Technology of Sound Reproduction**

The loudspeaker did not emerge out of the blue. It does not have an individually specifiable origin and did not become a static or singular object after its invention. Indeed, probably all

cultures have confronted the need to amplify sound. For most of history, the solutions to this problem were physical. Consider, for example, voice projection and visual augmentation in ancient amphitheatres, architectural acoustics in Renaissance churches, Enlightenment-era speaking trumpets, as well as nineteenth-century inventions such as the saxophone and turn-of-the-century developments in gramophone horns and pneumatics.<sup>5</sup> These devices are part of what Mara Mills (2009) calls the ‘long history of loud-speaking’. However, the loudspeaker proper marks a line in that history’s sand; it is distinguished from previous devices in that it vibrates the air in response to an electrical input. Even that definition is still very broad, though, covering devices ranging from the earliest telephones to contemporary developments in nanotechnology. The type of amplification under consideration here, which is the basis of most modern loudspeakers, is defined by the moving electromagnetic coil principle as it developed after the invention of the electronic vacuum tube, particularly in the work of Peter Jensen in the 1910s, and Chester Rice and Edward Kellog in the 1920s. But since this is not a cones-and-coils organology of loudspeaker, many of these technical details are a footnote to a more general discussion.<sup>6</sup>

From the perspective of this article, the loudspeaker only becomes meaningful as part of a larger set of technologies and cultural practices. This includes recording formats and playback devices, microphones and instruments, vacuum tubes and transistors, forms of signal processing and transmission — a technological complex that we might call an assemblage of transduction. Jonathan Sterne (2003: 22) defines transduction as a process by which sound is ‘turn[ed] into something else and that something else [is turned] back into sound’. But transduction is not just mechanical; it is a deeply cultural artifact (*ibid.*). As such, this article also focuses on the cultural actions and conditions that subtend the tools of transduction. Together, this assemblage of transduction and its correlated acoustic precepts and practices constitute an emulsion that we might call a ‘listening formation’. An examination of this listening formation provides the backdrop against which the loudspeaker assumed its musical and cultural significance.

Christopher Faulkner (1994: 65) originally defined a listening formation as ‘the whole context of audition for historically specific audiences, taking account of expectations formed for them by the whole culture and technology of speech and hearing of which they are a part’. Extending his conceptualization, we can say that listening formations account for the affordances of both obvious objects (such as loudspeakers) and less visible materialities (such as sound waves) in relation to both the ontogenesis and phylogenesis (Bourdieu 1996) of acoustic subjectivities. These sociohistorical material and affective relations are understood to be

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<sup>5</sup> Two prominent pneumatically amplified devices were Charles Parsons’ Auxetophone and Thomas Edison’s Aerophone. The imagined uses of Edison’s compressed-air amplifier ranged from the benign (“signaling distant vessels”) to the ridiculous (giving voice to the Statue of Liberty). For more on the Aerophone, see anon. (1878a) and anon. (1878b). On other physical means of amplification, see for example Schmidt (2000), Blesser & Salter (2007), Howard & Moretti (2009), Cottrell (2012).

<sup>6</sup> The possibility of electrical sound amplification relies on many ideas and technologies that predate the loudspeaker (see Hunt 1954). Additionally, the loudspeaker is not a static object; it has sustained a variety of materials and principles, uses and abuses (Wilson 1929; Beranek 1954; Klapholz 1984; Borwick 2001; Eargle 2003; Newell and Holland 2007). See also the famous paper by Rice & Kellog (1925).

generated within certain systems of thought, to circulate within particular institutional arrangements, and to be forged into and through certain configurations of social action and public order (cf Latour 2005; Bennett 2007; Straw 2010; Born 2011).<sup>7</sup> The loudspeaker illustrates these dynamics, given that its invention involved the convergence of a particular scientific epistemology with an emergent institutional arrangement — a convergence that both relied on and shaped a historically specific understanding of the relationship between sound technology and listening subject.

In constructing and operating the earliest public address systems, from the ‘rough-and-ready lash up’ of Fred Warren in the UK (anon. 1963: 8; cf Warren 1965) to the widely publicized demonstrations by various contingents of the Bell System in the US (Green and Maxfield 1923), one of the primary goals was to conceal the work of the loudspeaker. Indeed, while much of the reportage surrounding the first loudspeakers focused on the spectacular and sensational aspects of electrically amplified sound — ‘Lincoln’s Gettysburg Address reverberating through the air like the roar of a giant! A piano solo resembling the chimes of Westminster Abbey played by the Colossus of Rhodes!’ (anon. 1915) — public address engineers espoused a cooler rhetoric of control, naturalness, transparency. In the words of Western Electric (ca. 1922): ‘Ideal conditions obtain when the audience is unaware of the loud speaking equipment and is of the impression that it hears the words of the speaker direct’.

But concealing the work of the loudspeaker was counterintuitive. Although engineers aimed for transparency, they discovered that the logical solution to this problem (mimicking a speaker’s voice and an audience’s conditions of audition by projecting the full range of frequencies from a single loudspeaker) created a sound which ‘the listener believes . . . is badly distorted’ (Eccles 1929: 237). Instead, engineers found that the ‘frequency-sensitivity of normal ears’ (Fletcher and Wegel 1922) allowed them to focus not on the full frequency spectrum but on the range of sound ‘which is most essential to intelligibility’ (Cameron 1936: 260), while the psychology of sound localisation encouraged them to divide ‘the amplified speech currents among a number of well-distributed loud speakers’ (Eccles 1929: 237). In constructing loudspeakers and sound systems, engineers thus created a system of representation and mediation that took into account not just the technical capabilities of their equipment, but also the perceptual capabilities of their listeners — perceptual capabilities which were understood to be both physically imperfect and psychologically strategic.

The conception of hearing at the root of these practices came from two fields: the acoustic sciences and telephony. From the mid nineteenth century the acoustic sciences<sup>8</sup> were based in an epistemological distinction between subject and object which accepted that the physics of sound in the air exist in an indirect and complex relationship with the sensation of

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<sup>7</sup> In this sense, listening formations are neither rigid nor homogeneous: they account for inertia and impetus, normative conventions and departures from them. Indeed, ‘formation’ here designates an ongoing dynamic of structure and process, in which various practical and conceptual orientations toward sound are collocated but not necessarily integrated, held together by magnetisms of incongruence.

<sup>8</sup> The ‘acoustic sciences’ can be thought of as a constellation of disciplines including the physics of sound, the physiology of the ear, the psychology of hearing, as well as musicology and music theory, which participates in processes of objectivation and subjectivation similar to those described by Foucault (1970) more generally in terms of the ‘human sciences’. The archaeology of the acoustic sciences — especially the intellectual history of the decibel — are topics that I pursue in another essay.

sound in the ear. Telephone researchers harvested the instrumental fruit of this epistemological distinction by eliminating speech frequencies deemed inessential to intelligibility in the interest of reducing the bandwidth of a signal — which increased the cost-effectiveness of the telephone system by allowing multiple signals to be transmitted through a single cable (cf Fagen 1975; Sterne 2012). In this way, the construction of the telephone system was based in a normalized conception of the listening subject that was forged through a particular conjunction of scientific epistemology and industrial capitalism (Sterne 2012: 41ff). Through a similar understanding of relationships between the frequency range of the loudspeaker and the frequency response of ‘normal ears’, on the one hand, and between speaker placement and the psychology of localisation (cf Boring 1942: 381ff), on the other, the loudspeaker sound system is also configured according to the capacities and limitations of a normative listening subject. Loudspeakers and sound systems can be ‘concealed’ because they exploit these capacities and limitations of the ‘mind’s ear’ (Sterne 2013).

Within a listening formation, the loudspeaker and the listener are thus attuned to one another. As Sterne (2006) has argued with regard to the psychoacoustic logic underlying the MP3, loudspeakers and sound systems work because they ‘play’ the listener as much as they play sound. Indeed, there is a dynamic between the loudspeaker and the loudspoken that participates in the same perceptual technics and political modulations described by Sterne (2012; 2013) in relation to the MP3. The loudspeaker can thus be understood as part of a broader history in which particular sets of problems in scientific epistemology and industrial capitalism fused around the turn of the twentieth century, giving rise to a specifically modern conception of acoustic subject–object valences. This is one of the main lessons of sound studies: sound technologies and acoustic subjectivities consist in their mutual modulation. If this is the general sense in which the loudspeaker has played a significant role in the formation of modern listening, it has also been involved in specific ideological debates, material reconfigurations and aesthetic transformations in twentieth-century musical and acoustic culture.

## **The Advent of the Loudspeaker and the Publics of Public Address**

Many of the first uses of the loudspeaker amounted to novelty. For example, as an extension of one of the earliest and farthest-fetched uses for public address systems (a means of air-traffic control; see Pridham 1918; Jensen 1975: 110-111) and as a precursor to more sinister uses (a means of crowd control; see Johnson and Cloonan 2008: 57), Peter Jensen and Edwin Pridham’s Magnavox was explored for its use in airborne advertising: ‘An aviator three thousand feet in the air said, “Buy a bond!” and crowds of people . . . heard him plainly’ (anon. 1919: 81). Scientists were enthralled with the ability of electrical amplification to act as an acoustic microscope, bringing previously unheard atomic sounds within earshot (anon. 1924a; anon 1924c). In California there was a loudspeaker large enough to be used as a seven-person diving platform (anon. 1922a), while a New Jersey City Hall was outfitted with a sound system so large that the whole town could hear it, so powerful that ‘a visitor’s clothes flap in time to the music, and entering the tower containing the strongly vibrating air is like walking through mud’ (anon. 1931a: 68).

Despite gimmicks such as these — though surely also in a way because of them — loudspeakers and public address systems took permanent root in an array of contexts through the

1920s: from schools to pools (Glover 1931; anon. 1922a), steamships to stadiums (Cameron 1936: 259; anon. 1926b), churches to courtrooms (anon. 1921a; anon. 1926a), workplaces to warning systems (Mitchell 1931: 9; Lane 1922), restaurants to racetracks (Cameron 1936: 264; Adams 1987: 9). Indeed, from the National Air Races to the Indianapolis 500, loudspeakers announced pole positions and ordered drivers to start their engines. One of the earliest and most noticeable uptakes of electrical amplification, though, was in politics, where the technology received almost as much coverage as the figures that used it.

Woodrow Wilson, for example, whose poor health had limited his public speaking engagements, was able to continue addressing large outdoor crowds thanks to a custom system developed by Magnavox in 1919 (Jensen 1975: 114ff). A similar system was used in 1920, during Democratic nominee James Cox's campaign efforts (anon. 1920a; anon 1920b). In other cases, loudspeakers were attached to vehicles and used to blare advertisements and political messages through neighbourhoods and across the country (anon. 1922b). Indeed, loudspeakers were still news in Calvin Coolidge's term (anon. 1925).

Perhaps most famous, though, were Warren Harding's inaugural speech and his funeral oration to the Unknown Soldier on Armistice Day, both in 1921. Partly, Harding's inaugural speech was remarkable for demonstrating that a public address system made for orderly oratory:

There was none of the crowding cruelty which maims and sometimes kills the woman or child who is caught in the press of an unthinking crowd. The newspapers of Washington had told their readers that the voice would be distributed all over the plaza and the park, and naturally there was no great rivalry for front positions. (anon. 1921b: 3; cf Dooley 1932: 14)

Commentary on Harding's funeral oration went further, concerning itself less with the ability of the loudspeaker to civilize the crowd, and more with its ability to foster new listening formations at a level that R. Murray Schafer (1994: 215) calls the acoustic community.

Echoing Plato, early commentators recognized that 'Public speaking occupies a place of paramount importance in the conduct of a democratic form of government' (Western Electric ca. 1922). However, the increasing American population, and the increasing urbanization of that population, 'prompted some to predict the passing of the art of public expression which had been diligently studied and faithfully practiced for many centuries' (ibid.). The electronically amplified loudspeaker apparently solved this problem, allowing Harding to address 'the greatest number of people that has ever listened to one man's voice at one time in the history of the world' (anon. 1921b: 1; cf anon. 1920c). This expansion of the acoustic community was said to mark 'an epoch in communication' (anon. 1921d: 30-31), 'a new day in the psychology of the spoken word' (anon. 1921b: 2; cf Green and Maxfield 1923: 75).

During this period of post-War re-stabilization, such discourses were explicitly tied to the project of nation building. Indeed, in describing the combination of the loudspeaker and radiotelephony that made such demonstrations possible, the Bell System patted itself on the back for its contribution to a 'time when a nation's head can speak simultaneously to many such audiences scattered over the length and breadth of the land. For science, manifesting itself in the telephone art, has united East and West' (anon. 1921d: 32). Self-serving though the Bell's rhetoric may have been, it is elegant and seems sincere:

Back of it all lay a new conception of the American heart; a realization that this first public test of telephony's latest triumph had been a triumph for America itself; a deep and heartfelt feeling of thanks that there had been brought into being a means of binding together with newer and more intimate bonds, the Union which thousands of those who sleep at Arlington had died to preserve . . . (ibid.: 33)

The ability of the loudspeaker to act in the service of nation building — to redefine the character and boundaries of America as an acoustic community — was obviously not lost on politicians or corporations.

We get a sense here of what's in a name: *public* address system. Ideas about 'publics' have specific histories, distinct from but overlapping with other understandings of audiences and groups such as crowds, mobs and masses (cf Butsch 2008). And if Harding's inaugural allayed fears about the impersonal disorder of the 'crowd' that concerned an earlier generation of analysts (e.g. Le Bon 1896; Simmel 1903; cf Tarde 1898), then discourse surrounding his funeral oration implicitly brushed off concerns about the passivity of the 'masses' that characterized social science and critical commentary of the day (e.g. Madge 1939; Lazarsfeld 1969; Adorno 2009).<sup>9</sup> Instead, reports tended to extoll the virtues of the loudspeaker, not only as a tool for expanding and unifying the American acoustic public sphere, but also for increasing 'the enjoyability of modern life and the efficiency of modern business' (Mitchell 1931: 9).

Criticisms against amplification did of course arise. Some complained that the loudspeaker's 'lusty lungs' created an 'impenetrable din' in New York City (anon. 1930a), also known as the 'Big Babel' (Seymour 1928: 12). Others, in contrast to the utopian political view of the loudspeaker expressed by American corporations such as Bell, thought that amplifying political speeches in London's Hyde Park would be, simply, 'wearisome' (anon. 1928a: 425). While such complaints were part of broader discourses about noise as a social problem in the early twentieth century (cf Smilor 1979, Thompson 2002, Bijsterveld 2008, Schwartz 2011), it is also possible to mount a more ideological critique of the loudspeaker. For example, it would be possible to suggest, against the rhetoric surrounding the Harding oration, that the 'public' of public address is not the same as the Enlightenment public idealized by Richard Sennett (1977) and others (Eagleton 1981; Habermas 1984). For Sennett (ibid.: 261), the loudspeaker would not stimulate 'public' life; it would destroy it. The centrality of the orator, in Sennett's argument, aligns public address with control rather than dialogue, with passive spectatorship more than active witnessing. Such concerns represent something more than annoyance about noise or nostalgia for a public sphere that supposedly degenerated from coffeehouses to couchpotatoes. Indeed, while contemporary theorists may make more room for the 'publics' of public address by pointing to the importance of intersubjective aural interpellation in the formation and maintenance of everyday public life (Warner 2002; Ochoa Gauthier 2006; Born 2013), Sennett's argument takes on a chilling dimension when it comes to the use of the loudspeaker in establishing the Nazi regime. 'Without the loudspeaker', Hitler is said to have written, 'we would have never conquered Germany' (quoted in Attali 1985: 87; cf Birdsall 2007).

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<sup>9</sup> For insightful analyses of several of these research programmes, see Clark (1969), Jowett et al. (1996), Hubble (2006), Hullot-Kentor (2009).

What we see here are some of the ideologies that were projected onto — and through — the loudspeaker during the 1920s. By 1930, *Projection Engineering*, one of the few trade papers dedicated to public address, was justly confident in the state of the art and its prospects: ‘the so-called public-address system is being employed by all industries, amusements and in every walk of life’ (Simons 1930: 18). A sound amplification industry had solidified and, despite the Depression, business was booming across the US (from New York airports to speaking cattle in Seattle) and around the world (in Mexican churches and Peruvian parks, Belgian palaces and Chilean theatres).<sup>10</sup> Of course, these technological, social and economic developments do not fully preexist or determine one another. Rather, they are co-produced within the dynamics of a listening formation, in the reciprocal and reconstructive frictions that exist between established conventions of acoustic mediation and the affordances of a new technological object.

## **The Loudspeaker and Twentieth-Century Music**

If through the 1920s the applications — and controversies — of the loudspeaker were snowballing in public address generally, ‘The cost of music’, said a Western Electric advertisement in 1932, was ‘tobogganing’: ‘Park-wide music at an operating cost of a few cents an hour — that is what you get with the Western Electric Music Reproducing System!’ (Billboard 1994: 60). Western Electric was in the business of amplification, and so making a virtue of the fact that bands were no longer required for musical entertainment was in the company’s best interest. Many musicians, though, were less enthusiastic. Take for example British critic Edwin Evans, lambasting the development of what he called ‘Robot Music’:

Already now there is no convincing reason why the proprietor of a popular dance-hall should engage a band at all. What with the enormous technical improvement in the process of recording, and the attention which wireless has caused to be concentrated on the problem of amplification, a combination of gramophone and loud-speaker can now be produced that gives the required volume and a tone-quality good enough to satisfy the taste of the average dancing public. (Evans 1928: 10)

This anxiety over the redundancy of the musician is a perennial concern regarding technological innovation in music history (cf Théberge 1997) and the actual industrial intricacies of these processes in the early twentieth century have been well documented by music scholars (e.g. Ehrlich 1989; Kraft 1996), especially in relation to what the Musicians’ Union called the ‘evil effect’ of synchronized sound cinema (anon. 1931b; anon. 1930b). But Evans’ worries about robot music stemmed from a particular application of amplification: ‘a combination of gramophone and loud-speaker’. This application that sparked one of its most important controversies in the form of the jukebox.

Coin-operated music machines attained a level popularity in the phonograph parlours of the late nineteenth century; a combination of social and technological limitations, however,

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<sup>10</sup> List of applications and contexts from Simons (1930: 18-20, 28). For a description of the emerging global sound empire in cinema, see Thompson (2004). On the relationship between the PA industry and the Depression, see McNicol (1931).

meant that their popularity was short-lived. One important sociotechnical limitation was the necessity of ear tubes, which restricted listening to a handful of individuals at most. By the turn of the century, though, machines offered large amplifying horns, in addition to multiple disc selection and fully automated (if still hand-wound) operation, thus staving off the total extinction of coin-operated music machines. But the real boon — the big bang of the jukebox industry — waited another twenty years:

Technology did not catch up with the jukebox until 1927, when several companies introduced electrically amplified instruments . . . Electrical amplification was the single most important technical improvement in the history of the machine. It created something entirely different from what had come before, and made possible everything that followed. Suddenly the jukebox was capable of competing with loud orchestras. It could entertain large groups of people in large halls, all at once, for a nickel. (Lynch and Henkin n.d.)

The repercussions of the loudspeaker in this context were swift and extensive: ‘Soon, brothels, pool halls, Harlem social clubs, speakeasies, and southern roadside joints replaced their simple player pianos with jukeboxes’ (Boehlert 1994: 94). Of course, the complaints registered in articles like ‘Tinned Orchestras: Where the Robots Fail’ (anon. 1931c) and ‘Automaton Deputies: Dancing to “Unreal” Music’ (J.M. 1930) indicate that neither jukeboxes nor sound recording more generally managed to fully replace live acts (cf Hazzard-Gordon 1990: 112).

Indeed, during the 1920s loudspeaker sound systems also began appearing in music venues to assist live musical performance. When they did, they were a source of uncertainty and controversy. One critic (Pearce 1929: 737) called the sound system ‘inventive ability misapplied’, wondering rhetorically why dancehall owners would ‘engage a band of twelve when he can get more volume from one of five by using the amplifying device’. He continued, urging musicians ‘to protest *en bloc* against using a device which is damaging their own and also many others’ future prospects. Surely the talkies are proving a big enough menace without the need of any more clever (?) ideas’ (ibid.).

Al Davison (1929: 737) defended his ‘clever’ invention, noting that critics had ‘failed to appreciate the true position’:

Mr. Pearce seems to have overlooked that the size of a dance band is seldom to be governed so much by the volume it can produce as by the variety of tone colours and effects it can feature, and its harmonic fullness. My amplifying device very efficiently increases the volume of each and every man in the band, but it cannot make, say, one saxophone, or (as another instance) one violin sound like a complete section, because each member of the section is playing a different part. (ibid.)

Davison was apparently genuine in his desire, not to put musicians out of work, but to enhance their tone — to offer an ‘apparatus [which] reduces a musician’s labour to that point at which he plays not only more sweetly, but more easily. There is no need for him to exert himself unduly by forcing his tone, as is so often the case when playing in large halls as we are’ (ibid.: 738). In the end, there was truth to both sides of the argument: sound systems did facilitate a shift from the semi-orchestral backing of big bands to smaller ensembles, and they also facilitated new

musical tones and new roles for voices and musical instruments. The controversy of the loudspeaker thus continued.

Crooning is one of the best known examples here. The softer, more delicate tones of this new, electrically amplified style of singing were resisted by critics and musicians (such as Al Jolson) trained in the tradition of acoustic singing. Established definitions of what constituted vocal talent and proper technique led to the condemnation of crooners as ‘odious’ and ‘slushy’, while those who saw a powerful voice as a marker of masculinity demeaned crooners as effeminate. One audience member went so far as to throw a grapefruit at Rudy Vallee during a 1931 concert, apparently protesting that Vallee wasn’t a ‘real man’. Crooning — and by extension the loudspeaker — thus participated in a renegotiation of gender norms in 1920s and 1930s music and culture (cf Frith 1986; McCracken 1999; Johnson 2000; Lockheart 2003).

From the late 1920s, when the guitar was first paired with an electrically amplified loudspeaker, it met with the same mixture of wonder and skepticism that was held for electricity more generally during the early twentieth century (cf Nye 1992): a young woman encountering the new instrument for the first time blurted ‘Oh how marvelous!! Don’t you get a shock when you touch it?’ (Miller 1936: 13), while the patent office was unclear on whether the electric guitar was a musical instrument or an electronic device (Smith 1987: 17-19). Club owners worried that these newfangled guitars would blow fuses and disrupt their businesses, and so discouraged their use (Feather 1957: 130; cf Schmidt-Horning 2004). Old-guard guitarists and musicians resisted too, viewing ‘the electric guitar as an oddity or gimmick’ (Fliegler 1993: 12). As such, there were efforts to defend the instrument against the ‘conjecture and . . . endless barrage of questions from guitarists’ that arose when it was first introduced (Mulcahy 1936: 14). Against the ‘fallacy’ that the electric guitar was simple to play and limited to clichés, there were efforts to establish it as an instrument that took serious practice and which was ‘only as limited as the man who plays it’ (ibid.). Another writer (Chambers 1939: 271) referred to electric guitars as ‘instruments of torture’ that ‘made their appearance to crucify the ears of aesthetic musicians’ — a comment which, though tongue-in-cheek (he nevertheless had ‘a yen to own one’), still indicates something about the extent to which guitar purists reacted against amplification. As with crooning, the possibilities afforded by the electric guitar amplifier incited debate over the denigration of traditional musical values and playing techniques (cf Noonan 2008).

Owing partly to the curiosities and pretensions of musical modernism, the loudspeaker also took root in the world of art music. These roots were put down after Luigi Russolo, who could only have dreamed of the loudspeaker, and before Pierre Schaeffer, who needed it as a matter of course (not to mention the centrality of amplification to avant-garde composers such as John Cage and La Monte Young). In the interim, there was Leopold Stokowski. Stokowski famously extolled the virtues of electrically amplified sound, and of the new musical possibilities that came along with it. Nowhere was this more evident than in a series of demonstrations and performances stemming from Stokowski’s collaboration with Bell Labs between 1930 and 1940. The goal here was to reproduce music in what was called ‘auditory perspective’, which involved advances in the frequency response of recorders and amplifiers, a new preoccupation with the spatialization of sound and hearing, and increasing the dynamic range of the loudspeaker system to match — and exceed — that of an orchestra (Fletcher et al. 1934; cf McGinn 1983). In an early report on the collaboration, Stokowski expressed his excitement about electrical amplification: ‘The limitations of music are becoming less and less’, he said, predicting that ‘electrical-musical instruments’ and ‘sound films of the future’ would ‘be able to convey emotions higher than even thought — things subtle and intangible — almost psychic in their

being' (anon. 1931d: 28). Whatever Stokowski is supposed to have meant by these oracular comments, his enthusiasm for the loudspeaker was echoed in the popular press.

Reporting on the 1933 Philadelphia–Washington demonstration for the National Academy of Sciences, the *New York Tribune* (1933) claimed to have witnessed 'something incomparably better than anything producible by unaided human hands', while the *Philadelphia Inquirer* (Martin 1933) thought the loudspeaker 'dazzlingly disclosed' 'vast and vital vistas for the whole uncharted future of symphonic and operatic performances'. Even the sober scientists at Bell Labs were given to dramatising the performance of their new loudspeaker system. Harvey Fletcher (1934: 9), for example, boasted that electrically amplified sound was 'of a character that may give even greater emotional thrills to music lovers than those experienced from the original music' (cf Kellogg 1929; Jewett 1933). The enthusiastic response to the loudspeaker and electrical amplification were thus shared widely. But, as with musical instruments and public address systems more generally, the enthusiasm was not universal.

The Stokowski-Bell demonstrations themselves were seen by some as 'spooky' (Kaempffert 1933), leaving audience members 'mystified and often terrified' (anon. 1934), and new loudspeaker-enabled performance practices incited anxiety among musicians, both in terms of the disruption of hierarchies and the possibility of technological redundancy.<sup>11</sup> However, despite strong critical reactions such as these, sound systems and loudspeakers nevertheless became necessities in a variety of musical contexts during the early twentieth century — including not only the contexts examined here, but also radio, cinema, television and others. Indeed, through the 1930s musicians' and hobbyists' magazines such as *Down Beat* and *Radio Times* were increasingly filled with advertisements for and articles about loudspeakers, public address systems and instrument amplifiers. *Melody Maker* (anon. 1934a: 2) was even scolding 'all those corny halls without microphones', describing 'a screaming need for amplifiers'. It was at this time that the loudspeaker achieved ubiquity in musical culture — a moment marked by a question posed matter-of-factly by *Melody Maker* in 1934(b: 4): 'What's a gig without an amplifier?'

## Conclusion: A Ubiquitous Music in the Air

From mystery to ubiquity, novelty to necessity, impossibility to inevitability: the loudspeaker played a central role in numerous aesthetic, environmental and discursive transformations in early twentieth-century musical and acoustic culture. The technology achieved this centrality not by being straightforwardly requested and accepted by musicians and audiences but, rather, through a series of negotiations and realignments in which it was a source of both convenience and controversy, breakthrough and backlash.

In contrast to mythologies of rock and as a complement to research focused on mid-century developments, it is clear that sound reinforcement had in fact achieved a significant degree of technological and professional stability by the mid 1930s. During this period the

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<sup>11</sup> Accounts of the auditory perspective audience as 'spellbound' but 'not a little terrified' were repeated after the 1940 demonstration (anon. 1940).

loudspeaker also assumed a centrality in the cultural configuration of the acoustic subject. By playing on a normalized conception of hearing established in a discursive alignment of the acoustic sciences and industrial capitalism achieved for the purposes of telephony, this sound-reproduction technology took on a defining role, not only in twentieth-century musical culture and the construction of the acoustic environment, but in the formation of modern listening more generally.

Although it is mundane and second-nature to hear a loudspeaker today, the forms and functions of the device were neither given nor neutral. Listening to a loudspeaker is a cultural practice that takes place within a listening formation, at the mutually modulating intersections of biography and biology, physics and psychology, technique and technology. We are reminded of this most obviously when amplified sound is powerful enough to chatter teeth and shatter eardrums (Stevens and Davis 1936; cf Jasen 2012; Cusick 2013). But, given the loudspeaker's 'perceptual technics' (Sterne 2012), it is no less true in the everyday contexts in which the modulations are less apparent.

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