

A stylized illustration of a mid-century modern living room. The scene is set against a teal background with a white floor. On the left, a man in a dark suit sits in a blue armchair, resting his chin on his hand. In the center, a man in a dark suit stands with his hands on his hips, looking towards a woman in a red dress who is seated in a white armchair. To the right, a man in a dark suit stands next to a large, dark wooden coffee table. A woman in a blue dress sits on the table, and another man in a dark suit sits on the floor in front of her. The illustration is done in a graphic, almost woodcut style with flat colors and bold lines.

Histories and  
Cultures of  
Multichannel  
Sound

# Living Stereo

Paul Théberge  
Kyle Devine  
Tom Everett

B L O O M S B U R Y

Living Stereo



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Multichannel Sound

**PAUL THÉBERGE**  
**KYLE DEVINE**  
**TOM EVERRETT**

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# CONTENTS

<i>Figures</i>	vii
<i>Acknowledgments</i>	viii

Introduction: Living Stereo <i>Paul Théberge, Kyle Devine and Tom Everett</i>	1
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## **PART ONE (AUDIO) POSITIONS**

1 The “Sweet Spot”: The Technology of Stereo and the Field of Auditorship <i>Tony Grajeda</i>	37
2 The Stereophonic Spaces of Soundscape <i>Jonathan Sterne</i>	65
3 Sonar and the Channelization of the Ocean <i>John Shiga</i>	85

## **PART TWO LISTENING CULTURES**

4 Training the Listener: Stereo Demonstration Discs in an Emerging Consumer Market <i>Tim J. Anderson</i>	107
5 Mono in the Stereo Age <i>Eric Barry</i>	125
6 Looking Past the Stereo Loudspeakers: From the Home to the Amplified Concert Hall <i>Jonathan Tee</i>	147

- 7 Recorded British Folk Song  
*Allan F. Moore* 165

### **PART THREE** MULTICHANNEL SOUND AND SCREEN MEDIA

- 8 Television: Now with Two Channels of Audio  
*David Sedman* 185
- 9 The Grandeur(s) of CinemaScope: Early Experiments  
in Cinematic Stereophony  
*Matthew Malsky* 207
- 10 Atmos Now: Dolby Laboratories, Mixing Ideology  
and Hollywood Sound Production  
*Benjamin Wright* 227
- 11 A Symphony of Sound: Surround Sound in Formula  
One Racing Games  
*Ruth Dockwray and Karen Collins* 247
- Stereo Timeline* 267
- Contributors* 273
- Index* 277

# FIGURES

1.1.	Inhabiting the “sweet spot” of stereophonic sound High Fidelity Magazine 9(3) (1959): 18	38
1.2	The lines have been drawn: mapping acoustic space From Fowler (1959): 41	49
1.3	“Hark Audiophile!” The discourse of audio fidelity appeals to non-technical, “feminized” men High Fidelity Magazine 9(2) (1959): 65	53
2.1	“Real space” and “virtual space” From R. Murray Schafer (1967), Ear Cleaning: 15	72
2.2	Musical composition as a “cone of tensions” From R. Murray Schafer (1967), Ear Cleaning: 25	73
9.1	Grignon’s sound spreading diagram From Grignon, L.D. (1953) “Experiment in Stereophonic Sound.” JSMPTE 61(3): 366 (© SMPTE, used with permission)	216
9.2	Grignon’s sound magnification in close-up diagram From Grignon, L.D. (1953): 369	217
9.3	Apartment sequence From Grignon, L.D. (1953): 367	218



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# Introduction: Living Stereo

*Paul Théberge, Kyle Devine and  
Tom Everrett*

Stereo is a living part of sound culture. Most electronically mediated sound comes to us in stereo, whether we are listening on complimentary airliner headphones or expensive hi-fi systems, whether tuning into the radio or streaming a TV program on a laptop, singing along in the car or chatting over background music at the bar. Stereo also dictates how sound engineers set up microphones and mix albums in recording studios, as well as how musicians of all sorts approach songwriting and arranging. Stereo's multichannel descendants, meanwhile, constitute part of the pleasure of moviegoing and videogaming. In these ways, and many more, entire social and industrial formations have taken shape around the principle of stereophony. Indeed, the proliferation of stereo sound—its techniques and technologies—is so widespread that the term has taken on the characteristics of a generic trademark: in much the same way that, say, all clasping fasteners are referred to as zippers, it is common to call *any* sound system a “stereo,” regardless of its actual mechanics of sound reproduction.

Given the significance and even, perhaps, the centrality of stereophony in contemporary musical and acoustic culture, it is surprising that stereo's widespread aesthetic, social and economic implications have been largely ignored in music, sound and media studies.<sup>1</sup> It seems that, as with many ubiquitous technological systems, stereo has been “made invisible by its own success” (Latour 1999: 304). While making and hearing stereophonic sound is nowadays taken for granted and second nature, such technical possibilities can also be seen as cultural abilities that have emerged in the conditional and overlapping histories of music, sound reproduction and

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<sup>1</sup>There are some exceptions here. First, there is an established body of popular and professional writings on the development of stereo, including biographical accounts (e.g. Crowhurst 1957, Sunier 1960, Fox 1981, Alexander 1999). But such works are geared largely toward hi-fi enthusiasts, hobbyists and electrical engineers; they do not adopt the historical, cultural and musical approach that defines the present volume. There are, of course, also a few key works on stereophonic sound in music and media studies (e.g. Keightley 1996, Anderson 2006, Dockraway and Moore 2010, Valiquet 2012), which we will engage with in more detail below.

listening. Indeed, while stereo today may be largely “invisible,” in historical and cultural terms it is not instinctive, inevitable or even ideal. Nor will stereo live forever.

The chapters in this volume thus share a similar goal: to make stereo strange. *Living Stereo* highlights the contingencies and conjunctures that have underwritten the naturalization of stereophonic sound. We want to recover the historical roots of stereophonic listening practices, to analyze the conventions and particularities of stereophony as an aesthetic phenomenon, and to understand what the widespread adoption of stereo has meant for musicians, sound engineers, audio enthusiasts and everyday listeners, as well as the diverse media industries where stereo and multi-channel sound reproduction have become a central feature (e.g. film, broadcasting and videogames). Indeed, the range of perspectives and actors addressed here is broad, given that stereophonic sound both transcends a variety of media contexts and yet is variously articulated to the demands of particular media. Our aim is to understand stereophonic sound as part of a broad multimedia matrix—a matrix that in significant ways has defined aural and musical culture since at least the mid-1900s. Taken together, the chapters here retell a history of music and sound from the perspective of stereo and multichannel reproduction.

## **For a Deep History of Stereo: Staging, Auditory Perspective, Listening Practices**

The history of stereo has many origins. Perhaps the most obvious starting point, for a book like this, would be the launch of stereophonic music recordings in the 1950s, followed by the introduction of affordable stereophonic turntable cartridges in 1958 and the subsequent proliferation of “the stereo” in the 1960s home. Indeed, a number of the chapters in this volume focus on this particular historical moment, when stereo was first commercialized (in both the film and music industries) and expressed through notions of realism and high fidelity. Record companies, especially through their promotional campaigns, logos and trademarks, advocated the ideas of spaciousness and presence afforded by the combination of hi-fi and stereo reproduction: terms such as “Living Stereo” (RCA), “Living Presence” (Mercury) and “360 Sound” (Columbia) adorned record jackets, trumpeting the sonic ideals of stereophonic sound.<sup>2</sup>

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<sup>2</sup>Many of the recordings made under these imprints have been reissued on CD, singly or in box sets, commemorating the early days of stereo. A number have also become the subject of their own, largely celebratory histories, some focusing exclusively on the early stereo era and others spanning a larger period of time (e.g. Valin 1993, Wilentz 2012).

But the history of stereo is more multilayered than that. We might, for example, point forward to the belated acceptance of stereo in 1980s television broadcasting. Equally, we might point further back, to the introduction of stereo in early 1950s cinema, or to the release of Disney's *Fantasia*, in 1940—or, further still, to the experimental multichannel systems developed by Bell Laboratories in collaboration with Leopold Stokowski during the 1930s. There are also parallel developments in the UK: EMI engineer Alan Blumlein's 1930s patents, for example, laid the groundwork for many modern stereophonic principles. And, of course, we might see stereophonic precedents in Clément Ader's two-channeled telephonic transmissions of the Paris Opera in 1881, which paved the way for late nineteenth-century and early twentieth-century music subscription services such as the French Théâtrophone and the English Electrophone. Indeed, all of these episodes are integral to the history of stereo; many of them are explored in more detail both here and elsewhere in the book. (For a chronological overview of stereo, see the Stereo Timeline at the end of this volume.)

We want to begin by digging deeper. Each of these potential starting points presumes that stereo is, first and foremost, a technological phenomenon. Such is the usual way of thinking about “stereophonic sound.” For example, one prominent encyclopedia defines stereo as:

A system of sound recording or transmission in which signals are captured, mixed, or synthesized using two or more audio channels in such a way as to deliver a spatial or three-dimensional auditory impression to a listener when these audio channels are connected to loudspeakers in a listening room. (Brook and Ramsay 2006)

Stated more simply in *The Audio Dictionary*, “‘Stereophonic’ ... refers to a sound system that provides the listener with an illusion of directional realism” (White and Louie 2005: 374).

Our understanding of stereo, however, goes beyond the sound system. We think of stereophony as a set of relations between audio technologies, acoustic spaces (physical and virtual), listening techniques, scientific and commercial discourses, economic conditions and reception contexts. Understood in these ways, stereo cannot be said to have a singular or continuous history of development. Indeed, the history of stereophonic sound (and the history of sound reproduction more generally) seldom follows such linear patterns: it is a history of discontinuity, of fits and starts, of movements toward both high and low “fidelity,”<sup>3</sup> of confusion and competition between binaural

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<sup>3</sup>“Fidelity” is a particularly problematic term in sound studies, and we want to emphasize a strong epistemological break with emic understandings of it. For us, “fidelity” is more of a misnomer than a measurement of the degree to which a recording is “faithful” to a source, or

and stereo systems; it is a multichannel history consisting of numerous intersecting flows of sound, music, scientific inquiry, financial investment and invention, and listening contexts and practices that lead only occasionally toward any kind of unitary movement, cohesion or success.

To begin a *deep* history of stereo we thus feel that it is important not to pursue a linear path that implies an overarching historical trajectory (as the timeline at the end of this volume may suggest) but, rather, to consider stereo as a set of historically specific conceptual problems or propositions.<sup>4</sup> To this end, we want to suggest three rubrics that lend themselves to new ways of thinking about stereo, and which might circumvent some of the historical assumptions and discursive tropes of earlier popular and scholarly accounts. In the following section, entitled “Staging Stereo,” we introduce the idea of *staging* as an alternative to the overwrought distinctions between the real and the virtual, lo-fi and hi-fi, the live and the recorded—distinctions that have tended to distort how we think about the role of stereo reproduction in musical culture. In contrast, staging highlights the constructed nature of both stereophonic representation and that which it represents; the emphasis here is on technical practices that led to our conception of the stereophonic image or *sound stage*. In “Auditory Perspective,” we begin by examining the development of a cultural-perceptual awareness that predates stereo as a technology. As early as the late eighteenth century, scientific inquiry into the mechanisms of human hearing begins to suggest that listening is essentially *binaural* (two-eared) in character. This insight lends itself to the idea that hearing is, like vision, *perspectival* and that sounds are received from a specific subject position. These assumptions then form the basis upon which much research and technological development are pursued from the 1930s onward. Finally, in “Listening Practices” we consider the commercial constraints of technological innovation and the contingencies and practicalities of reception. It is in these contexts that the idealized aesthetic and scientific notions that underwrite stereo are confronted with the realities of commerce and everyday life. Stereo, in its technical execution and its relationship to the demands of particular communities and contexts of use, is molded and transformed to meet the needs of both industry and pleasure.

Collectively, these conceptual frameworks signal that we think of stereo as not simply a technology. It is a constantly changing historical and cultural phenomenon. It is *living stereo*.

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any sense of “absolute sound quality”; is it not an overarching “logic” in the history of sound reproduction. Such critiques are established (cf. Chion 1994, Sterne 2003, Devine 2013). However, this brief note, as well as the flavor of the following discussions, should signal our critical distance from “fidelity” as an analytical term.

<sup>4</sup>The notion of “deep history” that we employ here is similar to the media-archeological approaches of Zielinski (2006) and Parikka (2012); however, we do not claim to follow their concepts or methodologies in any strict sense.

## Staging Stereo

Notions of realism and fidelity were prominent among the discourses that circulated around stereo during the period of its commercialization in the 1950s and early 1960s. These were in large part inherited from its immediate predecessors in the world of consumer audio: namely, LP records and hi-fi reproduction. In this sense, promotional appeals to “concert hall realism” and the “best seat in the house” were expansions of an already saturated discursive environment within which new audio devices and processes were introduced during the post-war period (cf. Anderson 2006). As several of the chapters in this volume argue (e.g. Dockwray and Collins, Grajeda, Moore, Wright), the legacy of these discourses has resulted in an overly polarized set of debates that pit notions of realism, fidelity and authenticity against the obvious artifices of stereo production practices. We want to skirt these debates, as far as this might be possible, by introducing a way of thinking about stereo that we hope might be more productive and less polarized. With this in mind, we want to introduce the notion of “staging”—a notion that can be taken to indicate both the possibility of an external referent (but one that is not, in itself, wholly synonymous with the “real”) and the processes associated with its technological representation. Furthermore, the idea of staging places an emphasis on the ways in which we might think of stereo not simply as a static space in which sounds are represented (or reproduced), but as a more performative space that is produced through a variety of social and technical practices and, also, a space in which other cultural practices are enabled (cf. Lefebvre 1991). To elaborate the idea of staging, we take as our point of departure an early moment in the disjointed history of stereo: Clément Ader’s experiment in the telephonic transmission of operatic and theatrical performances that took place at the Paris Electrical Exhibition of 1881.

The theatrical transmissions of 1881 are among the first public appearances of stereophonic sound reproduction: that they first took place via the telephone rather than sound recording (Edison’s phonograph had been invented in 1877, only a year after the telephone) says much about the wide range of technical and commercial possibilities that were actively pursued during its early days—possibilities that would, eventually, be rendered *impossible* by the optimization of telephone transmission systems for multiple channels of speech communication (cf. Fagen 1975, Sterne 2012). In this early context of possibility, Clément Ader engaged in a remarkable experiment: not only did he transmit sounds from the Paris Opera and the Théâtre Français to a remote audience via listening stations located in specially equipped rooms at the Electrical Exhibition hall (located approximately two kilometers away), but he did so in such a way as to simulate the effect of sitting directly at the edge of the theater stage, hearing the

sounds of the singers and actors as if they were spread out in front of the listener. Ader achieved this effect through a system of multiple microphones placed in pairs on either side of the stage near the footlights; the signal from each pair was fed via telephone wires to multiple sets of paired telephone listening receivers, one for each listener's left and right ear.

Ader's accomplishment was significant in a number of ways: his system demonstrated the quality of his newly designed telephone receivers; it offered a practical demonstration of relatively obscure scientific concepts of binaural listening, or what *Scientific American* referred to at the time as "binauricular auduition" (Anon. 1881b: 422); and finally, we would argue, it suggested that one of the roles of telephone technology would be to transmit and reproduce the cultural space of nineteenth-century spectacle and entertainment, the space of the theatrical stage. Indeed, the popular and scientific accounts of the event published in France at the time (several of which were translated and published almost verbatim in the US)<sup>5</sup> all called attention to the remarkable way in which listeners were able to perceive the position and movement of individuals on the stage: "the singers place themselves, in the mind of the listener, at a fixed distance, some to the right and others to the left. It is easy to follow their movements, and to indicate exactly, each time that they change their position, the imaginary distance at which they appear to be" (ibid.). Furthermore, virtually all the accounts compare the phenomenon to another popular device of the day: "we may recall the stereoscope, which allows us to see objects in their natural relief. A similar effect is produced to the ear" (ibid.). But while viewing stereoscopic images had, from the 1850s onward, become a popular pastime often associated with the reproduction of three-dimensional images of outdoor scenes and far-away exotic places, Ader's transmissions firmly placed the reproduction of audio space in relation to staged entertainment—in effect, offering a technical representation of that which was already a representation (cf. Altman 1992: 46).

Jonathan Crary has placed the development of the stereoscope within the context of ongoing nineteenth-century debates concerning the perception of space; the stereoscope became central to these debates in the way that it defined "the seeing body as essentially binocular" and the perception of space as resulting from the *differences* between what each eye sees (1990: 119; we will return to this point below). Similarly, the impression

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<sup>5</sup>In addition to the article in *Scientific American* (Anon. 1881b), the magazine *Nature* had earlier published a series of articles covering the Paris Electrical Exhibition, one of which was largely devoted to Ader's telephone experiment (Anon. 1881a); the article was largely derived from an account published in French, ostensibly by Count Du Moncel, founder of the journal *La Lumière Électrique*. Du Moncel later published a book (1887) about the telephone that contained a detailed description of Ader's invention. More recent assessments of the Théâtrephone can be found in Laster (1983) and Crook (1999).

of distance and movement afforded by Ader's apparatus was described, in both contemporary accounts and his patent application, as the result of differences in the perception of loudness by each ear (*ibid.*; Ader 1882: 1). Referring to the stereoscope and essentially equating the effects of audio and visual perception, Ader described his arrangement of telephones as "auro-stereoscopic" (1882: 3).<sup>6</sup>

Crary goes on to argue that, while the effect of the stereoscope would become conflated with "the real," its optical effects are actually quite unnatural and "planar" in character, reducing the effect of traditional perspective (as understood through classical painting and photography), and ultimately resulting in "an eradication of 'the point of view'" (1990: 124–8). The comparison of Ader's experiment with the stereoscope breaks down in this instance: certainly binaural and stereo audio would also become conflated with discourses appealing to a kind of audio "realism," but, insofar as the effect of binaural reproduction would appear to be more cohesive than the planar stereoscopic image, we would argue that it actually enhances, rather than "eradicates," a sense of the listener's "point of audition."<sup>7</sup> Thus, binaural reproduction, despite its obvious connections to the stereoscope, was from the outset understood as a singular, ideal listening position in front of a distinct "scene."

In this sense, Ader's emphasis on the functional utility of his invention is not without consequence: it insists on a relationship between a particular nineteenth-century conception of the audience before a theatrical spectacle: even the location of the microphones—at the lip of the stage—suggests a "point of audition" that would have been highly unusual for most audiences of the day, providing an experience that might have emphasized the artificial and the spectacular more than the realistic. Indeed, while Ader refers to the stereoscope in his patent, he makes no appeal to the discourse of "realism." His claims are more modest: "the auditor is enabled to follow the actor's movements about the stage, and thus receives a more intelligible impression of the performance" (Ader 1882: 1). Significantly, when his invention was reintroduced at the Paris Exposition in 1889 and subsequently commercialized, it was dubbed the "Théâtrophone," thus further distancing it from the popular stereoscope and emphasizing its connection to both the stage

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<sup>6</sup>Loudness is not, of course, the only factor relating to spatial perception: later studies in physics and psychoacoustics point to time of arrival, phase differences and other factors as contributing to the ability of humans to hear spatially. However, for Ader and his contemporaries, the phenomenon seemed to be explained most readily as the result of differences in loudness. See below for further discussion of nineteenth-century research into auditory localization and the spatialization of hearing.

<sup>7</sup>"Point of audition" is a term introduced by Michel Chion (1994) to describe the apparent position from which a character in a film might hear a sound, and is in this way analogous to "point of view" camera work.



and the telephone.<sup>8</sup> This emphasis is not surprising given the historical relationship between live performance and the evolution of operatic, theatrical and concert stages (and venues) in western culture. However, it perhaps also marks the beginning of the long, ambiguous and problematic relationship between live performance and electronic media as described by scholars such as Steve Wurtzler (1992) and Philip Auslander (1999).

Our purpose here, however, is not to take up this binary between the live and the recorded but to think about how discourses and practices associated with technologies such as the Théâtrophone variously and actively construct stereo reproduction as a kind of imaginary “stage,” a specific kind of imaginary space within which musical performances are represented.<sup>9</sup> The idea of staging thus refers both to a potential external space—“the stage”—and to a set of technological practices that are, in essence, representational. Understood in this way, the “staging” of stereo can take many forms and, in its broadest sense, ought to also include the idea of the stage in relation to the meta-space of the theater and to audience position (every representational space implies a preferred subject position; cf. Sterne and Grajeda, this volume). For example, even when notions of realism and fidelity are invoked in relation to stereo, they are often combined with terms such as “concert hall” realism, which carry along with them class and high culture connotations, or found in expressions such as “the best seat in the house”—the “best seat” in such instances being that which gives the best listening position with regards to the imaginary stage. The *staging* of stereo can also take on a very literal meaning in some cases: for example, in some of the promotional events associated with the early stereo experiments undertaken by Bell Labs and conductor Leopold Stokowski during the 1930s (which will be discussed in more detail below), the sounds of an orchestra picked up from the stage of one concert hall were transmitted to loudspeakers installed on the stage of another, remote venue (McGinn 1983: 57). Stereophonic sound was thus “staged” as a kind of spectacle in its own right.<sup>10</sup>

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<sup>8</sup>The Théâtrophone had a remarkable run: although it seems to have been adopted in a limited fashion—primarily in public places, such as hotel lobbies, and in the homes of the upper classes—the commercial development of the technology continued until about 1929. The technology was marketed under the name “Electrophone” in Britain, the US and elsewhere; in each instance, the naming of the device does not appear to emphasize the connection with stereo, as such.

<sup>9</sup>It should be noted that Ader’s invention was essentially binaural in character and its effects should be distinguished from the stereo recording practices described in this section. The distinction between binaural and stereo methods of recording will be dealt with in more detail in the following sections of the introduction.

<sup>10</sup>Interestingly, Stokowski located himself in the hall with the loudspeakers, balancing and modulating the sounds they produced, rather than occupying himself with the task of leading the orchestra, located elsewhere, thus lending his fame as a conductor to the act of mediation.

Promotional events of one kind or another have been central to the introduction of new technologies—both industrial and consumer technologies—since the middle of the nineteenth century: Ader's Théâtrophone was introduced at one of many such events that took place at regular intervals in Paris, and elsewhere, from the 1850s to the 1930s (cf. Williams 1982: 58–66). On a smaller scale, and not unlike the Stokowski/Bell concerts, Edison organized a long series of touring events to promote the phonograph: his famous “tone tests” elaborately staged live performers against their own recordings in an attempt to convince audiences of the “fidelity” of phonographic reproduction (Thompson 1995). With stereo it was the home, as the primary site of consumption, that became a latter-day extension of these promotional events. In this volume, Tim Anderson discusses the role of demonstration records in promoting the ideals of two-channel reproduction in the home: invoking Tom Gunning's notion of the “cinema of attraction,” he argues that demonstration records were a key vehicle for convincing listeners of the superior spatial effects possible through stereo. Anderson goes a step further in suggesting that the demonstration records were also significant in the way in which they “trained” the consumer to adopt a new mode of listening.

Of course, with demonstration records, and indeed in most recording and listening situations, a literal stage is not present. Yet many sound recording engineers have nevertheless come to think of (and describe) the metaphorical space of stereo reproduction as a kind of stage. This way of thinking is deeply embedded in engineering practices, where musical instrument sounds, regardless of the circumstances of their recording, are often panned in such a way as to imitate the way one would hear an orchestra or band performing live on stage. And within engineering and manufacturing discourses, the term “sound stage” is commonly employed in describing the audio space of the stereo mix (cf. Moylan 2002). A stage is, of course, a three-dimensional space and, beyond panning sounds from left to right, engineers employ a number of other techniques and devices, such as artificial reverb, to create the effect of greater depth and breadth. For example, in one of its instructional manuals accompanying the release of a line of amateur and semi-professional reverb devices in the late 1980s, the Alesis Corporation described the role of reverb within sound mixing as follows: “These [reverb] programs were chosen for the purpose of creating a ‘sound stage’ for the musical performance. There is a well-defined sense of three dimensional space that is occupied by each instrument: left to right and front to back” (Alesis n.d.: 4). To bring its point home, the manual includes an elaborate, shaded graphic representing the precise location, width and depth of various instrument sounds and reverb effects as they might sound in an audio mix.

While these discourses and practices have been long-standing within a variety of promotional, manufacturing and engineering communities,

they have also, in recent years, been taken up by a number of scholars in an attempt to analyze and understand the effects of mixing (and audio processing more generally) on listener experience. Serge Lacasse (2000) has analyzed in great detail the various uses of the microphone, signal processing, mixing and panning in what he refers to as the “staging of the voice” in rock and pop music recording. “Staging,” in his usage, places contemporary sound recording within a long history of western theatrical and aesthetic discourse and practice to illuminate their impact on the production of meaning and affect in popular music, especially as they relate to the sound of the singing voice. More broadly, Ruth Dockwray and Allan F. Moore (2010) have described the production of a kind of virtual space that they call the “sound-box,” which appears to have emerged in pop and rock recording during the 1970s. In this volume, Moore extends his analysis to a discussion of British folk music and the transition from mono to stereo recording practices. The aesthetics of the sound-box appear to transcend widely accepted generic boundaries, which says something about the affordances of stereo as a mode of sound reproduction. However, as Moore argues, the use of these recording practices has particular implications for notions of folk authenticity.

The idea of the sound-box is, in many respects, similar to the idea of a sound stage but also suggests that, by the 1970s, sound recordings should be thought of as creating their own, unique type of spatial environment, one that no longer refers to any kind of “real” performance space. Multitrack recording plays a key role in first isolating individual instrument sounds so that they can then be processed and precisely located within the virtual space of the stereo mix. The sound-box/stage that listeners perceive in the stereo mix is thus not predicated on the idea of a “real” stage or a simple pair of microphones used to capture a “real” performance; it is, rather, a highly artificial space created through the layering of multiple audio tracks. In this sense, the “sound stage” has become, in Deleuzian terms, a kind of “deterritorialized” space—one that must be “reterritorialized” for a culture raised on listening to music via loudspeakers (cf. Théberge 1989, 2004; Doyle 2005).

Beyond the virtual space represented by the sound stage, Simon Zagorski-Thomas (2010) further distinguishes between what he calls “functional” and “aesthetic” staging. While Dockwray and Moore clearly relate the “sound-box” idea to the development of a studio-based aesthetic, Zagorski-Thomas’ notion of “functional staging” suggests that certain approaches to sound mixing may be prompted by practical issues related to reception rather than production. For example, he argues that the practicalities of playing dance music through large speaker systems in clubs led engineers to treat and place sounds differently than when mixing rock music for playback in the home; the latter practice often results in an attempt to simulate the sound of large venues—creating the effect of “a stadium in

your bedroom.” Zagorski-Thomas’ notion of “functional staging” thus makes an important point about the idea of sound staging more generally: “staging” sounds in music recording is a process that variously ties together a sonic aesthetic of “real” performance spaces—along with their attendant ideologies of immediacy and authenticity—with studio production practices and assumptions about the contexts of reception. In this way, we can think of three interlocked “stages”: the stage of performance, the stage created in the mix, and the stage on which sounds are played back.

These observations about the staging of stereo sound suggest that when we think about stereo as simply the left and right tracks of a stereo tape, the two sides of a record groove, or a pair of loudspeakers or headphones, we miss an important fact: that the production of a stereo recording involves the channeling of multiple sources of sound into a single, left–right configuration and, also, that stereo playback can employ multiple speaker arrays. The use of multiple microphone techniques was already common in the days of monophonic recording, whenever it was necessary to highlight the contribution of a singer, soloist or other prominent element in a musical texture, or to create a sense of spatial depth (cf. Doyle 2005). While it was always possible to record even a large ensemble, such as a symphony orchestra, in stereo with only a pair of microphones (as is often done in live radio broadcasts where the multiple microphones might be distracting for the live audience), recording engineers typically used multiple microphones to obtain better balances between different sections of the ensemble, and between ensemble and ambient sound. In the case of Decca London’s so-called “phase 4” recording process of the early 1960s, the input from as many as twenty microphones could be routed through a custom-designed mixing console to produce a stereo recording. Indeed, it is important to recognize that the development of commercial stereo recording during the late 1950s and early 1960s occurs simultaneously with the development of multitrack recording techniques: two-, three-, and then four-track recording was common and, by the end of the 1960s, recording on as many as sixteen or twenty-four tracks was possible. The creative and transformative uses of multitrack recording are well known in popular music, but even in classical music recording, multitracking was often used to ease the burden of balancing multiple microphone inputs while recording: “years ago it was either two or three tracks. There wasn’t much to do back then. We could manipulate three tracks and get certain little things, little nuances maybe. But with sixteen tracks, what we’re doing is really recreating the whole orchestra ... Of course, sixteen tracks could mean fifty microphones” (in the words of classical music recording mixer Ray Moore, quoted in Harvith and Harvith 1987: 325).

If stereo is actually the meeting ground for multiple channels of sound, stereo reproduction is, likewise, not confined to only two channels. This has been especially true in film sound, where stereo and surround sound

systems have proliferated, employing multiple speakers in a variety of competing configurations and formats.<sup>11</sup> Despite its appeal to a kind of three-dimensional audio “realism,” film sound might still fruitfully be thought of in relation to the framework of staging and audience positioning suggested here. Hollywood cinema has long been thought of as the medium of realism *par excellence*, but its historical associations with drama, performance and public exhibition make it almost impossible for cinema to fully extricate itself from its links with nineteenth-century musical and theatrical forms and venues. Indeed, the movie palaces of the 1920s and 1930s, with their elaborate proscenium arches and other architectural details, continued to make an explicit link between film experience and the spectacle of opera and theater long after cinema had parted company with vaudeville and other early entertainment venues. Much later, many theaters of more modern design still contained vestigial markers of theatrical entertainment: e.g. the velvet curtains that hid the film screen until it was time for the show to begin. And today, the popularity of the Metropolitan Opera HD broadcasts and the continued, if occasional, success of musicals such as *Les Misérables* (2012), exploit connections between cinematic, operatic and theatrical spectacle.

So while the cinematic screen is not a “stage,” it is nevertheless situated in a theatrical context: in an age of television, internet and mobile viewing, theatrical exhibition is still a core component in film production and distribution. Within conventional cinematic exhibition practice, the configuration of audience seating forces a front-facing orientation to the screen and, we would argue, to a large degree this requires that sound projection in the cinema retain the character of a “sound stage”;<sup>12</sup> this continues to be true even in an era devoted to the development of an ever-increasing array of loudspeakers and surround-sound configurations. As Benjamin Wright argues in this volume, while manufacturers such as Dolby promote their surround systems on the basis of their ability to place sounds with increasing accuracy within the cinema and to immerse

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<sup>11</sup>Unlike film, the music recording industry has never fully succeeded in convincing listeners that music requires more than two channels for adequate sound reproduction. For a variety of reasons both Quad recording (in the 1970s) and high-definition, surround audio formats (SACD and DVD-A) introduced in the late 1990s and early 2000s have failed to catch on with consumers. In the latter case, even though a number of high-profile sound engineers actively pursued the idea of creating a new recording aesthetic based on multichannel surround mixing (Cherney 1998), and while a new Grammy award category for “Best Surround Sound Album” was introduced in 2005, consumers had already decided that MP3 files, which feature compressed audio and stereo playback, were more amenable to their interests in music sharing and mobile listening (cf. Sterne 2012).

<sup>12</sup>In emphasizing the staging framework, we are consciously breaking with the more conventional modes of analyzing film mixing practices in relation to realist, narrative and diegetic concerns. For our purposes, the idea of staging might offer a more subtle framework for understanding the role of sound in film than a rigid adherence to the notion of diegesis.

the audience within a three-dimensional acoustic space, sound engineers are bound by ideologies of speech intelligibility, narrative and diegetic coherence, and the need to tie sounds to the visual frame for fear of distracting audiences from the essential space of representation. Thus the frontal, left-center-right array of speakers—in effect, the stereo sound stage—is always privileged in film mixing, regardless of the total number of sound channels employed in the mix and their eventual configuration in the film (or home) theater.

Other screen media, such as television and computer gaming, have varying and contradictory associations with the traditions of theatrical spectacle. As such, an application of the idea of “staging” may seem more problematic; but as the notion of the stage recedes, the significance of audience perspective and positioning becomes even greater. This is especially the case with gaming, where the real-time modular generation of the audiovisual gaming environment and notions of “interactivity” would seem to work against conventional analysis based on a theatrical model. However, the relationship between gaming and other media is complex: as Alexander R. Galloway (2006) has argued, the origins of the first-person shooter game genre may lie in the radical “point-of-view” (POV) camera style of some film noir and thriller movies. And as Ruth Dockwray and Karen Collins suggest in this volume, game developers are often engaged in creating the audio equivalent of this radical subjective camera style: game developers create three-dimensional audio environments that simultaneously take into account both the position of sound events in the virtual space of the game as well as their distance from the listener/gamer. So while the discourse of computer gaming emphasizes the “immersive” character of gaming experience, the subjective impression of immersion can only be arrived at by a careful calculation and coordination of the user within an apparatus that simultaneously places them both inside *and* outside the game action. Like cinema, the video screen ultimately limits the ability of the medium to achieve total immersive verisimilitude and, in effect, reduces the virtual world of the game to a kind of stage, albeit one that is highly kinetic and mobile. As Dockwray and Collins argue, sound matters to gamers, perhaps because the deployment of game sounds contributes more to the sense of immersion than does the screen image.

These reflections suggest that, overall, the idea of staging and audience positioning within conventional media is relatively static and singular in character. But we would be remiss if we did not outline, if only briefly, various alternative modes of stereo and multichannel sound projection. We do so, not to valorize these approaches as “avant-garde” or “radical,” but simply to highlight the very conventions within which these alternatives must operate. For example, within the world of popular music, Brian Eno introduced a modified stereo system for the playback of his so-called

“ambient” music of the late 1970s and early 1980s.<sup>13</sup> The system used a third speaker that combined both the left and right stereo signals but was wired out of phase with the main stereo pair; placed at the apex of a triangle with the other speakers, the third speaker produced only sounds not common to the main stereo signal. The system resulted in a somewhat more distributed, less focused musical space but, also, one that did not privilege a singular auditory position (i.e. the stereo “sweet spot”). Also during the 1970s, pianist Glenn Gould experimented with a multiple microphone recording technique, similar to that employed in other classical music recording, but instead of using it to render the conventional image of the concert hall “stage,” he used the various microphone positions to create the effect of a highly mobile acoustic space—what he sometimes referred to as an “acoustic orchestration” or “choreography” (2012).

As noted above, multichannel audio and surround-sound systems can also situate the audience in a singular, static relationship to a virtual “sound stage” and this has often been a problem even for avant-garde electronic music composers who, despite their efforts to explore multichannel sound projection as a three-dimensional environment, have typically had to grapple with conventional concert hall settings that assume a seated, immobile audience. As Jonathan Tee argues in this volume, the problem is not simply the legacy of the concert hall, per se, but is a larger, more fundamental problem of the historical and discursive construction of music listening as “an audiovisual practice.” For Tee, both stereo listening in the home and multichannel listening in the concert hall are normative in the sense that they insist that listening takes place before a real, or imagined “visual scene.” In confronting these norms, contemporary artist Janet Cardiff has used her association with art galleries and other venues to create multichannel audio works, such as her well-known *Forty Part Motet* (2001), that permit an audience to move freely around an open space punctuated by groups of loudspeakers, each playing a single line of music. While the audio reproduces a musical performance, it does so in a way that breaks with the conventions of concert staging and listening. Cardiff, and partner George Bures Miller, have created a wide range of audiovisual installations that variously play with notions of staging, narrative cinema, soundscape and mobility, constantly opening up our relationship with media and subject positioning to a kind of playful scrutiny.

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<sup>13</sup>For a detailed description of his three-speaker stereo system, see Eno’s album notes for his fourth ambient release, *On Land* (1982).



## Auditory Perspective

The idealized subject positions integral to stereo as an aesthetics of staging open out onto a deeper archaeology of listening. Indeed, the history of stereo as an aesthetic phenomenon, as the development of a set of representational conventions and a system of mediation, is inseparable from a new understanding of acoustic subjectivity that has developed slowly and unevenly since the 1800s. During this period, an epistemological formation that we call the “acoustic sciences” took shape, and conceptions of sound and listening underwent a paradigm shift.<sup>14</sup> In particular, we note a transition from sound and listening as non-spatial phenomena to fundamentally spatial phenomena (Boring 1942: 381–92; cf. Pierce 1901, Blauert 1997). Our argument is that the subsequent development of stereophonic sound participates in a broader and “practically universal acceptance of what might be called the *spatialization of thought and experience*” (Gross 1981–2: 59, emphasis in original; cf. Kern 1983).

A key aspect of the newly spatialized acoustic subject emerged from research into auditory localization and binaural audition. Such developments can be traced at least as far back as 1796, when Giovanni Battista Venturi published his expressly two-eared experiments on sound localization. While Venturi’s work was largely ignored and quickly forgotten, questions about the acoustic perception of space nevertheless became increasingly prevalent through the nineteenth century, marked by the arrival of devices such as the binaural stethoscope (1851), the differential stethoscope or stethophone (1858), and the pseudophone (1879), as well as the writings of well-known figures such as Charles Wheatstone, Ernst Heinrich Weber, Lord Rayleigh, Alexander Graham Bell and Carl Stumpf.<sup>15</sup> Partly through the work of Somerville Scott Alison, by the mid-nineteenth century “the principle of bin-aural observation” was beginning to redefine the medical field (1861: 324). By the late nineteenth century, the “laws of Binaural Audition” were entering the lexicon of the acoustic sciences writ large (Thompson 1879: 385). Indeed, Anton Steinhauser (1879) noted around this time that theoretical approaches to hearing could be fundamen-

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<sup>14</sup> We think of the “acoustic sciences” as a constellation of disciplines including physical, physiological, psychological and musical approaches to sound. In different ways, these disciplines exemplify processes of objectification and subjectification that are similar to those described by Foucault (1970) more generally in terms of the “human sciences.” A fuller archaeology of the acoustic sciences is beyond the scope of our project here.

<sup>15</sup> Interestingly, while Helmholtz is clearly a key figure in establishing “modern aurality” (Erlmann 2010; cf. Steege 2012, Sterne 2012, Hui 2013), and while he did much to advance the study of binocular vision, Helmholtz contributed very little to research on binaural hearing (Wade and Ono 2005: 646). For additional background on some of the thinkers and technologies mentioned here, see Boring (1942), Rosenzweig (1961), Wade and Ono (2005), Wade and Deutsch (2008).



tally divided into “Monaural Audition” and “Binaural Audition.” Although Steinhäuser exaggerated when he claimed that binaural audition “has never, to my knowledge, been yet developed” (1879: 181), this was nevertheless a significant moment in the crystallization of the idea that human perception of acoustic space and sonic direction was dependent on various differences in the arrival of sound at the two ears. The acoustic subject’s ability to locate sound in space thus becomes “essentially binaural,” in a sense paralleling Cray’s research into the establishment of an “essentially binocular” subject in the early nineteenth century (1990: 119).<sup>16</sup> As we will show below, the (re)discovery of two-eared listening is an ongoing trope in the history of sound reproduction. Here, though, we want to emphasize how the development of stereo as an aesthetics of staging is “inseparable from a massive reorganization of knowledge and social practices that modified in myriad ways the productive, cognitive, and desiring capacities of the human subject” (3).

It is this spatial, binaural conception of the acoustic subject that undergirds a key forerunner of stereo: the development of “auditory perspective” at Bell Laboratories in the 1930s. Auditory perspective is interesting because, as is apparent in the work of Bell Labs, the phrase simultaneously designates a mode of sound reproduction and a mode of listening. Reflecting on the broad research agenda that nourished the development of this particular technology/technique, Harvey Fletcher notes that Bell’s aim during the early twentieth century was to “make a telephone reproduce the sound so that it sounded like you were talking like we are talking to one another, about a meter away” (1966: 9).<sup>17</sup> Summoning a century of change in the acoustic sciences, he says the breakthrough in achieving this goal was binaural: “You would always know it was the telephone until I don’t know who stumbled over the fact that we listened with two ears.”<sup>18</sup> This basic idea anchored Bell’s early research into binaural sound reproduction, which used a tailor’s mannequin—“Oscar, the dummy with microphone ears” (Anon. 1933b: 2)—to replicate “the conditions of normal hearing ... by modifying the

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<sup>16</sup>Sylvanius Thompson made this connection in a literal sense: “The Pseudophone is an instrument for investigating the laws of Binaural Audition by means of the illusions it produces in the acoustic perception of space. It is therefore the analogue for the ears of the Pseudoscope of Wheatstone, which serves to illustrate the laws of Binocular Vision by means of the illusions it produces in the optical perceptions” (1879: 385).

<sup>17</sup>For explanations of why Bell supported such a broad research agenda (one that was sometimes seemingly irrelevant to telephony), see Fagen (1975), McGinn (1983) and Sterne (2012). See also Jewett (1940).

<sup>18</sup>Fletcher goes on to describe how he invited Bell’s head of research in to listen to the dual-earpiece setup: “I said ‘well how does it sound’ and he said if those damned kids would stop talking like that maybe I could hear. He was completely fooled, for the first time. And of course that became quite a stunt around the Laboratories for many years” (1966: 9–10).

sound field near them as a human head modifies it near the ear” (Fletcher 1933: 287). In other words, the binaural system “aims to reproduce in a distant listener’s ears, by means of [headphones], exact copies of the sound vibrations that would exist in his ears if he were listening directly” (Steinberg and Snow 1934: 245).

Properly binaural reproduction was of great interest to Bell Labs—not to mention the 600,000 people who listened through Oscar’s ears over the course of Chicago’s 1933 Century of Progress Exhibition (cf. Anon. 1933a, 1933c). However, during this period, for reasons we discuss below, engineers spent at least as much time and effort developing “less ideal arrangements” (Steinberg and Snow 1934: 245). Instead of the “microphone ears” and headphones that defined binaural, such arrangements “consist[ed] of as few as 2 microphone–loudspeaker sets” (ibid.). Although these loudspeaker setups were accepted as inferior to “true” binaural, they were nevertheless capable of producing “good auditory perspective” (ibid.). Music critics were less reserved. Writing about early public presentations of the technology, in which a Philadelphia Orchestra performance was transmitted to a remote and empty stage, the *Philadelphia Inquirer*’s Linton Martin noted: “Employment of the principle of ‘auditory perspective’ through the use of the binoral [sic] system of tone transmission ... made possible tonal triumphs which, it may conservatively be claimed, have never before been achieved” (1933: n.p.). The *New York Times* was similarly gushy: “The new ‘reality,’ described as ‘stereo-phonic’ presentation, or auditory perspective ... gave the audience an inkling of the music of the near future and introduced a new art—the production of effects no mere human orchestra is capable of producing” (Anon. 1934: n.p.). Crucially, these loudspeaker systems emerged from the same understanding of human hearing that informed the headphone-based binaural experiments. Bell’s John Mills was explicit about this: “Through the application of [the] principle of binaural audition,” he said, “it is possible to reproduce with essential illusion an orchestral performance” (1936: 139; cf. Jewett 1933).

Similar connections between the human hearing apparatus and sound-reproduction devices arguably lie at the root of the entire history of acoustic mediation. Going back to some of the earliest experiments in recording and playback, for example, Jonathan Sterne describes a device called the ear phonautograph, which used a severed human ear to inscribe acoustic vibrations on a piece of smoked glass. In this way, Sterne argues, the device “places the human ear ... as the source and object of sound reproduction” (2001: 260). Although less grisly than the ear phonautograph, Oscar accomplished something similar. But instead of the singular notion of “the ear” that animated the phonautograph, and which defined certain strains of the modern acoustic sciences (cf. Hui 2013), Bell’s work with Oscar established the *ears*—and thus both auditory perspective and the essentially

binaural acoustic subject—as the basis of what would become stereophonic sound reproduction.<sup>19</sup>

Across the Atlantic, similar conceptions of the relationship between sound technology and human hearing were articulated in the work of Alan Blumlein, who is equally credited with the invention of stereo.<sup>20</sup> In a patent filed in 1931, around the time he began working at the newly formed EMI, Blumlein described a two-channel system of sound reproduction that was meant to convey a sense of sonic directionality. He opened the patent by stating that the “fundamental object of the invention” as a technology was rooted in “the physical relations between sound sources, sound waves emitted thereby, and the human ears” (Blumlein 1933: 1). However, whereas Fletcher and his colleagues started from properly binaural sound reproduction, only then moving to dual-loudspeaker models, Blumlein began by rejecting the mimetic binaural model: “it would appear,” he said, “that in reproducing from two loud speakers the differences received by two microphones suitably spaced to represent human ears would give [directional sound effects] to a listener if each microphone were connected only to one loud speaker” (2). What Blumlein found, though, was that a reasonable approximation of the binaural effect could be achieved by arranging loudspeakers “in [a] suitable spaced relationship to the listener” (ibid.). In this way, by conceiving of the listening subject as a stable, ideal auditory position in a spatialized sound field, Blumlein’s understanding of sound perception is equally an outgrowth of the binaural acoustic subject.

Such discourses became even more pronounced in the audiophile literature that served mid-century hi-fi culture. John Sunier, for example, notes in his introductory account of stereo: “The human hearing system simply cannot receive the necessary psychoacoustic cues and stimuli for natural

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<sup>19</sup>Of course, exclusively ear-based understandings of auditory experience pose their own problems, given that listening is in fact a matter of full-body physiology, from head to toe. Although this is especially apparent in cases of loud music and dance, it is no less true in other listening situations (cf. Jasen 2012, 2014).

<sup>20</sup>It is unclear the extent to which Blumlein was aware of the work going on at Bell, and vice versa. Amidst the hubbub surrounding the centenary of stereo in 1981, marked by the release of the Stokowski album *Early Hi-Fi: Wide Range and Stereo Recordings Made by Bell Telephone Laboratories in the 1930s* (Bell Laboratories 1979), Bell’s Media Relations department wrote to Bent Hertz of Danmarks Radio in an effort to cement the corporation’s place as the “true” inventor of stereo. Hertz (1981) obliged, noting: “Bell Labs ... successfully [produced] stereorecordings [sic] even before Mr. Blumlein got his patent in 1931.” Hertz went on to suggest in this letter that perhaps Blumlein heard about Bell’s work when he was employed by Columbia in 1929, or when he worked for Western Electric International in London. Further, Philip Vanderlyn speculates that Blumlein had read certain publications of Bell employees and was thus “prompted to consider how some of the spatial aspects of a performance could be communicated through the medium of a recording” (1978: 664). Our point, however, is not to establish linear connections or pride of place but, rather, to understand these developments as artifacts of a particular historical conjuncture.

listening from monophonic or single-channel sound” (1960: 16). He goes on to describe the “naturalness of stereo” and, further, “the stereophonic advantage in human hearing” (ibid.; cf. Crowhurst 1957). Indeed, as Eric Barry notes in this volume, the supposed “naturalness” of stereo became a key selling point during this period, as part of the defamation of mono recording as single-eared, “unnatural,” “inauthentic”—and outmoded. Of course, from our perspective the connection between stereo sound and human hearing is less “natural” than naturalized—the result of a long series of developments in which a two-eared conception of the acoustic subject came to underwrite the development of stereo technology. But the Sunier example is striking because it expresses a kind of reversal: stereo technology *also* then came to underwrite understandings of human hearing. As with nineteenth-century thinkers who imagined the body as a kind of machine, and like more recent conceptions of the human brain as a kind of computer, stereo thus exemplifies a widespread phenomenon whereby the capacities of media systems, on the one hand, and human subjects and cultures, on the other, become thought of together, in terms of common sets of foundational metaphors (see Shiga and Sterne, this volume; cf. Durham Peters 1999, Kittler 1999, Gitelman 2000, Rodgers 2010, Sterne 2012).

The crystallization of binaural/stereo ideas and technologies was not limited to cinema and music. As part of a set of broader shifts in cultural-perceptual awareness, the history of stereo is also connected to a number of developments in other fields—fields which, though not explicitly concerned with the cultural sphere, or even the acoustic sciences as such, can nevertheless be understood as overlapping phenomena in a shared history of listening. For example, Blumlein explicitly identified “sub-aqueous directional detection” as part of the grounds of his invention (1933: 1). His comment evokes John Shiga’s chapter in this volume, which outlines how, in the early twentieth century, both the ocean and techniques for listening to it were articulated to logics of rationalization and militarization. Shiga notes that “many of the First World War developments in sonar technology defined human listening capacities in a way that ... exploit[ed] the human operator’s capacity to discern differences in phase and amplitude between left and right ears so that locational information about U-boats could be extracted from incoming sounds.” The Second World War then saw the weaponization of sonar and its listening techniques, allowing military operators not only to identify but actively target enemy vessels. In these ways, stereo represents an acoustic extension of Paul Virilio’s argument that certain aspects of visual culture developed alongside a “*logistics of military perception*” (1989: 1, emphasis in original). The history of acoustic subjectivity suggests that such military logistics are also part of the genealogy of contemporary stereophonic microphone techniques and playback systems.<sup>21</sup>

<sup>21</sup> Prior to the invention of more sophisticated electronic radar systems in the 1930s and 1940s,

In constructing the forerunners of stereo, both Blumlein and Bell were doing more than soldering wires and arranging loudspeakers. They were also participating in a key moment in the articulation of the modern listening subject. Such experiments thus illustrate one of the most important lessons of sound studies: sound technology and acoustic subjectivity are not just connected but mutually constituted. Research at Bell, EMI and elsewhere did more than prefigure the technological arrival of stereo; it also laid the foundation for how stereo sound would be made and heard; it set the stage for both the aesthetic conventions of the stereophonic object and the listening conventions of the stereophonic subject. Indeed, the invention of auditory perspective as a mode of sound reproduction evolved in tandem with the *reinvention* of auditory perspective as a faculty of hearing.

The history of perspective has typically been the purview of visual culture studies, and it is worth considering how the history of stereo, as an epiphenomenon of auditory perspective, might resonate with the stories that scholars of the visual normally tell about perspective and subjectivity. Visual studies tends to describe how perspective was invented in the Renaissance and dissolved with the rise of cubism and cinema, alongside parallel changes in the viewing subject or “observer” (cf. Crary 1990). In sound scholarship, we find advocates of a roughly consonant narrative. Steven Connor, for example, argues that with the advent of sound reproduction “The rationalized ‘Cartesian grid’ of the visualist imagination, which positioned the perceiving self as a single point of view ... gave way to a more fluid, mobile and voluminous conception of space ... Where auditory experience is dominant, we might say, singular, perspectival [space] gives way to plural, permeated space” (1997: 206–7). Indeed, as can be gleaned from numerous other studies (e.g. Thompson 2002, Doyle 2005, Blesser and Salter 2007, Schmidt Horning 2012, Born 2013, Sterne 2013), sound reproduction in the twentieth century became fundamentally about controlling and manipulating new types of synthetic acoustic space—as well as their implied and multiple auditory perspectives.

There is surely some explanatory power in situating the proliferation of space and perspectives within a history of decentered subjectivity, which is to highlight a kind of parallelism between the histories of auditory and visual subjectivity. Yet the history of stereo resists any facile “postmodern” reading of these developments. In considering the archaeology of the acoustic sciences that subtends multiperspectival audio, it is possible to argue that the stereophonic subject is remarkably stable, even “centered.” Examples here include the implied auditory perspective of stereo as a

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binaural acoustic location devices were also widely used on ships and on land to permit the hearing of warning signals at times of poor visibility, or to help locate incoming enemy bombers. These devices generally worked by channeling the sounds captured by two (or more) metal dishes or horns to the corresponding left and right ears of a human auditor.

staging effect, the hyper-rationalized approaches to underwater sound as a gridded and channeled acoustic space, as well as idealized speaker placements in home listening. Tony Grajeda (this volume) identifies this latter instance as part of a “particular stage in the modernization of perception,” in which the “sweet spot” emerges “as the privileged location for the listening experience, the rationalization of an aural field that presupposes as it reproduces a particular relation of subject to world.” In his reflexive critique of “soundscape” as a problematically emic concept, Sterne concurs: “The essence of the soundscape, and indeed the essence of stereo ... is a stable audioposition, one from which the entire world is available to be heard” (this volume).

In these ways, the auditory perspective of the stereophonic subject is part of a “distinctively modern set of practical orientations toward listening” (Sterne 2003: 95). Indeed, many scholars identify the years surrounding 1930 as a pivotal moment in the modernization of sound and listening (e.g. Thompson 2002, Erlmann 2010). We similarly find that the discourse networks underpinning the protracted development of stereophonic sound constitute a significant point of definition in our ongoing acoustic modernity. At the level of the history of subjectivity and the epistemology of sound reproduction, stereophony undeniably instances some of the main narratives of modern and postmodern spatial organization: rationalization; the formation of a singular, binocular/binaural subject; the conflation of natural and mediated processes; and the possibility of multiple, overlapping synthetic spaces. Significantly, though, in the world of sound, the relative stability of a singular auditory perspective continues to characterize stereo reception and the (still) modern stereo listener.

## Listening Practices

Stereophonic ideals, in the form of subject positions, conceptual orientations and discursive constructions, are only part of the story. The history of stereo is equally about various commercial realities and listening practices, none of which are strictly governed by the representational and epistemological formations mapped in the previous two sections. Indeed, in terms of selling stereo and listening to it, we want to challenge one of the most entrenched ways of thinking about stereophonic sound: the idea that stereo is simply an extension of, or perhaps even a synonym for “fidelity.” Certainly, as noted above, the early promotional appeals of stereo expanded and reinvigorated the discourses of realism and hi-fi sound reproduction introduced a decade or more earlier. But more importantly, stereo came to be seen as the culmination of the post-war development of hi-fi and long-play recording technologies. In the closing chapters of their